Implications of the Spatial Design of School Buildings on Student Interactions and Student Self-Directed Learning Activities

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‘I, Ahmed Tarek Zaky Fouad confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.'
Abstract

The importance of school buildings is rooted in the vitality of education for societal development. Literature perceives learning as a social process, enriched by student interactions and self-directed activities, and the school design should afford those learning practices. Therefore, research on school buildings requires a broad investigation of the spatial design from the early design decisions, uncovering the design potentiality and reaching the actuality of school operation. This investigation outlines the research scope, while more attention is drawn towards informal learning spaces outside classrooms, including corridors, libraries, dining spaces and play areas.

This research focused on secondary school buildings. It performed quantitative spatial analysis on eleven UK schools, designed by three architecture firms; alongside qualitative interviews with one architect from each firm. This data explores the school design potentiality for possible learning practices. The research, thereafter, studies two (of the eleven) buildings through quantitative onsite observations and student questionnaires; and qualitative interviews with the school managements and teachers. These explain the building actuality of occurring student interactions and self-directed activities, relative to operational managerial schemes (regulations, teacher guidance and supervision) and student preferences.

Findings discuss the influence of functionalities allocation, configurational accessibility and the furniture setup on student interactions, activity types and distribution. Nevertheless, regulations, supervision and student preferences still influence the occurring activities. Shallow corridors afford interactive learning if connected to open learning spaces. Libraries incubate collaborative or quieter (and focused) self-directed activities. Dining spaces accommodate student intellectual practices beyond eating activities. Play areas have the highest activity diversity. The research outcome explains the school actual operations, and how they correspond to (or divert from) the original design potentiality. This outcome contributes to the existing knowledge on the student social life in schools, and how the spatial design and school rules impact activity types across informal spaces. This possibly links to future work on interactive design processes as a methodology that reduces the gap of understanding between design intentions and actuality.
Impact Statement

This research has an impact from an academic perspective of studying school building design, operations and learning processes as well as an impact from the professional perspective of the practice of designing school buildings.

From an academic perspective, this research explains the relationship between the school building, as an example of a learning environment, and the student interactions and self-directed activities (initiated by students) as examples of learning practices. The knowledge cumulated concerning this socio-spatial relationship adds to the available research body on school buildings, not only to confirm the validity of the relationship but more importantly to define its parameters and how the school design impact the occurring student activities. Hence, the research expands beyond just supporting existing theories to clearly explain the spatial dimension of learning activities, especially the student self-directed activities and interactions that emerge outside the classroom boundary. At the same time, the research has an academic impact relating to its articulation of different theories, such social constructivism, environmental psychology of spatial affordances and educational sociology of the pedagogic framework, through providing a detailed empirical account of their application mechanisms within a particular environment, i.e. the school building.

From a professional perspective of designing schools, this research provides an understanding of the implications of the design decisions taken by the team of architects (i.e. design team) during the school design process, and how those decisions yield a design potentiality that influences the student learning practices. Through quantitative spatial analysis, the design potentiality is defined at a holistic level of the whole school building and more importantly at a zoomed-in scale of specific informal learning spaces which are corridors, school libraries, dining spaces and play areas. This impact how architects perceive learning spaces and what to be expected from their operation. Moreover, the research expands beyond defining potentiality to conduct fieldwork inside operational school buildings. The outcome reveals the implications of the design potentiality on the building actuality in terms of student learning practices of interactions and self-directed activities. Accordingly, the research guides future school design processes, specifically for the spatial configuration and furniture setup of informal learning spaces inside secondary school buildings, either locally in the UK or to be applied globally for overseas schools.
Acknowledgements

During a fieldtrip to a London secondary school in 2015, as part of my master studies, it was my first encounter with open learning spaces. Their design and potentiality challenged my understanding of learning spaces as an architect or as a former student who experienced typical cellular-classroom school typology. That fieldtrip was an eye-opener. It triggered my interest in learning spaces, having been rapidly expanded through literature that introduced me to social learning, stepping outside classroom boundaries and encompassing everywhere in the school building. This research puts scientific words to my growing understanding of learning practices and learning spaces. It delivers an analytical study of school buildings, derived by interest in architecture of learning space and more importantly for the sake of students – the future generation.

On my long, hectic but amusing and worth-the-pain journey, I am grateful for several people who did not only contribute to this research but made me who I am right now. And for that, I am truly appreciative.

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Table of Contents

Abstract ........................................................................................................................................ iii

Impact Statement ......................................................................................................................... iv

Acknowledgements ....................................................................................................................... v

Table of Contents ........................................................................................................................ vi

List of Figures ............................................................................................................................... xii

List of Tables ................................................................................................................................. xviii

1 Introduction ................................................................................................................................. 1
  1.1 Importance of Schools ............................................................................................................. 1
  1.2 Parameters of the Schooling System ...................................................................................... 1
  1.3 The Research Scope: The Spatial Design and the Learning Practices .................................. 2
  1.4 Research Questions .............................................................................................................. 4
  1.5 Research Structure and Chapter Overview ......................................................................... 4

2 Literature Review ....................................................................................................................... 6
  2.1 Space and Activities ............................................................................................................ 6
  2.2 Learning Philosophies and Pedagogic Framework ............................................................... 8
    2.2.1 Behaviourism ................................................................................................................ 9
    2.2.2 Cognitivism .................................................................................................................. 9
    2.2.3 Constructivism ............................................................................................................... 10
    2.2.4 Social Constructivism – Collaborative Learning ......................................................... 10
    2.2.5 Summary of Learning Philosophies ............................................................................. 12
  2.3 Student Self-directed Learning activities ............................................................................. 13
  2.4 Bernstein’s Pedagogical Framework .................................................................................... 14
    2.4.1 Classification and Framing .......................................................................................... 15
    2.4.2 Summary of the Pedagogic Framework ...................................................................... 16
  2.5 Affordances .......................................................................................................................... 17
    2.5.1 Concept Definition in the Context of the School Environment .................................... 17
    2.5.2 The Relative Nature of Affordances Due to the Environment Itself .............................. 18
    2.5.3 The Relative Nature of Affordances Due to the Organism .......................................... 18
    2.5.4 Summary of Affordances and its Contribution in this Study ...................................... 20
  2.6 The Spatial Translation of Theoretical Learning ................................................................. 20
    2.6.1 The Spatial Dimension of Behaviourism and Cognitivism ......................................... 20
    2.6.2 The Spatial Dimension of Constructivism: Student-Centred Learning ...................... 21
      2.6.2.1 Transforming Closed Classrooms .......................................................................... 22
      2.6.2.2 Open Learning Spaces ........................................................................................... 23
      2.6.2.3 Informal Learning Spaces (outside the Classroom) ............................................. 23
      2.6.2.4 Summary of Constructivist Learning Spaces ....................................................... 24
    2.6.3 The Spatial Dimension of Bernstein’s Pedagogic Framework in the School Building .... 25
    2.6.4 Summary of Learning Ideas: From Theory to Space ................................................... 26
  2.7 Existing Research on School Buildings ............................................................................... 27
    2.7.1 Post Occupancy Evaluation – Definition and Importance ......................................... 27
    2.7.2 Research on School Buildings and Student Achievement ........................................ 28
    2.7.3 Research on School Buildings and Student Behaviour, Experience and Satisfaction .... 29
2.7.4 Research on School Buildings and Student Well-being ........................................... 30
2.7.5 Research on School Building Configuration Using Space Syntax .................................. 33

2.8 Summary of the Literature Review ................................................................................. 35

3 Methodology .................................................................................................................... 38

3.1 Research Phases ............................................................................................................ 38
  3.1.1 Design Potentiality ..................................................................................................... 38
  3.1.2 Building Actuality ...................................................................................................... 39

3.2 Case Studies .................................................................................................................. 40

3.3 Research Design – Mixed Methods .............................................................................. 43
  3.3.1 Architect Interviews .................................................................................................. 44
  3.3.2 Management and Teacher Interviews ....................................................................... 45
  3.3.3 Student Questionnaire .............................................................................................. 46
  3.3.4 Onsite Observations ................................................................................................. 46
    3.3.4.1 Snapshots ........................................................................................................... 47
    3.3.4.2 Gate-counts ........................................................................................................ 52
    3.3.4.3 Challenges and Considerations During Fieldwork Observations ...................... 56
  3.3.5 Configurational Syntactic Analysis: .......................................................................... 56
    3.3.5.1 Analysis Models: Accessibility vs Visibility ......................................................... 57
    3.3.5.2 The Spatial Model Boundaries ............................................................................ 59
    3.3.5.3 Analysis Grid Size .............................................................................................. 59
    3.3.5.4 Analysis Measures .............................................................................................. 59
  3.3.6 Functional Analysis ................................................................................................. 60

3.4 Sequence of Data Collection and Analysis .................................................................... 61

3.5 Data Processing and Compilation ................................................................................... 62
  3.5.1 Compiling the Spatial Analyses ................................................................................ 62
  3.5.2 Processing Observation Data .................................................................................. 63
  3.5.3 Merging Spatial and Observational Data ................................................................. 64

3.6 Summary of the Research methods .............................................................................. 64

4 Potentiality of the Spatial Design ...................................................................................... 67

4.1 School A1 ....................................................................................................................... 67
  4.1.1 Function Analysis ..................................................................................................... 67
  4.1.2 Configuration Analysis ............................................................................................ 69
  4.1.3 Configuration of Functions ...................................................................................... 72
  4.1.4 Design Potentiality of School A1 ............................................................................ 73

4.2 School A2 – Design Potentiality ...................................................................................... 74

4.3 School A3 – Design Potentiality ...................................................................................... 76

4.4 School A4 – Design Potentiality ...................................................................................... 77

4.5 School B1 ....................................................................................................................... 78
  4.5.1 Function Analysis ..................................................................................................... 78
  4.5.2 Configuration Analysis ............................................................................................ 80
  4.5.3 Configuration of Functions ...................................................................................... 81
  4.5.4 Design Potentiality of School B1 ............................................................................ 83

4.6 School B2 – Design Potentiality ...................................................................................... 84

4.7 School B3 – Design Potentiality ...................................................................................... 85

4.8 School C1 ....................................................................................................................... 85
  4.8.1 Function analysis ...................................................................................................... 86
8.1 The Design and Potentiality of School Dining Spaces .......................... 201
8.2 School Dining Spaces Actuality vs Design Potentiality .......................... 205
  8.2.1 Student Mixing and Encounters in Dining Spaces .......................... 205
  8.2.2 Popularity of Dining Spaces for Student Self-directed Activities .......... 209
  8.2.3 Student Group Formations and Seating Arrangements in Dining Spaces 215
8.3 Affordances of Dining spaces ......................................................... 217
8.4 Summary of Studying School Dining Spaces ...................................... 218
9 School Play Areas: Playgrounds and Terraces ...................................... 221
  9.1 The Design and Potentiality of School Play Areas ............................ 221
  9.2 School Play Areas Actuality vs Design Potentiality ........................... 225
    9.2.1 Student Mixing and Encounters in Play Areas .......................... 225
    9.2.2 Popularity of Play Areas for Student Self-directed Activities .......... 229
    9.2.2.1 The playground .................................................. 230
    9.2.2.2 Upper-floor Terraces ............................................ 246
    9.2.3 Student Group Formations in Play Areas .................................. 249
  9.3 Affordances of Play Areas ......................................................... 252
  9.4 Summary of Studying School Play Areas ........................................ 255
10 Research Discussion: Design Implications ........................................ 258
  10.1 The School Building Design Potentiality and Operation Actuality ......... 258
    10.1.1 Design Potentiality ............................................... 259
    10.1.2 Building Actuality ................................................ 260
    10.1.3 The Re-definition of Spatial Function .................................. 261
    10.1.4 Summary of the Design Potentiality and Operational Actuality ....... 263
  10.2 Affordances: From Design Potentiality to Building Actuality ............ 263
    10.2.1 School Affordance from a Holistic Approach .......................... 265
    10.2.2 Affordances of informal spaces and their popularity .................. 267
    10.2.3 Examples of Affordances within Informal Spaces ....................... 269
    10.2.4 Summary of Affordances in the school building ........................ 272
  10.3 Spatial Boundaries and Control – Classification and Framing ............. 273
  10.4 Student Behaviours and Satisfaction with the School Building ............ 277
  10.5 Summary of Main Discussion Points ............................................ 278
11 Conclusion ......................................................................................... 280
  11.1 Understanding the School Building Potentiality vs Actuality ............... 280
  11.2 The Design and Operation of Informal Learning Spaces ...................... 281
  11.3 Research Limitations and Future Work ......................................... 283
  11.4 Research Contribution .................................................................. 283
12 References .......................................................................................... 285
13 Appendices ......................................................................................... 297
  13.1 Qualitative Data of the Design Decisions During the Design Process: Architects Interviews ........................................................................ 298
    13.1.1 Information Sheet .................................................................. 298
    13.1.2 Consent Form ...................................................................... 300
    13.1.3 Interview Structure ......................................................... 301
13.2 Detailed Spatial Analyses of Eight Cases Studies (Expansion of Chapter 4) ............... 323
  13.2.1 School A2 ................................................. 323
    13.2.1.1 Function Analysis........................................... 323
    13.2.1.2 Configuration Analysis..................................... 324
    13.2.1.3 Configuration of Functions.................................. 326
  13.2.2 School A3 .................................................. 329
    13.2.2.1 Function Analysis........................................... 329
    13.2.2.2 Configuration Analysis..................................... 330
    13.2.2.3 Configuration of Functions.................................. 331
  13.2.3 School A4 .................................................. 334
    13.2.3.1 Function Analysis........................................... 334
    13.2.3.2 Configuration Analysis..................................... 335
    13.2.3.3 Configuration of Functions.................................. 337
  13.2.4 School B2 .................................................. 340
    13.2.4.1 Function Analysis........................................... 340
    13.2.4.2 Configuration Analysis..................................... 341
    13.2.4.3 Configuration of Functions.................................. 342
  13.2.5 School B3 .................................................. 345
    13.2.5.1 Function Analysis........................................... 345
    13.2.5.2 Configuration Analysis..................................... 346
    13.2.5.3 Configuration of Functions.................................. 347
  13.2.6 School C2 .................................................. 350
    13.2.6.1 Function Analysis........................................... 350
    13.2.6.2 Configuration Analysis..................................... 351
    13.2.6.3 Configuration of Functions.................................. 353
  13.2.7 School C3 .................................................. 356
    13.2.7.1 Function Analysis........................................... 356
    13.2.7.2 Configuration Analysis..................................... 357
    13.2.7.3 Configuration of Functions.................................. 359
  13.2.8 School C4 .................................................. 362
    13.2.8.1 Function Analysis........................................... 362
    13.2.8.2 Configuration Analysis..................................... 363
    13.2.8.3 Configuration of Functions.................................. 364

13.3 Ethical Application for Onsite Observations Inside the School .............................. 367
  13.3.1 Filled Application Document..................................... 367
  13.3.2 Approved Document............................................... 382

13.4 Introducing the Researcher to Students of the Observed School Buildings .............. 383

13.5 Qualitative Data of School Management Interviews............................................. 384
  13.5.1 Information Sheet .............................................. 384
  13.5.2 Consent Form.................................................... 386
  13.5.3 Interview Questions............................................... 387
  13.5.4 Transcription of the Interviews.................................... 389
    13.5.4.1 Interview with the Principal of school A1 ................. 389
    13.5.4.2 Interview with the Assistant Principal of school A1 ....... 396
    13.5.4.3 Interview with the Deputy Head of School B1 ................ 405
    13.5.4.4 Interview with Facility Manager of School B1 ................ 412

13.6 Qualitative Data of School Teacher Interviews................................................. 417
  13.6.1 Information Sheet .............................................. 417
  13.6.2 Consent Form.................................................... 419
13.6.3 Interview Questions ................................................................. 420
13.6.4 Transcription of the Interviews .................................................. 422
  13.6.4.1 Interview with Teacher 1 From School A1 .............................. 422
  13.6.4.2 Interview with Teacher 2 from School A1 ............................ 431
  13.6.4.3 Interview with Teacher 1 from School B1 .............................. 440
  13.6.4.4 Interview with Teacher 2 (Also the Librarian) from School B1 .................. 446

13.7 Student Questionnaires .................................................................. 449
  13.7.1 Information Sheet: Sent to the Student Parents or Guardians .......... 449
  13.7.2 Parent Opt-out Form ................................................................. 452
  13.7.3 Information Sheet (For Students) Before Taking the Online Questionnaire 453
  13.7.4 Student Questionnaire Content (18 Questions) ......................... 454
  13.7.5 Outcome of the Student Questionnaires ...................................... 458
    13.7.5.1 Student Spatial Preferences for Interactions ......................... 458
    13.7.5.2 Student Spatial Preferences for Intellectual Activities ............. 459
    13.7.5.3 Student Rating the School Spaces ...................................... 462
    13.7.5.4 Summary of the Student Questionnaire ............................... 463

13.8 Quantitative Data of Snapshots .................................................... 465

13.9 Quantitative Data of Gate-Counts .................................................. 467
List of Figures

Figure 2.1: Bernstein’s Pedagogic Framework ......................................................... 15
Figure 3.1: The Geographical Location of the Eleven Case Studies............................... 42
Figure 3.2: Cases Studies to Investigate the Design Decisions, the Spatial Design and Building
Actuality .................................................................................................................. 43
Figure 3.3: Methods to Investigate the Two Research Phases ........................................ 44
Figure 3.4: School A1 Observation Zoning ............................................................... 48
Figure 3.5: School B1 Observation Zoning .................................................................. 49
Figure 3.6: Snapshot Example After Digitisation .......................................................... 51
Figure 3.7: Gate Distribution on A1 Floor Plans ......................................................... 53
Figure 3.8: Gate-counts Distribution on B1 Floor Plans .............................................. 53
Figure 3.9: Differences Between Accessibility Model (Left) vs Visibility Model (Right) of One
Space ...................................................................................................................... 57
Figure 3.10: VGA of Grid Units (Left) vs Agrregated VGA of Each Space (Right) ............. 63
Figure 4.1: A1 Plans; Coloured by the Spatial Functions .............................................. 68
Figure 4.2: A1 Plans; Indoor vs Outdoor Spaces  Figure 4.3: A1 Spatial Categorisation ....68
Figure 4.4: A1 Categorisation of Spaces (Areas and Counts) ....................................... 69
Figure 4.5: VGA for the Visual Mean Depth, School A1 ............................................. 70
Figure 4.6: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School A1 ........71
Figure 4.7: Correlation of Visual Mean Depth Against Spatial Function (School A1) ........72
Figure 4.8: Average Visual Mean Depth of Individual Form, Informal and Circulation Spaces
................................................................................................................................. 73
Figure 4.9: VGA for the Visual Mean Depth, School A2 ............................................. 74
Figure 4.10: VGA for the Visual Mean Depth, School A3 ........................................... 76
Figure 4.11: VGA for the Visual Mean Depth, School A4 ........................................... 77
Figure 4.12: Building Wings, Connecting Block and the New Extension under Construction in
School B1.................................................................................................................. 78
Figure 4.13: B1 Plans; Coloured by the Spatial Functions ........................................... 78
Figure 4.14: B1 Indoor vs Outdoor Spaces  Figure 4.15: B1 Spatial Categorisation ....... 79
Figure 4.16: B1 Categorisation of School Spaces (Areas and Counts) ........................... 80
Figure 4.17: VGA for the Visual Mean Depth, School B1 ........................................... 80
Figure 4.18: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School B1........81
Figure 4.19: Correlation of Visual Mean Depth Against Spatial Function (School B1) ....81
Figure 4.20: B1; Average Visual Mean Depth of Individual Formal, Informal and Circulation
Spaces ...................................................................................................................... 83
Figure 4.21: VGA for the Visual Mean Depth, School B2 ............................................. 84
Figure 4.22: VGA for the Visual Mean Depth, School B3 ............................................. 85
Figure 4.23: C1 Renovation Plan (level 1) .................................................................. 86
Figure 4.24: C1 Plans; Coloured by the Spatial Functions ........................................... 86
Figure 4.25: C1 Indoor vs Outdoor Spaces  Figure 4.26: C1 Spatial Categorisation ....... 87
Figure 4.27: C1 Categorisation of School Spaces (Areas and Counts) ........................... 88
Figure 4.28: VGA for the Visual Mean Depth, School C1 ........................................... 88
Figure 4.29: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School C1 ......90
Figure 4.30: Correlation of Visual Mean Depth Against Spatial Function (School C1) ......91
Figure 4.31: C1; Average Visual Mean Depth of Individual Formal, Informal and Circulation
Spaces ............................................................................................................. 92
Figure 6.11: Circulation Closure Through the Theatre and Disconnection of Level-three Wings (B1) .................................................................................................................. 160
Figure 6.12: Heat Map of Concentrations and Gate-counts of Students (B1) .................. 162
Figure 6.13: Design and Operation of the Congested South-wing Corridor (B1-level 2) .... 163
Figure 6.14: Closure of Internal Corridors During Break-times (A1) ................................. 164
Figure 6.15: Activity Types and Categories in upper floor Corridors and the Surrounding Spaces (A1) .................................................................................................................. 166
Figure 6.16: Average Visual Mean Depth and Frequency of Activity Along the Accessibility Range in A1 Corridors and Surrounding spaces .................................................................... 167
Figure 6.17: Spatial Distribution of Activities in Corridors and the Surrounding Spaces (A1) .................................................................................................................. 168
Figure 6.18 Forum Space (Low Back Support) in the Western Open Studios (A1 - Level 4) . 169
Figure 6.19: The Design of Open Studios and Isovists from Teacher Locations (A1 - Level 4) .................................................................................................................. 170
Figure 6.20: Visibility Model for the Visual Mean Depth (A1 - Level 4) .............................. 170
Figure 6.21: Frequencies of Group Population on Upper Floors Spaces (A1) ..................... 171
Figure 6.22: Frequencies of Different Activities in each Space in the Upper Floors (A1) .... 172
Figure 6.23 Circulation Closure During Breaks (B1) .......................................................... 173
Figure 6.24: Gate-counts During Breaks (B1) .................................................................... 174
Figure 6.25: Boundary-less Corridors Around the Centralised Dining Spaces (B1) .......... 175
Figure 6.26: Break-out Space, Lockers Space and the Bag Storage Area (B1 - Level 2) .... 176
Figure 6.27: Closed Break-out Space Next to Library; With Warning Signages (B1) .......... 177
Figure 7.1: Accessibility of Library Spaces, Compared to Other Functions ....................... 184
Figure 7.2: Library Allocation and Relation to the Main Student Route ......................... 185
Figure 7.3: Library Location, Movement alterations and Gate-counts (A1) ....................... 186
Figure 7.4: Library Location, Movement routes and Gate-counts (B1) .............................. 187
Figure 7.5: B1 Library Porosity (Open-Plan) to Surrounding Corridors ............................. 188
Figure 7.6 Aggregated Student Occupancies in the Library (A1 vs B1) ............................ 189
Figure 7.7: Library Visual Mean Depth Based on Visibility Models (A1 vs B1) ................. 191
Figure 7.8: Activity Variations in the School Library; Coloured by Activity Categories (A1 vs B1) .................................................................................................................. 191
Figure 7.9: Librarian Isovist and Student Activity Distribution (A1 vs B1) ......................... 192
Figure 7.10: Student Grouping and Movable Furniture in the Library (A1 vs B1) .......... 194
Figure 7.11: Closely Aligned Student Desks (library B1) .................................................. 195
Figure 7.12: Librarian Isovists from their Desk and Student Isovists from Common Sitting Locations (A1 vs B1) ............................................................................. 196
Figure 8.1: Dining Typologies in the Studied Schools (Unified Area vs Multiple Units) .... 202
Figure 8.2: Accessibility of Dining Spaces in the Studied Schools ...................................... 204
Figure 8.3 Separated Dining Units, Each with its Own Staircases (A1) ......................... 205
Figure 8.4: Recorded Gate-counts in A1 Dining units ..................................................... 206
Figure 8.5: Original (Left) vs Expanded (Right) Dining Area (B1) ................................. 207
Figure 8.6: Foldable Dining Benches for the Dining Extension (B1) ............................... 208
Figure 8.7 Gate-counts for B1 Dining Area ...................................................................... 209
Figure 8.8: Student Occupancies in Dining Spaces (A1 vs B1) ........................................ 210
Figure 8.9: Activities Percentages in Dining Spaces; Coloured by Categories (A1 vs B1) .... 212
Figure 8.10: Student Interactions and Self-directed Activities and Teacher Supervision in Dining Spaces (A1 vs B1) ............................................................................. 213
Figure 8.11: Intellectual Activities in Dining Spaces (A1 vs B1) ......................................................... 214
Figure 8.12: Dining Furniture and Group Formations (A1 vs B1) ............................................................ 215
Figure 8.13 Fixed and Movable Furniture and In-between Circulation Routes in Dining Spaces (A1 vs B1) ........................................................................................................................................... 216
Figure 9.1: Playground Spaces of the Eleven Case Studies ........................................................................ 222
Figure 9.2: Accessibility of the Playground and Terraces, Compared to Other Spaces in Each School ........................................................................................................................................ 223
Figure 9.3: Accessibility Spectrum and Frequency of Grid Units Along the Spectrum, for the Playgrounds of all Schools ........................................................................................................................................ 224
Figure 9.4: Movement Counts in Different School Functions (A1 vs B1) .................................................. 226
Figure 9.5: Visual Mean Depth and Gate-counts, Focusing on the Playground (A1 vs B1) ... 227
Figure 9.6: Gated Social Area West of Pitches (B1 Playground) ................................................................. 228
Figure 9.7: Visual Mean Depth of Movement Patterns (A1 vs B1) ............................................................ 229
Figure 9.8: Playground Occupancies and Concentration Clouds (A1 vs B1) ............................................. 231
Figure 9.9: Accessibility of Different Play Areas in the Playground (A1 vs B1) ........................................ 232
Figure 9.10: Activity Types and Categories in the Playground (A1 vs B1) ................................................. 234
Figure 9.11: Visual Mean Depth of Playground Activities by Location (A1 vs B1) .................................. 235
Figure 9.12: Average Accessibility and Range of Each Activity in the Playground .............................. 236
Figure 9.13: Verbal Interactions in the Playground (A1 vs B1) ............................................................... 237
Figure 9.14: Sports in the Playground (A1 vs B1) .................................................................................... 238
Figure 9.15: Intellectual Activities, Games and Performances in the Playground (A1 vs B1) .......... 239
                                                                                                       ............................................................................. 240
Figure 9.16: Challenges and Misbehaviours in the Playground (A1 vs B1) ........................................... 241
Figure 9.17: Student Solitude in the Playground (A1 vs B1) ................................................................ 243
Figure 9.18: Relaxed Activities in the Playground (A1 vs B1) ................................................................. 244
Figure 9.19: All Playground Activities (A1 vs B1) .................................................................................. 245
Figure 9.20: Student Occupancies in Terraces (A1) ............................................................................... 247
Figure 9.21: Activity Variations in Terraces During Breaks (A1) .............................................................. 248
Figure 9.22: Individuals, Pairs and Small Groups in the Playground (A1 vs B1) .............................. 250
Figure 9.23: Medium and Large Groups in the Playground (A1 vs B1) ............................................ 251
Figure 10.1: The Sequential Development of the School Building ......................................................... 254
Figure 10.2: Forms of Affordances and Chances of Activity Occurrence, Relative to School Regulations ........................................................................................................................................... 268
Figure 13.1 Flow Diagram of the Interview Structure ............................................................................. 301
Figure 13.2: A2 Plans; Coloured by the Spatial Functions ........................................................................ 323
Figure 13.3: A2 Indoor vs Outdoor Spaces Figure 13.4: A2 Spatial Categorisation .............................................................. 323
Figure 13.5: A2 Categorisation of School Spaces (Areas and Counts) ................................................... 324
Figure 13.6: VGA for the Visual Mean Depth, School A2 ......................................................................... 325
Figure 13.7: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School A2 ............................ 326
Figure 13.8: Correlation of Visual Mean Depth Against Spatial Function (School A2) ....................... 326
Figure 13.9: A2; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces ........................................................................................................................................... 328
Figure 13.10: A3 Plans; Coloured by the Spatial Functions ........................................................................ 329
Figure 13.11: A3 Indoor vs Outdoor Spaces Figure 13.12: A3 Spatial Categorisation .............................. 329
Figure 13.13: A3 Categorisation of School Spaces (Areas and Counts) .................................................. 330
Figure 13.14: VGA for the Visual Mean Depth, School A3 ...................................................................... 330
Figure 13.15: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School A3 .................. 331
Figure 13.16: Correlation of Visual Mean Depth Against Spatial Function (School A2)..................332
Figure 13.17: A3; Average Visual Mean Depth of Individual Formal, Informal and Circulation
Spaces ........................................................................................................................................333
Figure 13.18: Campus Layout of School A4 .............................................................................334
Figure 13.19: A4 Plans; Coloured by the Spatial Functions .....................................................334
Figure 13.20: A4 Indoor vs Outdoor Spaces Figure 13.21: A4 Spatial Categorisation ............335
Figure 13.22: A4 Categorisation of School Spaces (Areas and Counts) .................................335
Figure 13.23: VGA for the Visual Mean Depth, School A4 ....................................................336
Figure 13.24: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School A4 ......337
Figure 13.25: Correlation of Visual Mean Depth Against Spatial Function (School A4) .........337
Figure 13.26: A4; Average Visual Mean Depth of Individual Formal, Informal and Circulation
Spaces ........................................................................................................................................339
Figure 13.27: B2 Plans; Coloured by the Spatial Functions .....................................................340
Figure 13.28: B2 Indoor vs Outdoor Spaces Figure 13.29: B2 Spatial Categorisation ..........340
Figure 13.30: B1 Categorisation of School Spaces (Areas and Counts) ...............................341
Figure 13.31: VGA for the Visual Mean Depth, School B2 ....................................................341
Figure 13.32: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School B2 .......342
Figure 13.33: Correlation of Visual Mean Depth Against Spatial Function (School B2) .......342
Figure 13.34: B2; Average Visual Mean Depth of Individual Formal, Informal and Circulation
Spaces ........................................................................................................................................344
Figure 13.35: B3 Plans; Coloured by the Spatial Functions .....................................................345
Figure 13.36: B3 Indoor vs Outdoor Spaces Figure 13.37: B3 Spatial Categorisation ..........345
Figure 13.38: B3 Categorisation of School Spaces (Areas and Counts) ..............................346
Figure 13.39: VGA for the Visual Mean Depth, School B3 ....................................................346
Figure 13.40: Visual Mean Depth of Individual Spaces in School B3 ...................................347
Figure 13.41: Correlation of Visual Mean Depth Against Spatial Function (School B3) ......348
Figure 13.42: B3; Average Visual Mean Depth of Individual Formal, Informal and Circulation
Spaces ........................................................................................................................................349
Figure 13.43: C2 Plans; Coloured by the Spatial Functions .....................................................350
Figure 13.44: C2 Indoor vs Outdoor Spaces Figure 13.45: C2 Spatial Categorisation ..........350
Figure 13.46: C2 Categorisation of School Spaces (Areas and Counts) ...............................351
Figure 13.47: VGA for the Visual Mean Depth, School C2 ....................................................352
Figure 13.48: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School C2 ......353
Figure 13.49: Correlation of Visual Mean Depth Against Spatial Function (School C2) ......353
Figure 13.50: C2; Average Visual Mean Depth of Individual Formal, Informal and Circulation
Spaces ........................................................................................................................................355
Figure 13.51: C3 Plans; Coloured by the Spatial Functions .....................................................356
Figure 13.52: C3 Indoor vs Outdoor Spaces Figure 13.53: C3 Spatial Categorisation ..........357
Figure 13.54: C3 Categorisation of School Spaces (Area and Count) .................................357
Figure 13.55: VGA for the Visual Mean Depth, School C3 ....................................................358
Figure 13.56: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School C3 ......359
Figure 13.57: Correlation of Visual Mean Depth Against Spatial Function (School C3) ......360
Figure 13.58: C3; Average Visual Mean Depth of Individual Formal, Informal and Circulation
Spaces ........................................................................................................................................360
Figure 13.59: Campus Layout of School C1 ............................................................................361
Figure 13.60: C4 Plans; Coloured by the Spatial Functions .....................................................362
Figure 13.61: C4 Indoor vs Outdoor Spaces Figure 13.62: C4 Spatial Categorisation ..........362
Figure 13.63: C4 Categorisation of School Spaces (Areas and Counts) ...........................................363
Figure 13.64: VGA for the Visual Mean Depth, School C4 ..........................................................363
Figure 13.65: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School C4 ...........364
Figure 13.66: Correlation of Visual Mean Depth Against Spatial Function (School C4) ........364
Figure 13.67: C4; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces ..................................................................................................................366
Figure 13.68: Preferred Spaces for Hanging Out in the School (A1 Left, B1 Right) ...............458
Figure 13.69: Preferred Spaces for Quiet Conversation with Friends (A1 Left, B1 Right) ......458
Figure 13.70: Preferred Spaces for Student Solitude (A1 Left, B1 Right) ...............................459
Figure 13.71: Preferred Spaces for Eating (A1 Left, B1 Right) ....................................................459
Figure 13.72: Preferred Study Group Format (A1 Left, B1 Right) ..............................................460
Figure 13.73: Group Study Population Preferences (A1 Left, B1 Right) ..................................460
Figure 13.74: Preferred Spaces for Students Intellectual Activities (A1 Left, B1 Right) ......461
Figure 13.75: Student Preferences for Library Visits/Week (A1 Left, B1 Right) ....................461
Figure 13.76: Duration Spent in the Library/Day (A1 Left, B1 Right) ........................................462
Figure 13.77: Student Rating for Different Spaces for Quiet Intellectual Activities ..........462
Figure 13.78: Student Rating for Different Spaces for Vibrant Intellectual Activities ..........463
Figure 13.79: Snapshot Example in A1’s level-5 terrace ......................................................465
Figure 13.80: Gates Example on the School Plan (From A1; Level 4) ........................................467
List of Tables

Table 2.1: Ideologies of Social Constructivism by Vygotsky, Compared to Classical Constructivism ................................................................. 12
Table 2.2: Comparison of Learning Philosophies ................................................................. 13
Table 2.3: Summary of Classification and Framing ................................................................. 17
Table 3.1: Projects and Awards of the Three Firms ................................................................. 40
Table 3.2: Total area (m²) and Layouts of the Eleven Case Studies (Lighter Yellow is the Playground) ........................................................................ 41
Table 3.3: One Day Observation Schedule Example (A1 Left and B1 Right) .................. 50
Table 3.4: Data Entry for Each dot in the Snapshots ................................................................. 51
Table 3.5: One-Day Schedule of Gate-counts (A1 Left and B1 Right) .................. 54
Table 3.6: Gate-counts per 5 Minutes (A1) ................................................................. 55
Table 3.7: Gate-counts per 5 Minutes (B1) ................................................................. 56
Table 3.8: Building Typology According to Corridor Network as Illustrated by Kliment (2001) ................................................................. 60
Table 3.9: Example of Functional Properties Projected on the Configurational Analysis for Two Grid Units ................................................................. 62
Table 3.10: Configurational Data Projected on the Functional Properties of Each Space ................................................................. 63
Table 3.11: Observation Attributes (Recorded on Site and Added in Office) ................................................................. 63
Table 3.12: Functional and Configurational Attributes Added to Observation Data ................................................................. 64
Table 3.13: Qualitative and Quantitative Research Methods for the two Research Phases ................................................................. 66
Table 4.1: Visual Mean Depth (VMD) of the Whole Building and Each Level (School A1) ................................................................. 70
Table 4.2: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School A1 ................................................................. 72
Table 4.3: Visual Mean Depth (VMD) of the Whole Building and Each Level (School B1) ................................................................. 80
Table 4.4: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School B1 ................................................................. 82
Table 4.5: Visual Mean Depth (VMD) of the Whole Building and Each Level (School C1) ................................................................. 89
Table 4.6: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School C1 ................................................................. 91
Table 4.7: Comparison of School Attributes (Areas and Counts) ................................................................. 97
Table 4.8: Strength of the Coefficient of Variance (R²) in the Areas of Spatial Functions for Every School ................................................................. 98
Table 4.9: Mean Area of Each Spatial Function ................................................................. 99
Table 4.10: Summary of Building Typologies, Functions and Formalities For each School ................................................................. 101
Table 4.11: Variations in R² – Coefficient of Variance in Configuration of Functions (All Case Studies) ................................................................. 108
Table 4.12: Relationship Between Functional allocation and Configuration ................................................................. 109
Table 5.1: Categorisation of Activities in Both Schools ................................................................. 121
Table 5.2: Percentage of Occurrence of Self-directed Activity in Each Spatial Functions (A1 vs B1) ................................................................. 126
Table 5.3: Configurational Properties of interactions (A1 vs B1) ................................................................. 129
Table 5.4: Standard Deviation of Accessibility for Each Activity (A1 vs B1) ................................................................. 138
Table 6.1: Circulation Potentially for Interactions and Self-directed Learning ................................................................. 150
Table 7.1: Summary of Library A1 vs B1 ................................................................. 200
Table 8.1: Dining Design and Aggregate Area (%) in Each School ................................................................. 203
Table 10.1 Scenarios of Affordances for Different School Functional Allocations and Spatial Configuration .......................................................... 267
Table 13.1: Visual Mean Depth (VMD) of the Whole Building and Each Level (School A2) .................. 325
Table 13.2: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School A2 .................................................................................................................. 327
Table 13.3: Visual Mean Depth (VMD) of the Whole Building (School A3) ........................................ 330
Table 13.4: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School A3 .................................................................................................................. 332
Table 13.5: Visual Mean Depth (VMD) of the Whole Building and Each Level (School A4) ............ 336
Table 13.6: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School A4 .................................................................................................................. 338
Table 13.7: Visual Mean Depth (VMD) of the Whole Building and Each Level (School B2) ............ 341
Table 13.8: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School B2 .................................................................................................................. 343
Table 13.9: Visual Mean Depth (VMD) of the Whole Building and Each Level (School B3) ............ 346
Table 13.10: Configurational Properties for Each Spatial Function in School B3 ....................... 348
Table 13.11: Visual Mean Depth (VMD) of the Whole Building and Each Level (School C2) ......... 352
Table 13.12: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School C2 .................................................................................................................. 354
Table 13.13: Visual Mean Depth (VMD) of the Whole Building and Each Level (School C3) ......... 358
Table 13.14: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School C3 .................................................................................................................. 360
Table 13.15: Visual Mean Depth (VMD) of the Whole Building and Each Level (School C4) ......... 363
Table 13.16: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School C4 .................................................................................................................. 365
Table 13.17: The Transcription (Meaning) of Each Symbol on the Snapshot ................................. 465
Table 13.18: Sample of the Snapshots Tabulated Data in School A1 ............................................. 466
Table 13.19: Sample of the Snapshots Tabulated Data in School B1 ............................................. 466
Table 13.20: Repeated Recordings for All Gates During Circulation Time, Break Time, and Class Time (School A1) ................................................................. 468
Table 13.21: Total Recording for Circulation, Break and Class Times (School A1) ......................... 468
Table 13.22: Total and Average Gate-Counts of All Times (School A1) ......................................... 469
Table 13.23: Repeated Recordings for All Gates During Circulation Time, Break Time, and Class Time (School B1) ................................................................. 470
Table 13.24: Total Recording for Circulation, Break and Class Times (School B1) ......................... 470
Table 13.25: Total and Average Gate-Counts of All Times (School B1) ......................................... 471
1 Introduction

“Education is not preparation for life; education is life itself” (Dewey, 1916, p. 239)

1.1 Importance of Schools

The importance of schools is derived from the fundamental role of education for societal development. The aforementioned words are written by the famous philosopher John Dewey who called (since the beginning of the 20th century) for transformations in the schooling system. He believed that schools required massive advancements to match our social progress (Dewey, 1899). The importance of schools also links to their operation as channels of transferring cultural capital and knowledge across generations (Bourdieu, 1993). Hence, schools either promote or suppress societal advancement (Durán-Narucki, 2008).

In the UK governmental report ‘Schools pupils and their characteristics’ (2020b), there are 3456 state-funded secondary schools in England, accommodating 3.4 million students in 2020. If the schooling system has an important role in shaping societies (Dewey, 1916/2004), the school building itself contributes to this role, considering this huge number of school buildings and the long hours spent by students inside the school building (Daniel et al., 2019). In a study by the Organisation for Economic Co-operation and Development, it was calculated that students in England spend 912 hours on average per year inside the school building during secondary education (OECD, 2014). It is argued that students are impacted by the environment where they spend time (Dewey, 1899/2008) which renders the importance of research on school building design and operation (Walden, 2015b). Whilst scholars and research projects study school buildings, as discussed in literature, still, the existing research is scarce especially in utilising quantitative methods (Daniels et al., 2019; Sailer, 2015).

1.2 Parameters of the Schooling System

Research on the schooling system encompasses diverse parameters that compose the practice of learning and the student’s social life during the learning process. In recent times, learning expanded beyond the boundary of the physical environment of schools or similar premises to include remote teaching and online learning methods on digital platforms. However, this research is only focused on the school building, and accordingly, the research parameters (discussed below and in the literature review) are mainly associated to physical school premises. The research parameters are defined through three over-arching themes: (1) the learning process, (2) the students and (3) the built environment of the school building.

Learning, as defined by the Oxford dictionary (2017), is the gain of knowledge (or skills) through self-study, experience, or being taught. The learning process comprises the curriculum, i.e. what is being studied, the learning philosophies, i.e. how humans perceive knowledge gain and the learning formats, i.e. the techniques of delivery. Furthermore, the learning process is impacted by the teacher and their quality of teaching which is influenced by the teacher trainings, qualifications and methods of implementing learning techniques. The learning outcome is partially assessed through the student attainment which is a tangible method of evaluation. Yet, acknowledging learning as a mental process requires a broader
understanding of the student experience and acquired knowledge. Thus, learning is recognised as a social process, shaped through the student daily interactions and activities inside the school premises.

The student is the intended recipient of learning and is one of the main actors (along with teachers, family and the community) which shape the learning process inside the school building. The student life inside the school is shaped by certain parameters. It includes the student social behaviours and relations inside the school; their needs and preferences; their experience and satisfaction with the building; and their physical and mental wellbeing. Some other external factors affect the student, such as their parents or guardians; their social background; and their family’s economic situation. The life of the student inside the school building is also shaped by the school management. It is responsible for setting the school mission and vision besides planning for the daily operation of the school (scheduling). Management also lays down the school policies and regulations, to ensure the fulfilment of the school vision, and to facilitate the school daily operation.

The school building is the physical environment accommodating the learning practices. The school building, as a project, starts with the design process, guided by the design team (i.e. a team of architects), design regulations, client team, requirements from the brief and environmental considerations. The design process is influenced by the team of architects’ concepts, perception of learning spaces and their understanding of the student needs. There are further factors that influence the school building design, including the project budget, location and site, views, grounds and aesthetics. The design output is a set of drawings that portray the spatial functions and configuration, shaped through the aforementioned factors and translated into a tangible premise. The constructed school comprises different spaces allocated by the design team, such as classrooms, studios, halls, the library, dining spaces, social areas, offices, services and play areas which are all connected by a circulation network of corridors and staircases. The school building has certain characterised, either tangible in the form of materials, partitions, furniture and equipment; or intangible, such as the air quality, acoustics or the spatial relations of visibility and accessibility properties.

1.3 The Research Scope: The Spatial Design and the Learning Practices

Considering the multiple parameters in the schooling system, this research focuses on the relationship between the spatial design which portrays the potentiality of the school building and, on the other side, the student learning practices which portray the actuality of operation. Within this scope, the spatial design is portrayed through the design decisions (by the team of architects during the design process) and the outcome, i.e. spatial functions and configuration. The student learning practices encompass their interactions and further learning activities initiated by the students inside the school building. Hence, this study is a manifestation of a broader scheme which investigates the relationship between the built environment and the social life inside a building. This relationship is not exclusive to school buildings but incorporates public buildings, such as universities, libraries, hospitals, offices, etc.

The first important parameter in this research is the spatial design of the school building. The school design process is perceived through the architect decisions and objectives, derived
from their socio-cultural perceptions of how societies occupy and function in space (Heitor, 2005). Whilst the term ‘design’ linguistically refers to the process or the end-product, it is argued that more attention is drawn towards studying the final end-product than investigating the process itself (Lawson, 2005). Nevertheless, the importance of the design process is directly associated to its role of satisfying the user needs (Canter, 1977). In the school building, students are the main user group, and the design process needs to be oriented towards their needs, rather than architecture fashion (Schalz, 2015). Thus, the school grows into a home for students (Daniels et al., 2019).

The school design process yields a set of drawings which carries the spatial characteristics of the physical building in terms of configuration and functions. These spatial characteristics are studied through space syntax theories and methods. According to Bill Hillier (1996), buildings are perceived as “information-rich probabilistic space machines, able to absorb as well as generate social information through their configuration” (p.305). Along this train of thought, the spatial configuration, manifested through accessibility and visibility relationships, is the prime contributor to movement patterns which follow the theory of natural movement (Hiller et al, 1993). Thereafter, movement patterns yield patterns of co-presence and encounters that eventually lead to interactions and possible student activities.

The research scope also encompasses the student learning practices, happening inside the school building. The understanding of learning practices is founded on studying student movements, interactions and activities which all relate back to the spatial configuration. There is more focus on activities that are initiated by the students themselves with a degree of autonomy, i.e. self-directed activities, elaborated in literature section 2.3. Self-directed activities, beside interactions, are investigated outside the classroom, within the informal learning spaces (literature section 2.6.2), such as the library, dining space and play areas. Those patterns connect to the notion of social learning (Vygotsky, 1978), based on constructivist ideas that perceive knowledge gain through constructing perceptions, ideas and experiences in the student mind (Cooper, 1993). Whilst constructivism, as a philosophy, is a theoretical foundation, the student practices themselves, as expressions of constructivist learning, have a spatial dimension inside the school environment that accommodates, facilitates or hinders their occurrence (Daniels et al., 2019).

Whilst studying the parameters of the research scope, there are certain considerations regarding the whole research framework and its complexity. All parameters of the schooling system (listed in the previous section 1.2) are entangled. Thus, it is crucial to study the inter-relations between the main parameters of the research scope (i.e. the spatial design and learning practices) and to simultaneously consider their relations to other parameters outside the scope. In simple words, this research illustrates an inter-disciplinary study that focuses on the school building (as the potentiality) and the student learning practices (actuality), yet it acknowledges and involves the other entangled parameters in the study, such as the management input (e.g. regulations), the student preferences and needs in different engagements and the teacher supervision.

In summary, this research acknowledges the relationship between space and activities. It focuses on the spatial design of the school building, and how it impacts the learning process. For that scope, the research investigates the design decisions (by the team of architects)
during the design process and its output spatial design which portray the potentiality of the school building. The research proceeds to investigate the actuality of the student learning practices, perceived through student interactions and activities inside the school. Finally, the research considers the inter-relations between the aforementioned parameters while recognising the impact of other parameters outside the research scope.

1.4 Research Questions

The research questions are derived from the research focus on the socio-spatial relationship between the school building, as the learning environment, and the student learning practices, as the reflection of the learning process. In that essence, the main research question is:

- How does the spatial design of the school building afford the student learning practices, expressed through interactions and self-directed activities?

The main research question is further disassembled into sub-questions that investigate two main dimensions: (1) the school building design and its potentiality and (2) the building actuality in terms of learning practices.

To investigate the design potentiality (1), there are two questions:

- What are the main design decisions, pursued by the team of architects during the design process, that yield the output spatial design of the school building?

- What is the potentiality of the spatial design, relative to the spatial configuration and function allocation, that triggers student interactions and further self-directed activities, especially within informal learning spaces?

To investigate the building actuality (2), there is one question:

- What are the actual practices of student interactions and self-directed activities within informal spaces of the school building as a result of the school operation?

Considering the comparative nature of the potentiality and actuality, for the study of different informal space, the study presents the spatial potentiality, followed by the actual operation and how it diverges from the original design.

1.5 Research Structure and Chapter Overview

The research is structured around the main research question that investigates the design potentiality in terms of spatial functions and configuration and the building actuality in terms of student interactions and self-directed activities. The research begins with a literature review (chapter 2) to define the socio-spatial relationship between the school building and learning practices. It introduces key learning theories, including constructivism, which defines learning as a social process, and the pedagogic framework of classification and framing. Those learning theories are then discussed for their spatial manifestation in the school building, through the concept of spatial affordances which explains how space affords learning practices through offering possibilities. The literature review finally presents previous research on school buildings, either relating to the student achievements, satisfaction and wellbeing; or studying the spatial configuration through space syntax analysis.

The research proceeds to explain the methodology of mixed research methods (chapter 3), comprising quantitative and qualitative methods to investigate the school building functionalities and configuration (i.e. potentiality of the design) and the student interactions
and self-directed activities (i.e. actuality of operation). Consequently, chapter 4 elaborates on the design potentiality through a full data set of three architecture firms and their eleven secondary schools, studied using space syntax analysis and function allocations. Thereafter, chapter 5 complements the study of design potentiality through observational fieldwork of two operational school building. It reveals the occurring patterns of student interactions and self-directed activities which portray the actuality of the school building.

After defining the design potentiality and building actuality through a holistic investigation of the whole school building (through analysis and observations), the following four chapters elaborate on the main informal spaces which are the circulation network (chapter 6), school libraries (chapter 7), dining spaces (chapter 8) and play areas (chapter 9). Each chapter discusses the design and furniture setup of the respective informal space to explore its potentiality, before presenting its actual operation of recorded interactions and self-directed activities. Learning practices are shaped through possibilities in space (affordances) yet simultaneously influenced by the management and student input which shape the actual operation of different informal spaces among the students.

Ultimately, the research presents the discussion of this whole study (chapter 10). It compiles the design implications, relative to findings from studying the spatial potentiality (of functions and configuration) and the building actuality (of learning practices and operational schemes). The discussion mainly explains the school building through spatial affordances, as possibilities, and their transcription into student interactions and self-directed activities, either from a holistic view of the whole building or at the detailed level of individual informal spaces, i.e. corridors, the library, dining spaces and play areas. The discussion also reveals the spatial boundaries and control in the school and the student overall satisfaction with their daily activities. The research conclusion (chapter 11) presents the overall understanding of the school design and operation, especially the informal spaces; the limitations of this research, possible improvements and future works; and finally, the main contribution to the field of studying school buildings. Following the conclusion, the references and appendices are added at the end and numbered 12 and 13.
2 Literature Review

This literature review explores the theoretical foundation that relates to the main research parameters and presents other research projects which share the same interest in school buildings. The main research question and sub-questions (introduction chapter 1.4) focus on investigating the implications of the spatial design and configuration on the student learning practices, perceived through interactions and self-directed learning activities inside the school building. Accordingly, the literature review focuses on learning theories which translate into student learning practices while also discussing the school building as the physical environment that accommodates those practices.

This chapter begins by outlining the over-arching relation between space and activities (section 2.1) which embraces the relationship between the school building and learning activities. This is based on the work of various scholars who discussed how space and activities are interrelated. This also links to space syntax as a theory and method pioneered in University College London (UCL). The chapter proceeds to present the generic theoretical background of learning which possibly applies to different learning processes in different environments not only school buildings. This includes learning philosophies (section 2.2), self-directed learning activities (section 2.3) and the pedagogic framework (section 2.4). After laying down the aforementioned theoretical foundation, this literature review introduces spatial affordances which explain the transition from learning theories into practices, being afforded by the school physical environment (section 2.5). Building on affordances, this chapter discusses how different learning philosophies and pedagogic concepts can be spatially represented in different school environments (section 2.6), thus, highlighting the role of social learning within informal learning spaces. Finally, the chapter presents existing research on school buildings, not exclusive to UK secondary schools (despite being the focus of this study), but inclusive to wider literature on school research in different countries. These research topics discuss the school building, relative to the student achievement, behaviour and wellbeing or other studies that highlight the school building spatial configuration and activities (section 2.7). The literature review summary is presented in section 2.8.

2.1 Space and Activities

Through a wider understanding of the spatial design beyond school buildings, different scholars have discussed the relation between the physical environment, i.e. the spatial envelope, and its societal behaviours and activities. Obsolete understanding of the physical environment perceived space as a passive envelope – a backdrop to social activities. This idea is argued to be obsolete, because scholars, later on, discussed how the physical environment influences members of the societies and their activities. For example, the passiveness of the environment was denied through the social production of space as a concept that perceived social practices as means of shaping the environment (Lefebvre, 1992). Moreover, environmental psychologists perceive the environment as an important contributor towards the human behaviours (Altman, 1991; Holahan, 1978). For instance, the work of George Mead (1934), followed by the work of George Kelly (1955), argued that the human understanding of the environment influences their behaviours. The body and the brain act relative to the spatial context.
Another group of psychologists focused on the human experience inside the physical environment. Heft (2001) discussed the work of James Gibson and Roger Barker and stated that “Individuals can never know the world independently of their own experience” (p. 74). This is based on ‘pure experience’, defined by James (1904) as the connection between the mind and body which leads to humans experiencing emotions in response to external events. Thus, the concept outlines the relationship between the individual (actor in a social life) and the physical environment. Gibson (1969), on the other hand, had a different understanding of the individual’s connection to the external environment. He argued that humans do not need to learn to perceive, since they intake information from environmental stimulus through experience. Thus, humans perceive to learn.

The relation between space and activities is further discussed through space syntax theory and methods which are implemented in this research. Space syntax, through the early work of Hillier and Hanson (1984) in ‘The Social Logic of Space’, investigated the interrelation between the society and its spatial form, thus, connecting the space occupied by users to their social activities. This argument is contextualised through space syntax ideas across scales, from the urban scale towards settlements, elementary buildings, palaces, houses, hospitals and offices. Space syntax made its own distinct contribution on the building scale through discussing interfaces between user groups inside buildings, hence, addressing activities (what people do) in relation to the spatial structure (Hillier et al., 1984). In fact, ‘The Social Logic of Space’ is considered the foundation of building configurational analysis that connects spatial properties to the building social life (Peponis et al., 1997). In sum, the relationship between space and activities is outlined in Hillier’s (1996) argument of how the built environment is primarily embodied in the social activities and functionalities taking place. He added that the building configuration influences the occurring patterns of movements, encounters and co-presence which eventually shape the patterns of interactions and activities. Accordingly, space syntax theories, methods and tools are applied to research on different building types including school buildings, as seen through research examples in section 2.7.5.

Hillier et al. (1993) discussed the theory of ‘natural movement’ in the context of urban spaces, such that movement is shaped by the grid spatial configuration. Highly integrated routes (configurationally shallower) have more movements and encounters than segregated routes. Movements are also impacted by attractors as final destinations. On the building scale, Hillier and Penn (1991) argued that, in strong programme buildings (i.e. constrained by many social rules as elaborated in section 2.5.3 and 2.6.3), movement is not expected to follow the configurational logic, i.e. not to occur naturally, since social rules influence the user movements and activities. While school buildings, being the focus of this research, are expected to have strong programmes with social rules implemented by the management and teachers, this research hypothesises that natural movement (along shallow routes by the effect of the spatial configuration) can sometimes happen within certain informal spaces of the school building, when students are granted freedom to move around and do self-directed activities (e.g. break times), therefore, leading to more student-to-student or student-to-teacher encounters and possible interactions.

The argument, in this research, that buildings and urban spaces can share the same theoretical concept, is derived from Hillier’s (1996) own understanding of the built
environment, where he discussed that: “Space is, quite simply, what we use in buildings” (p.19). Accordingly, if space, as the void occupied, is what matters and not the envelope itself, then what applies on the urban space could possibly exist in building spaces, providing the same conditions, i.e. less rules that impact the use of space. Moreover, the relation between movements and buildings is explained by Peponis et al. (1997) who argued that: “The major thrust of space syntax has been to describe space and movement as a dimension of social copresence” (p.764). Finally, Hanson (1999) argued that: “In moving around in buildings, people orientate themselves by reference to what they can see and where they can go (p.54). These ideas bring back the building configuration as a contributor towards the user routes. This supports the hypothesis (of this research) that there could be possible natural shallower routes for students in the school.

The aforementioned discussion acknowledges the relationship between space and the activities taking place in space. Researchers project this on the school building and the learning practices. For example, Durán-Narucki (2008) explained that “the quality of schools as environments specifically created for learning is then related to the quality of the learning activities that take place in them” (P.279). Similarly, learning practices are shaped through spatial conditions which also influence the student involvement and eagerness to participate in activities (Daniels et al., 2019; Walden, 2015a). Moreover, the school layout and furniture impact student movements, physical activities and wellbeing (Ucci et al., 2015). In the end, the students develop a sense of connection to the building which impact their life inside the school and their learning practices. Those ideas on the relationship between the school building and activities are expanded in multiple discussions, either the spatial dimension of learning theories (section 2.6) or the existing research on schools and the student life inside (section 2.7).

In summary, different scholars acknowledge the relationship between the physical environment and the social life inside the building, represented through the human experience in the physical space, movements, encounters and interactions, beside individual and group activities. Space is not a passive envelop independent of the human social life. This relationship is discussed in different ways, whether through space syntax which highlights the role of social encounters, interactions and activities in relation to the spatial configuration (Hillier, 1996); or through highlighting the role of the environment to shape the human behaviour (Mead, 1934) and the individual experience (James, 1904; Gibson, 1969). This socio-spatial relationship is studied through the school building and the student learning practices which are shaped by spatial conditions.

2.2 Learning Philosophies and Pedagogic Framework

In consideration of the socio-spatial relation between the school building and learning practices, this literature review discusses the philosophies and framework of learning which define the learning process, as the main social practice inside the school. Learning, as defined by the Oxford dictionary (2017), is the gain of knowledge through self-study, experience or being taught. Firstly, there is the notion of knowledge gain which is acknowledged in all philosophies as an outcome of the learning process. Nevertheless, there is a technique of knowledge gain for which different theorists have different explanations of how it takes place. The learning process, of various practices, is understood through different philosophies that
explain the means of receiving and processing knowledge by students during their learning experience (IDC, 2020). Learning theorists seek answers to two basic questions: “Where does knowledge come from and how do people come to know?” (Ertmer & Newby, 2013, p.47).

Learning, as explained in the previous definition, portrays different methods of knowledge gain: study, experience and being taught which reflect the views of different philosophies. The term ‘study’ highlights the learner’s role as the initiator of the process. The term ‘experience’ reflects an ongoing learning event and acknowledges the physical environment. The third phrase ‘being taught’ reflects an action of passing the knowledge from one entity to the learner. These are the generic foundations of the main learning philosophies.

Behaviourism focuses on the behavioural growth and responses of the learner (Skinner, 1968). Cognitivism discusses how the mind acquires knowledge (Bruner, 1990). Constructivism recognises the knowledge construction according to the learner perception (Jonassen, 1991a). While philosophies diversify, learning, in all cases, is viewed as a process rather than an action (Cooper, 1993). The learning philosophies are discussed in the upcoming sections.

2.2.1 Behaviourism

Behaviourism perceives learning through the environment. It is “observation of external events; environmentalism, in which the environment is the significant factor in determining human behaviour; and reinforcement, where the consequences of our actions affect subsequent behaviour” (Cooper, 1993, P.12). Behaviourism highlights environmental stimuli that influence the learner behaviours, thus, induce a gain of knowledge. The learner responds to stimuli, and their reactions recur in response to the same stimulus (Naismith et al., 2004). Behaviourism, in its core tenet, disregards mental processes, i.e. thoughts, feelings, and intentions, which distinguishes it from other philosophies. Mental processes, as perceived by behaviourists, do not determine behavioural choices which are recognised as a product of the human conditioning.

Following behaviourist perceptions, learners are ‘biological machines’ that do not consciously act but react to stimuli, thus, learn (Gregory, 1987). Skinner (1968) argued that the learner’s role is minimised to being active to encounter the environment, to be stimulated and to learn. In that essence, the environment hosts two forms of conditioning: classical or operant (Cooper, 1993). The classical conditioning triggers learning as reflexes to environmental stimuli (Pavlov, 1927). However, operant conditioning includes a reinforcement to influence the learner responses after their original behaviour, hence, learning is consequent to environmental encounters with positive or negative reinforcements (Skinner, 1974). While emphasising the environment and its stimuli, behaviourism is heavily criticised for undermining the individual role to that of a learning machine.

2.2.2 Cognitivism

From a cognitivist perception, learning is knowledge acquisition through a transfer process into the receiver’s mind (Cooper 1993). Cognitivism acknowledges the learner’s mental abilities to comprehend (Tennyson, 1992), unlike behaviourism which understands learning through the environment, its stimuli and reinforcement (Skinner, 1968). Cognitivism
recognises the learner’s encounters with the world beyond being just responsive to the environment. It re-defines the role of the ‘mind’ to acquire knowledge from an external entity (teacher) which adds a sense of mentalism (mind involvement) in the learning process (Bruner, 1990). This is opposite to behaviourism which undermine learners as biological machines and brains as functional organs (Gregory, 1987).

Learning, as perceived through cognitivist ideas, has been described as a sequential process from the first stage of information delivery, until knowledge acquisition (Ertmer & Newby, 2013). The mind receives, attempts to organise and stores information in a structured manner, to be retrieved whenever needed. This sequence highlights the prominent role of the learner’s memory as the key factor determining the amount of knowledge acquired during the learning process. Tennyson (1992) described how cognitivism defines the role of the mind through the ‘cognitive system’ model. It involves four areas of cognition within the mind (sensory receptors, executive control, working memory and long-term memory) and matches them to their purposes and their instructional needs to operate.

2.2.3 Constructivism

Constructivism, unlike the previous philosophies, recognises learners as creators of their own experience and reality, therefore, their own learning content (Cooper, 1993). Whilst cognitivism disapproved of behaviourism for its objectivist approach that emphasises the environment over the mind, cognitivists are themselves being criticised for the same predicament by constructivists. Cognitivists perceive the reality as external to the learner and include the mind in the equation as a memory (Jonassen, 1991b). Contrarily, constructivism acknowledges the mind, beyond a memory in the process of knowledge gain (Cooper, 1993). The mind is the “builder of symbols” (p.16). It shows awareness of possible outcomes and is capable of combining them (Miller, 2011). Knowledge is out there, and the mind filters the input from the world. The learner, through experiences and thoughts, constructs their own reality (Jonassen, 1991b).

Constructivist ideology matches the concept of ‘meaning making’, as introduced by Robert Kegan who discussed the human ability to “actively construct their own reality” (Ignelzi, 2000, p.5). “Constructivists do not deny the existence of the real world but contend that what we know of the world stems from our own interpretations of our experiences. Humans create meaning as opposed to acquiring it” (Ertmer and Newby, 2013, p.55). Eventually, constructivism is learning through building up personal interpretations from individual experiences and interactions but not through environmental stimuli nor knowledge transfer to the memory (Bednar et al., 1995). Consequently, knowledge is “a function of how the individual creates meaning from his or her own experiences” (Jonassen, 1991a, p.5). Knowledge is “not abstract but links to the context being studied and the experiences that the participants bring to the context” (Ertmer and Newby, 2013, p.57).

2.2.4 Social Constructivism – Collaborative Learning

Recognising constructivism as a reliable understanding of learning, scholars discussed theories on learning within a society. Among those scholars, the soviet psychologist and teacher Lev Vygotsky introduced ‘collaborative learning’. The theory recognises learning as a
shared process within interactive groups (Dillenbourg, 1999), and it has two main dimensions as discussed below.

The first dimension of collaborative learning understands learning as a social process (Vygotsky, 1962). The culture of a community has the prime influence on shaping their learning and knowledge base. It is the socio-cultural lens through which learners discover the world. Learning results from interactions with oneself but more importantly with peers, teachers or members of the society. Accordingly, learning communities evolve. Julie-Ann Edwards (2009) summarised Vygotsky’s perception of learning as the relationship between language, thought and communication which Vygotsky originally defined as a social process.

The second dimension of collaborative learning is the ‘zone of proximal development’ which explains the impact of learning in a community. It is “the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p.86). In simple words, the learner’s comprehension of knowledge is mainly dependent on their mental development. There is a difference between what the learner could achieve individually without assistance, compared to their potential achievement with guidance from teachers or more importantly with influence from other learners and interactions among those learners.

Considering learning as a social process and recognising knowledge expansion through ‘zone of proximal development’, the learning outcome is relative to positioning the student within a collaborative learning environment. Unlike individual learning, the collective atmosphere expands the learner current abilities to its maximum potential through an interactive society of communications, discussions, collaborations, and feedback. “Social interactions… stimulate members of the group to think together; from a psychological point of view this pushes forward the level of thinking of each child and ‘scaffolds’ his or her cognitive processes” (Coles, 1995, P.165). The term ‘scaffolds’, in this context, is developed by Vygotsky to describe the instructional support from teachers to learners, as they foster the learning of new skills or content, independence and growth (Magliaro et al., 2005).

Vygotsky’s collaborative learning cultivates constructivism from a social perspective, not in its classical form (Jonassen, 1999). It is identified as ‘social constructivism’, being differentiated from the original philosophy. Firstly, Vygotsky drew more attention to the collaborative nature of learning, promoting the cultural and social context as main contributors to knowledge gain. Contrarily, the original theory (individual constructivism) highlights the mind and its perceptions as the main contributors, while the social context is tangential. Moreover, Vygotsky’s ‘proximal zone of development’ renders cognitive functions as products of social interactions which establish a knowledge community of learners, whereas individual constructivism only acknowledges the individual’s experience. In summary, social constructivists believe that “knowledge is individually constructed and socially co-constructed by learners based on their interpretations of experiences in the world” (Jonassen, 1999, P.217). Table 2.1 provides a summarised comparison between the two approaches.
2.2.5 Summary of Learning Philosophies.

The three learning philosophies describe the human understanding of the learning process. Behaviourism highlights the environment and its stimuli to induce learning while denying the role of the mind (Skinner, 1968). Cognitivism acknowledges the brain as a memory (Bruner, 1990) to acquire knowledge delivered to students by teachers (Ertmer & Newby, 2013). Constructivism disapproves of perceiving the mind only as a memory that stores knowledge (Jonassen, 1991b) and highlights the mind as a constructor of its reality through experience and perceptions (Cooper, 1993). Coinciding with constructivism, Vygotsky’s ‘collaborative learning’ builds upon learning through a community of interactions that expands the learner’s potential beyond their individual learning capacity (Vygotsky, 1962), thus, portraying social constructivism (Jonassen, 1991a). Table 2.2 compares the main themes of behaviourism, cognitivism and constructivism.

The three learning philosophies have been studied thoroughly to understand the theoretical foundation of learning inside the school building. This foundation is necessary prior to exploring the design of learning spaces which incubates those concepts. It is argued that learning is a social process which is explained through constructivist ideas of how the mind builds knowledge individually or in groups. This theoretical idea has a consequent spatial translation onto the physical environment – the school building, as elaborated later on in section 2.6, after studying further learning theories in section 2.3 and 2.4 and connecting theories to space through the concept of affordances (section 2.5).

<table>
<thead>
<tr>
<th></th>
<th>Individual Constructivism</th>
<th>Social Constructivism</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Context/Environment</strong></td>
<td>Individual’s constructed reality</td>
<td>Social Context; the society</td>
</tr>
<tr>
<td><strong>Basic principal</strong></td>
<td>Mind’s perceptions and interpretations</td>
<td>Collaborative Learning, interactions, communication, proximal zone of development</td>
</tr>
<tr>
<td><strong>Learning</strong></td>
<td>Assimilation/construction of knowledge by individual’s mind</td>
<td>Learners are integrated into a knowledge community; society scaffolds the learner’s construction of knowledge</td>
</tr>
</tbody>
</table>
### Table 2.2: Comparison of Learning Philosophies

<table>
<thead>
<tr>
<th>Philosophy of Learning</th>
<th>Behaviourism</th>
<th>Cognitivism</th>
<th>Constructivism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main Contributor (what influences learning)</td>
<td>Environment; stimuli and reinforcement.</td>
<td>Mental ability; mind and memory</td>
<td>Learner’s mind and individual perceptions</td>
</tr>
<tr>
<td>Reality</td>
<td>Exist as the environment</td>
<td>External to the learner</td>
<td>Unique reality according to every learner’s mind</td>
</tr>
<tr>
<td>Knowledge</td>
<td>Behavioural responses to stimuli</td>
<td>Knowledge acquisition/gain by mind</td>
<td>Not acquired, but constructed by the individual’s mind</td>
</tr>
<tr>
<td>Knowledge Transfer</td>
<td>Transfer through generalisation; learner uses knowledge in events similar to the original environment (stimuli) that triggered knowledge</td>
<td>Learner’s memory activates knowledge relevant to event and apply it in different contexts; transfer occur.</td>
<td>According to the context, the mind perceives its own experience and creates knowledge which is conveyed from another experience</td>
</tr>
<tr>
<td>Human</td>
<td>Biological machine</td>
<td>Receptor of Knowledge</td>
<td>Builder of symbols and knowledge</td>
</tr>
<tr>
<td>Mind</td>
<td>Non Existent; brain is a biological organ</td>
<td>Provides references to the real world</td>
<td>Constructs the real world</td>
</tr>
<tr>
<td>Memory</td>
<td>Not addressed. Little reference to the idea of storing habits</td>
<td>Prominent role; receive, organise, store and retrieve knowledge</td>
<td>Always under construction; according to the minds perceptions</td>
</tr>
<tr>
<td>Key Principals</td>
<td>Human Conditioning; classical (by Pavlov) and Operant (by Skinner)</td>
<td>Information Processing</td>
<td>Cognitive Development (by Jean Piaget), Meaning Making</td>
</tr>
<tr>
<td>Learning perception</td>
<td>Direct Instruction and feedback (as reinforcement)</td>
<td>Injecting the memory with information; acquisition of knowledge</td>
<td>Mind builds knowledge through experience, interpretations and perceptions</td>
</tr>
<tr>
<td>Objectivism</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
</tr>
<tr>
<td>Environmentalism</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>Mentalism</td>
<td>×</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

2.3 Student Self-directed Learning activities

Building on the constructivist realisation of learning through perceptions and experiences (Cooper, 1993), self-directed learning is introduced, not as a learning theory but rather as a technique that enriches student knowledge (Loyens et al., 2008). The act of self-directed learning existed alongside human learning as early as philosopher, such as Socrates; or
historical leaders as Alexander the great (Hiemstra, 1994). However, the direct definition of self-directed learning is traced back to Malcolm Knowles (1975). He stated that “self-directed learning describes a process in which individuals take the initiative, with or without the help of others, in diagnosing their learning needs, formulating learning goals, identifying human and material resources for learning” (p.18).

In the context of the school building, self-directed learning activities take place as sequential events, which are recognised as self-regulation processes. The student self-regulates their ideas, behaviours and consequent actions (Bandura, 1986). Self-directed and self-regulated learning are analogous practices in terms of the learner engagement, motivation, and goals (Loyens et al., 2008). Zimmerman (2000) described the train of events. It begins with task analysis and self-motivation. The student then pursues the chosen activity, before self-reflecting on what was achieved during the session. Gibbons (2002) distinguished self-directed activities from teacher-directed activities. The latter describes events driven by the teacher in a formal setting inside the classroom, or similar teaching contexts (e.g. studios and lecture halls). For that, teachers determine the event structure in terms of activities in process, upcoming tasks, and the expected outcome.

Self-directed learning activities have positive impact on students during their daily routine inside the school building (Hiemstra, 1994). Firstly, self-directed activities are driven by the student curiosity which develops their eagerness to explore beyond formal teaching. Hence, they maximise the student engagement in various learning practices outside the classroom setting (Loewy, 1998). Secondly, self-directed activities stimulate the student cognitive functions (Bolhuis, 1996). Students start with exploration and self-orientation (i.e. setting goals), and they learn to take initiatives. Towards the end, students self-evaluate the process and its outcome to re-adjust future activities. Self-directed activities are either individual and group oriented and comprise self-guided reading, reflective writing, group studying, solving problems and interactive discussions (Hiemstra, 1994). These activities are either promoted or inhibited by the teachers who have a role to supervise and regulate self-directed activities (Bolhuis & Voeten, 2001). Eventually, teacher-directed activities (e.g. classroom teaching) are favoured over self-directed activities, being the conventional, less challenging and trusted learning technique inside the school building (Dignath & Veenman, 2020; Yasmin et al., 2019).

In summary, self-directed learning comprises activities initiated by students to enrich their experience and learning outcome, such as independent reading, reflective writing and group studying and discussions. Recognising constructivist perceptions of learning, students construct their own knowledge, collaboratively or individually, through choosing and pursuing tasks, self-motivation and self-reflecting. The focus on self-directed activities (in this research) relates to the high degree of student autonomy and less influence from the teachers, hence, allowing this study to investigate the role of the school physical environment in shaping the student activities. The school design also plays a role to stimulate the spread of student self-directed activities as elaborated in section 2.7.5.

2.4 Bernstein’s Pedagogical Framework

The previous sections have explored learning theories based on the three main philosophies and the technique of self-direction which all conceptualise the gain of knowledge for the
student. This section expands the understanding of learning theories through exploring a pedagogic framework which is founded on the educational system itself and is credited to Basil Bernstein. In other words, Bernstein invested in understanding pedagogy as a structure that defines school education, prior to exploring the means of knowledge gain (discussed in the previous section’s three philosophies). Similar to Vygotsky’s learning interactions, Bernstein perceived education through communications (Arnot & Reay, 2007). Hence, he studied the educational system as a mean of communication between teachers and students, i.e. the school curriculum and internal operation (Karabel & Halsey, 1976). This is presented and discussed in Bernstein’s classic texts ‘Class, Codes and Control’ Volume I (1971), II (1973), III (1975), and IV (1990). In general, Bernstein’s train of thought is summarised in his own words as:

“Formal educational knowledge can be considered to be realized through three message systems: curriculum, pedagogy and evaluation. Curriculum defines what counts as valid knowledge, pedagogy defines what counts as a valid transmission of knowledge, and evaluation defines what counts as a valid realization of this knowledge on the part of the taught.” (Bernstein, 1971, p.156).

Bernstein’s pedagogic framework comprises different components (figure 2.1). Firstly, the ‘Pedagogic Device’ is concerned with the curriculum as the primary component. It explains who has access to fields of knowledge (Bernstein, 2000). Learners have access to knowledge, i.e. thinkable knowledge, which determines the meaning they derive (Bibila, 2016). The accessible (thinkable) knowledge is subsequently passed on to students according to transmission rules, described as the pedagogic practice code (Bernstein, 2000). These rules prescribe how accessible knowledge is re-contextualised into curriculum material, how it is expressed in reality and taught in its field of reproduction – the school. The outcome of this process is eventually evaluated to find out the student gain of knowledge (Atkinson, 1985).

### 2.4.1 Classification and Framing

The prime concept in Bernstein’s practice code is ‘classification and framing’. Their representation in the learning process is an application of broader concepts that apply to the society. Bernstein (1971) acknowledged Marx and Durkheim for their theories that connect to classification and framing at a higher abstract level. Marx discussed “the social significance of society’s productive system and the power relationships” (p.134), which translates into Bernstein’s classification. Moreover, Durkheim explained “relationships between symbolic orders, social relationships and the structuring of experience” (p.133) which translates into Bernstein’s Framing. In simple words, classification at the macro level represents the social
division of labour, where the resulting categories are instantiations of power. In contrast, framing defines the social relations within this social division and signifies the idea of control (Bernstein, 1990).

Within the educational system, Bernstein (1971; 1975) explained classification as the degree of boundary which applies to categories of the pedagogic practice. On a smaller scale, it represents boundaries between programmes of study or curriculum materials taught within distinct subjects. On a larger scale, it is the separation between levels of education: primary, secondary, university. Classification is defined as strong or weak. The former (strong) refers to highly insulated categories, and the boundaries are rigid and explicit. For example, course materials are defined, and subjects are pre-set and do not overlap (Muller et al., 2004). Weak classification is the opposite scenario where boundaries are blurred or non-existent (Drake & Barnes, 2004). There is integration between different categories of one subject or interdisciplinary subjects (Muller et al., 2004).

The notion of framing refers to the degree of control by teachers or the degree of freedom, granted to students over the learning process and its material (Bernstein, 1971). Framing is concerned with control of four components. This includes the selection of materials (by the teacher vs the student), the tasks to fulfil and the sequence of teaching. There is also control over the pace of instruction and moving from one topic to another. For the aforementioned components, framing is rendered strong, if teachers have full control with limited options to students. The more freedom of choice provided to students, the weaker the framing becomes (Bernstein, 2000).

While classification and framing are associated with two different ideas, i.e. power and control, their degree of strength is proportional. Bernstein (1990) explained that strong classification (boundaries) is maintained in a system of strong framing (control). A system of strong classification and framing represents Durkheim’s “ritual order” which portrays mechanical solidarity, whereas weak classification and framing represent the flexible division of labour (Thijssen, 2012) which matches organic solidarity (Durkheim, 1893/1997). However, with the rise of constructivism, Bernstein suggested an evolution from traditional forms of strong classification and framing, towards progressive forms of weaker classification and framing (Bernstein, 1996).

2.4.2 Summary of the Pedagogic Framework

Parallel to learning philosophies as understandings of knowledge transfer, Bernstein introduced a pedagogical framework, mainly concerned with the curriculum and its structure. The pedagogic practice code defines rules of delivering the curriculum (Bernstein, 1996). Classification and framing are concepts of the practice code. The former (classification) defines the degree of boundaries between the programme of study and materials. The latter (framing) is the degree of control over the content and teaching. Classification and framing are exhibited as strong or weak, according to the strength of boundaries and the degree of control over the learning process (Bernstein, 1971). Recognising the theoretical backgrounds of classification and framing sets the foundation to investigating their spatial manifestation in the context of the school building, as described in section 2.6.3. It also allows this research to understand the studied environments of learning (multiple school building) as expressions
of boundaries and control, presented in the research discussion (section 10.3). Table 2.3 summarises the concept of classification and framing.

**Table 2.3: Summary of Classification and Framing**

<table>
<thead>
<tr>
<th>Major contributor in terms of originating the idea</th>
<th>Classification</th>
<th>Framing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptualised from</td>
<td>Marx</td>
<td>Durkheim</td>
</tr>
<tr>
<td>society's productive system classes; social division of labour</td>
<td>relationships between symbolic orders and social relationships (within this social division)</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Represent</th>
<th>Power</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Within educational system</td>
<td>Degree of boundaries between materials/subjects/courses/systems</td>
<td>Degree of control over selection, sequence, pace and evaluation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Strong</th>
<th>Weak</th>
<th>Strong</th>
<th>Weak</th>
</tr>
</thead>
<tbody>
<tr>
<td>subjects are pre-set and do not overlap</td>
<td>inter-disciplinary studies</td>
<td>teacher has full control with limited options to the learner</td>
<td>more freedom of choice to the learner</td>
</tr>
<tr>
<td>inter-discursive relations</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 2.5 Affordances

This literature review has introduced three main learning philosophies (section 2.2), self-directed learning as a constructivist learning technique (section 2.3) and Bernstein’s pedagogic framework (section 2.4). Those ideas outline the theoretical foundation of the learning process inside the school building. They have a spatial translation onto the physical environment which is explained in the next section 2.6. However, before discussing how the school building embodies theoretical ideas of learning, it is crucial to explain the transmission from theoretical conceptions, i.e. philosophies, theories and techniques which constitute a mental learning process, towards the school building and its learning spaces which represent the physical environment. To explain that, affordances constitute the key concept that expresses this mental-to-physical relationship between learning and space.

#### 2.5.1 Concept Definition in the Context of the School Environment

The school building is designed to accommodate and serve the learning practices, performed by the students; hence, it affords the student (and other users) actions (Daniels et al., 2019). The term ‘afford’ refers to the concept of affordances, as introduced by James Gibson who explained that possible actions occur by an organism on the environment, and in return, the environment affords those action. In the simplest example, a chair affords sitting (Gibson, 1979). In the context of the schooling system, the school building is the physical environment of learning, the students are the organisms, and their actions reconcile with their practices of
interactions and self-directed activities, to be afforded in space. The spatial design of the school building exhibits spatial affordances that either stimulate or inhibit those learning practices which themselves are reflections of learning theories: philosophies and techniques (Lackney, 2005; 2015). Building on Gibson’s ideas, Chemero (2003) further stresses that the complexity of affordances lies in the relation between features of the environment and the abilities of the organisms, hence, referring to the relative nature of affordances discussed in the upcoming section.

2.5.2 The Relative Nature of Affordances Due to the Environment Itself

Spatial affordances are relative to the environment itself, and what space offers to the users (Gibson, 1979; Chemero, 2003). Rietveld and Kiverstein (2014) clarified that the environment is a rich landscape ‘overflowing’ with possibilities. Individuals encounter the environment and select what is relevant to their needs. “[Humans] can be drawn to act on one affordance rather than another” (p.342). This reflects how the possibilities offered by the environment respond to the user needs. Nevertheless, some affordances “command an agent to act on them [for example] the door handle that invites pulling” (p.341). Thus, the environment does not only offer possibilities, but goes further to influence the user preferences. In summary, the environment is not a neutral container, but contributes to the interactions and activities (actions) of users in space through offering possibilities and influencing choices. This idea is the foundation upon which this research establishes the vitality of the school design potentiality (which offers possibilities) for learning opportunities in the school building, as described in chapter 4 and elaborated for multiple learning spaces (chapters 6-9).

In the context of the school building, this research connects the idea that the environment is a rich landscape of affordances (Rietveld & Kiverstein, 2014) to space syntax ideas on the building and its social dimension, as introduced earlier in section 2.1. Hillier (1996) stated that: “Culturally and socially, space is never simply the inert background of our material existence. It is a key aspect of how societies and cultures are constituted in the real world” (p.20). Moreover, Hillier and Hanson (1984) argued that a building, through its configuration, offers possibilities for user co-presence, encounters and interactions, relative to what they possibly see and where they possibly reach. Hanson (1998) clarified that “the spatial measure of how integrated or segregated a particular space is within a building or a settlement is a powerful predictor of how busy or quiet it is likely to be”. These statements link to the potentiality of the spatial configuration to shape the student activities inside the school building. Hence, the environment shapes affordances, and the generic statement applies which suggests that shallow integrated spaces potentially accommodate more student activities and interactions (Hillier, 1996). The question coming up here is: what happens in the less integrated (more segregated) space? This is investigated in this research to find out the differences between activities in the shallow vs deep school spaces, while focusing on informal spaces where students have more freedom to do their self-directed activities. In sum, the building configuration is argued to have an impact on the affordances for student activities which is concluded from the aforementioned literature and investigated through this research.

2.5.3 The Relative Nature of Affordances Due to the Organism
Alongside being relative to the environment, spatial affordances are relative to the human (organism) who perform actions in the environment. Rietveld and Kiverstein (2014) explained that human abilities translate to variations in ways of living which differ from one society to another or one individual to another, i.e. different human preferences. Therefore, human interactions and activities are relative to what is perceived as normative practices, derived from social and cultural background and the individual familiarity with the environment. Daniels et al. (2019) added that users (as organisms) have different means of ‘negotiating the environment’, and the user experience is partially determined according to their ‘cultural and individual histories’.

The way of living inside buildings (which shapes affordances for activities) can be perceived through social rules applied to space. Hillier and Hanson (1984) explained that users (of a building) are of two types: inhabitants who define social rules and control activities in space; and visitors who follow those rules. This applies to school buildings, where the management and teachers are perceived as inhabitants who control activities and implement regulations. The students, on the other hand, are perceived as visitors who follow regulations. Therefore, alongside the impact of the school configuration on the student activities and interactions (Hillier, 1996 – discussed in the previous section), “What is not described in space is inscribed in rules governing the behaviour” (Hanson, 1998, p.306). Hanson provided examples of how rules shape the life inside housing environments, and how rules differ between inhabitants and visitors. These ideas possibly apply to the school environment. For example, rules define where students (as visitors) are allowed to stay, being controlled by teachers and the management (as inhabitants). Rules also define how students behave individually or in social groups. Hillier and Hanson (1984) introduced a ratio of rules to events. The higher the ratio, the more restrictive the space, yielding less affordances for interactions and learning activities.

Continuing with the way of living inside buildings (which shapes affordances), social rules could be interpreted as programming. The building programme regulates the ‘interfaces’ between users, either through a strong programme, characterised by many social rules and limitations to the events in space; or a weak programme that has less rules and allows the spatial configuration to influence the user interfaces, i.e. movements and encounters (Hillier & Penn, 1991). The expression of rules inside buildings links to the discussion by Markus (1993) on how buildings represent power and control. Markus argued that users provide meaning to buildings, embodied in the relations “between people, between people and knowledge, and between people and things” (p.39). The school is an example of a building typology that controls relations and interfaces between users in a direct manner, where the school configuration facilitates the process of control by the teachers and the management (inhabitants) over students (visitors). In a later study, Koch (2004) provided empirical examples of how the building configuration facilitates (or restricts) control over its users, in terms of their movements, interactions and activities, through analysing and discussing three library buildings. Ideas, presented by Markus (1993) and applied by Koch (2004) for libraries (as building of knowledge sharing), can be applied to the school building. Control is possibly achieved through segregated spaces, like classrooms, where activities are controlled by the teachers who also control access towards those spaces. A different type of control is associated to shallow spaces that facilitate more teacher supervision, i.e. surveillance as
referred to by Markus. In this research, teacher control is examined within different configurations (shallow and deep) of informal learning spaces.

Apart from social practices, spatial affordances are relative to what individuals seek from the environment (Rietveld & Kiverstein, 2014). In the school context, this applies to students and teachers who introduce new function to space based on their needs and preferences in different engagements. For example, in the context of the school building, a typical classroom arrangement of individual row seating can be modified by students into a different layout of circular group seating to afford group discussions or revision sessions. Daniels et al. (2019) provided another example where teachers divide large open spaces (using furniture) into compartmented class spaces for multiple sessions at the same time. In summary, teachers or students shape the environment based on particular needs in various engagements which is elaborated when studying informal learning spaces (chapters 6-9).

2.5.4 Summary of Affordances and its Contribution in this Study

Learning practices are reflections of learning theories and techniques, being afforded inside the school building. Affordances comprise a set of possibilities offered by the school design to students as users of space. They are relative to the building itself as a rich landscape of affordance, not a neutral container. The spatial configuration shapes the student movements, and co-presence, therefore, their encounters and interactions. Nevertheless, affordances are also relative to the normative social practices of the school society. Accordingly, affordances, as possibilities, are filtered according to school regulations, permitting certain practices and restricting others. Moreover, affordances are relative to the users themselves, i.e. the student needs and preferences in various engagements. These ideas frame the focus of this study which will be pursued through spatial analysis and empirical fieldwork data. The concept of affordances is the foundation of studying the school design potentiality (chapter 4) and how affordances translate in actual building operation (chapter 5), before being elaborated for individual informal learning spaces (chapters 6-9).

2.6 The Spatial Translation of Theoretical Learning

The school building affords the learning process, which is a mental process, being spatially translated into the physical environment, relative to the spatial affordances offered by the building design. The main learning philosophies, self-directed learning (as a constructivist learning technique) and Bernstein’s pedagogic framework have been discussed from a theoretical perspective in sections 2.2, 2.3 and 2.4. They represent the learning theoretical foundation that translates into learning practices within the physical school building, thus, connecting back to the relationship between space and learning. The following discussion portrays the spatial manifestation of behaviourism, cognitivism and constructivism with more focus on the latter (constructivism) as the highly appreciated philosophy that supports social learning in the school. The discussion proceeds to explore the spatial dimension of self-directed learning and Bernstein’s pedagogic framework with focus on classification and framing.

2.6.1 The Spatial Dimension of Behaviourism and Cognitivism
Behaviourism acknowledges environmental stimuli that trigger the student learning (Gregory, 1987). Environmental stimuli are portrayed in the school building, as students are stimulated and respond to their space, thus, learn from it (Olatunji, 2013). The behaviourist notion of reinforcement translates to the feedback from teachers towards students (Cooper, 1993). Apart from digital communication, the two-way channel of feedback between teachers and students is primarily spatial (Manke, 1997). Marmot (2017) described that “human biology and social preferences still favour the rich, multisensory effects of face-to-face encounters that are hard to emulate virtually” (p.97) which draws attention to the student-to-teacher interactions in space. As mentioned before, Hillier and Hanson’s (1984) described building users as inhabitants who define social practices, i.e. teachers in school; and visitors who follow that pre-defined scheme, i.e. students. Hence, the school design regulates student-to-teacher interactions, either connecting or separating their encounters (Sailer, 2018).

Student-to-teacher interactions in space, which reflect behaviourist feedback, are primarily dependent on the spatial configuration of student spaces, teacher rooms and common areas for students and teachers. This configuration affords possibilities (Rietveld & Kiverstein, 2014) for students and teachers to meet. Interaction possibilities are shaped through spatial scenarios, where student routes mix with teacher routes, teacher spaces are along student routes or vice-versa (Pasalar, 2003; Sailer 2018). By contrast, scenarios where students are isolated from teachers are likely to lead to fewer ‘encounters’ (Hillier, 1996) between teachers and pupils and possibly to reduced feedback. Alongside the spatial configuration and the proximity of students to teachers, spatial functionalities either create a formal or informal setting which regulates interactions. For example, formal encounters occur inside classrooms between students and teachers, unlike their informal mixing and interactions along corridors or common spaces (Sailer, 2015). The student-to-teacher spatial relationship is investigated in chapter 4.15 when exploring the school design potentiality for student interactions.

Apart from behaviourism, cognitivism describes learning through implanting knowledge in the student mind which has a direct spatial representation through the design of classrooms. Many schools regulate student learning through a series of teaching events allocated inside classrooms (Davis, 2004). “Standardization and centralization in educational programs closely followed the principles of the industrial society...school was a highly formalized, hierarchical structure” (Lackney, 2005, P.510). In this setting, classrooms inform the student experience according to ‘pre-determined objectives’ by teachers (Kaya & Dönmez, 2010). The strong belief in content delivery from teachers to students is the main justification for the design of individual closed classrooms which restrict multiple student activities (Woolner & Thomas, 2016; Daniels et al., 2019) and are likely to afford fewer interactions or communications than would otherwise be the case (Pasalar, 2007; Sailer, 2015). This spatial model is criticised according to constructivists views which translate into a different model of learning spaces, as discussed in the next section.

2.6.2 The Spatial Dimension of Constructivism: Student-Centred Learning

Constructivist learning ideas highlight students as the centre of the learning process, and their minds as the creator of perceptions and experience (Cooper, 1993). Accordingly, the school is designed to afford learning practices of interactions and self-directed activities that enrich the student experiences (Schiro, 2013). Interactions are strategic learning tools (Coles, 1995)
in consideration of social learning among student communities (Vygotsky, 1968). Interactions are also pursued with a degree of student autonomy, rendering their occurrence as part of the student self-directed activities while being entangled with other forms of intellectual practices (Loyens et al., 2008). Interactions and subsequent collaborative activities happen in space and are highly influenced by the school design which primarily contribute to patterns of student co-presence and encounters, resulting from movements (Pasalar, 2007). Accordingly, the generative properties of the spatial configuration afford possibilities of interactions and eventually further learning activities (Hillier, 1996). The school building potentially promotes student mixing and interactions that enrich their experience and expand their knowledge or, contrarily, limits the student exposures, encounters and interactive learning opportunities (Sailer, 2018).

The role of the spatial design cultivates on Vygotsky’s social constructivism and ‘zone of proximal development’, where knowledge gain is maximised through interactions and collaborative activities, centred around the students (Coles, 1995) and spreading all-over the school building (Lackney, 2000). Consequently, constructivism re-structures the spatial portrayal of learning practices inside the school. Firstly, it alters the design of the typical classroom (Jonassen, 1999). Secondly, it expands the typologies of learning spaces to include open-plan spaces (Weinstein, 1979). Thirdly, and more importantly, constructivism recognises informal spaces (outside the classroom) as main loci for interactions and self-directed activities (Brown & Long, 2006). The following discussion will present ideas on the three main transformations of (1) closed classrooms, (2) open-plan classrooms and (3) informal learning spaces.

2.6.2.1 Transforming Closed Classrooms

Constructivist techniques migrate from teacher-centred learning (information delivery to students) towards the student-centred learning (of rich student experiences and collaborative interactions) which had implications on the closed classroom design (Williams, 2017). The transformation applies to the internal layout, as the conventional linear desk arrangement is re-organised into smaller clusters of group seating. Weinstein (1979) described those spaces as “areas where children can work alone or with groups...areas for reading and writing, mathematics, science, and crafts” (p.578). Furthermore, each classroom includes flexible furniture pieces that afford the new layout and new tools that support various collaborative activities. If the classroom design does not correspond to the newly introduced activity types, there is a design-activity mismatch leading to ‘setting deprivation’ (Weinstein, 1981). It describes a situation where the classroom fails to accommodate the student needs, causing impairment of the individual functioning and the quality of learning (Spivak, 1969).

The transformation of the classroom design into this interactive, activity-rich environment of student-centred learning has different reasons. Wanless (2016) justified that passive lecturing, as the conventional teaching method, does not equip students with skills needed for professional careers. Weinstein (1979) explained that “children learn best when they can actively explore an environment rich in materials...and when they are able to interact informally with their teachers and with one another” (p.577). Thus, student-centred learning, when afforded in the closed classroom (Weinstein, 1981), yields peer-learning activities (King, 2002) and stimulates class interactions between students, among themselves and with
teachers (Cohen, 1994; Elmore et al., 1996). The student role in the classroom changes from listening to constructing their own knowledge (Williams, 2017). Those ideas scaffold on Dewey’s ‘progressive learning’, whereas the classroom transforms into an informal social community of flexible, interactive learning and problem-solving (Dewey, 1938).

2.6.2.2 Open Learning Spaces

Alongside re-organising the typical closed classroom, student-centred learning promotes open-plan classrooms as new learning environments. Open-plan learning spaces describe a school whose internal partitioning, especially of classrooms, are minimal (Adelman & Walker, 1974). Bennett and Hyland (1979) justified the integration of open-plan classrooms through ideas of Blishen (1969) and Collins et al. (1973), such that education cultivates within an informal environment. Informality does not reflect a lack of structure but refers to flexibility in schedules and spatial arrangements. Hence, open-plan learning spaces support activities which are hardly accommodated in closed-plan classrooms (Weinstein, 1979). They secure a flexible collaborative work atmosphere and promote student activities within their spaces and further cross-interactions through connectivity to other spaces (Daniels et al., 2019). Nevertheless, while open learning spaces reflect less teacher control and allow for activities to diversify (Fouad & Sailer, 2019), they possibly facilitate surveillance (Markus, 1993), thereby, allow teachers to control student interactions and limit their occurrence. The relationship between space and control is elaborated in the next discussion on Bernstein’s framing (section 2.6.3). Open learning spaces are investigated for their design potentiality in chapter 4.15 and elaborated for their occurring self-directed activities, through one school example in chapter 6.2.3.

2.6.2.3 Informal Learning Spaces (outside the Classroom)

Informal learning spaces describe areas which attract students for interactions and self-directed activities (Knapp, 2007). They promote constructivist learning techniques and encourage student collaborations (Niemi, 2002; Mutekwe et al., 2013). Vygotsky described ‘collaborative learning’ as a social process founded on exchange of ideas (Vygotsky, 1978). Student communications consolidate learning outcomes through reflections and interactions all-over the school building (Day, 1999), thus, promoting social learning outside the classroom boundary (Dewey’s, 1956). Moreover, student self-directed activities cultivate on the student curiosity and eagerness to expand their knowledge which is significant away from the formal setting, hence, more possible outside formal classrooms (Loyens et al., 2008; Loewy, 1998). In summary, interactions and self-directed activities are both triggered within spaces that have certain spatial characteristics matching those of the informal learning spaces (Dudek, 2000). “[They] happens outside the classroom – on playgrounds and in corridors or halls of the school, in corners or under trees, where children can establish their own comfort zones” (Knapp, 2007, p.16).

The definition of informal learning spaces connects to ‘non-discipline specific’ spaces which are frequently occupied by students for self-directed activities (Harrop & Turpin, 2013). They are: “spaces where students can collaborate with their peers, utilize technology and be involved in engaging activities that have overflowed from the classroom” (Wanless, 2016, p.11). They comprise presentation spaces, study spaces and lounges (Lackney, 2015; Pasalar,
2003) and school libraries (Oblinger, 2006). Nevertheless, they have a broader definition which includes assembly and dining areas (Hughes et al., 2019) and circulation corridors (Sailer, 2015; 2018). Informal learning spaces also include playgrounds (Knapp, 2007). In summary, informal learning spaces are different locations that students reach and occupy to perform their activities (Boys, 2010). Informal learning spaces (their design and activities) are the main focus of four consecutive chapters (6-9) which explore the school circulation spaces, libraries, dining spaces and play areas.

Whilst informal learning spaces are highlighted through the work of different scholars, their contribution to the school learning process is underestimated (Lackney, 2015). Classrooms are still the loci of the schooling system (Walden, 2015b). Mallan (2019) referred to the insignificant attention given to the design of school dining spaces in comparison to formal space, despite their frequent occupancies by students on daily basis. In this research, chapter 8 is dedicated to exploring the role of dining spaces to accommodate the student learning activities. Furthermore, Hughes et al., (2019) highlighted the importance of the library space and multi-purpose gathering areas whose impact on the learning process is still not explored in research. Accordingly, school libraries are the focus of chapter 7. In summary, informal spaces are highly underrated despite being listed within the main school spaces in the UK Department of Education ‘generic design brief’ (2020a) which included school performance suites, dining suites, sports halls, libraries and outdoor playgrounds.

Continuing with the underestimation of informal spaces, school corridors are similarly marginalised in different studies, being regarded only as circulation routes rather than being acknowledged to facilitate interactions and exchange of ideas. Sailer (2018) criticised the criteria of corridor evaluation, drafted by Barrett et al. (2013) which underrated corridors, when being used as student gathering spaces. Similarly, C. Tanner (2009) minimised the purpose of school corridors to reduce crowdedness and ease movements, and Heitor (2005) argued that school design should reduce circulation spaces to consolidate activities inside more important studio spaces. These ideas dilute the social role of corridor spaces, derived from their configurational potential, to facilitate movements, encounters and interactions (Hillier, 1996) which can become key learning experiences, considering constructivist ideas (Cooper, 1993). In this research, corridors are highly recognised and are the main focus of chapter 6.

### 2.6.2.4 Summary of Constructivist Learning Spaces

In summary, student-centred learning, portrayed in student collaborative activities, interactions or self-directed learning, re-define the school building design. This includes the re-design and transformation of closed classrooms, the rise of open-plan learning spaces and the recognition of informal spaces, for instance, school libraries, social spaces, assembly and dining spaces, corridors and playgrounds. Weinstein (1979) distinguished ‘open education’ as the theoretical concept of student-centred learning, being differentiated from ‘open school’ as the open-plan classroom which is the practical application in the school building design. Nevertheless, the implementation of student-centred learning is not exclusive to open-plan classrooms but everywhere in the school (Daniels et al., 2019). It is determined by the building configuration to afford interactions (Sailer, 2018); the spatial layout and furniture to afford collaborative activities within open or closed learning spaces (Weinstein, 1979); and the
management role to implement multiple pedagogic approaches (Daniels et al., 2019). Recognising the role of constructivist learning spaces, this research focuses on studying the school informal learning spaces (defined in 2.6.2.3) where self-directed student activities are expected to concentrate, while the classrooms (where teachers are more likely to influence the student activities) are not included in this scope.

2.6.3 The Spatial Dimension of Bernstein’s Pedagogic Framework in the School Building

Alongside learning philosophies and self-directed learning, Bernstein’s pedagogic framework of classification (boundaries) and framing (control) also translates in the physical environment. Considering the idea of spatial control, Hillier and Hanson (1984) discussed the configuration of spaces and their entrances (within a building) to control access and movements, therefore, impact interactions and activities. This connects to the work of Markus (1993) on how spatial control is associated to the spatial configuration, as discussed in section 2.5.3. Moreover, Peatross and Peponis (1995) discussed classification and framing in the context of two undergraduate school buildings which is not particularly an investigation of secondary school buildings but still relates to this research. They argued that the school configuration (i.e. the spatial aspect) could reflect the pedagogic programme of boundaries and control (i.e. the theoretical aspect). Yet, a school, which is pedagogically programmed to maintain strong boundaries (classification) between departments and strong control (framing) over students of each department, could yield student socialisation across the spatial boundaries of different departments, in response to its spatial configuration. Through another example, outside the scope of learning spaces but relatable to the idea of control in buildings, Hanson (1996) discussed how courtrooms portray strong control over “separate and mutually-exclusive physical domains” (p.50), although the spatial configuration brings different users in the same space. These examples bring back the idea of the building programme (Hillier & Penn, 1991) and the social rules (Hillier, 1996) that define (and control) the user interactions, as presented in section 2.5.3.

In the context of the school building, Sailer (2018) explained how classification (as boundaries) applies within the school layout. For instance, highly isolated wings for separate school years reflect strong boundaries (classification), whereas a compact building design promotes integration and reflects weak classification. The degree of boundaries also applies on the scale of individual spaces (Fouad and Sailer, 2019). For example, the connecting spine and open piazzas in one school building have less boundaries and maximise the potential for student mixing and interactions (weak classification). Another school design introduces spatially separated dining spaces for student groups (strong classification), thus, inhibiting potential interactions across groups. In terms of framing, perceiving it as the degree of spatial control and considering teachers as inhabitants who control social rules (Hillier & Hanson, 1984), the spatial configuration either multiplies the teacher control or allows for student freedom. Sailer (2018) discussed the role of glass partitioning to promote high visibility in schools, unlike the typically enclosed and segregated classrooms which grant teachers full control over activities (Sailer, 2015). Along the same line of thought, multi-functional, highly accessible open studios promote weaker teacher control over the types of activities taking place, contrary to individual studios which are defined by subject (Fouad & Sailer, 2019). This links back to the role of open-plan learning platforms to promote constructivist interactive and collaborative learning activities, as discussed in the previous section 2.6.2. The spatial
dimension of classification and framing is re-visited from a holistic approach of the school design and a zoomed-in scale of informal learning spaces in the research discussion (chapter 10.3).

2.6.4 Summary of Learning Ideas: From Theory to Space

In the aforementioned discussions, various learning theories, derived from philosophies, techniques of self-direction and the pedagogic framework, have been elaborated while considering their spatial translation in the school building. Behaviourism recognises environmental stimuli that trigger learning; thus, students respond to their physical environment and learn from it. The behaviourist notion of ‘reinforcement’ translates to the feedback from teachers and students. The spatial configuration offers possibilities (affordances) for this feedback process, realised through student-to-teacher encounters and interactions, through connecting or separating their movements and co-presence. Moreover, spatial functionalities regulate formal encounters inside classrooms or informal mixing in corridors and common spaces. On a different perspective, the cognitivist belief of knowledge delivery to students is portrayed through the conventional design of closed classrooms for teaching events. This spatial model is restrictive for self-directed activities and affords less interactions, shifting the attention towards constructivist ideas on learning and learning spaces to promote student interactive activities.

Constructivism acknowledges learning through interactions and self-directed activities, since the learner mind builds its own knowledge from experience and perceptions. Constructivism introduces a new spatial model which re-defines the typical classrooms, recognises open-plan learning platforms and more importantly emphasises the role of informal spaces as loci for interactions. Firstly, the closed classroom is redesigned to afford clusters of group seating with flexible furniture and tools that support collaborative activities. Secondly, open-plan learning spaces are introduced, to afford flexibility in schedules, spatial arrangements and offer higher possibilities of interactions. Thirdly, informal learning spaces are recognised for their potential to afford student interactions and self-directed activities, primarily induced by configurational accessibility that induces movements, co-presence, and interactions; or provide a configurational diversity for different collaborative self-directed activities. Informal spaces include school libraries, presentation spaces, study spaces, lounges, assembly and dining spaces, social areas and corridors.

Classification and framing are main concepts in Bernstein’s pedagogic framework which have a spatial portrayal inside the school building. Classification is the degree of boundaries which, from a spatial understanding, impacts the degree of segregation or integration of spaces. Strong classification (boundaries) is achieved through physical partitioning within a restrictive environment, where students receive information from teachers (e.g. the classroom environment); whereas weak classification refers to open spaces that trigger students collaborative work and interactions. Classification is corresponding to a degree of framing which translates to spatial control. The school spaces are designed either to support the teacher control through controlled-access gateways, allocated supervision and minimal visibility between student spaces (strong framing). Contrarily, another design allows freedom for students through free movements, encounters and interactions or at least visibility connections to multiple spaces outside their classroom (weak framing).
In the end, learning theories have their spatial manifestation in the physical environment. This theory-to-space relationship emphasises the strong relation between learning and the school building. It also renders the importance of studying existing research in this topic, as presented in the next section 2.7.

2.7 Existing Research on School Buildings

After presenting learning theories and their spatial representation, this literature review explores existing research on school buildings. Daniels et al. (2019) discussed that research on school buildings is mostly concerned with environmental design parameters (e.g. climate, air and lighting quality) which is important yet insufficient to understand the student social life and learning practices in schools. Moreover, in some school design projects, less attention is drawn towards informal spaces that foster interactions and self-directed activities, compared to formal learning spaces (Nitecki & Simpson, 2016). Accordingly, the school needs further research on its social practices in respect to the building itself, as supported by Benito (2003) and Woolner et al. (2007). This section presents different scopes of research and key findings on school design in relation to the student social life and their learning practices.

This section begins by identifying the role of ‘Post-occupancy Evaluation’ as a general scheme of research that investigates how school buildings operate after completion (section 2.7.1). It proceeds to present various research on school buildings from the late 20th century until present times, through different studies in academic projects, articles and books. Some studies focus on the school building design in relation to student achievements (section 2.7.2), other research highlights student behaviours (section 2.7.3) and wellbeing in the school building (section 2.7.4). Finally, this section discusses research on the spatial configuration of school buildings from a space syntax approach and its impact on student learning practices (section 2.7.5).

2.7.1 Post Occupancy Evaluation – Definition and Importance

Acknowledging the relationship between space and learning, the school building is evaluated for its capability to primarily accommodate and further facilitate student activities and needs (Olatunji, 2013). This evaluation refers to ‘post-occupancy evaluation’, defined as “the process of evaluating buildings in a systematic and rigorous manner after they have been built and occupied for some time” (Preiser et al., 1988, p.3). Post-occupancy evaluation delivers “an appraisal of the degree to which a designed setting satisfies and supports explicit and implicit human needs and values of those for whom a building is designed” (Friedmann et al., 1978, p.20). Nevertheless, the vitality of post-occupancy evaluation to decode student activities and their social relation in the school is marginalised and needs more investigation by the research community (Daniels et al., 2019; Zimring, 1989). In fact, the fieldwork performed during this research is considered as post-occupancy evaluation, as presented in chapter 5 and elaborated for different informal spaces in chapters 6-9.

Post occupancy evaluation is important in school buildings for several reasons. Firstly, it reveals the school design implications on the building operation and student practices (Daniels et al., 2019). Lackney (2005) clarified that learning spaces either motivate or restrain
students (and teachers) for their educational goals, and this spatial impact needs to be defined. The relationship between activities and the physical boundary links to the notion of ‘Environmental competence’, referring to the student awareness of the school building impact on activities and their ability to shape the learning environment to fit their practices (Steele, 1980). Accordingly, post-occupancy evaluation uncovers problems in the spatial design that lead to ‘setting deprivation’, as situations when school buildings fail to accommodate different student needs, causing impairment of student functioning and quality of learning (Spivak, 1969).

2.7.2 Research on School Buildings and Student Achievement

Multiple studies focus on understanding the school design impact on the learning process which is evaluated through the student achievements. In the late 20th century, this research typology explored certain spatial parameters of building age and conditions. Researchers concluded that students poorly perform in deteriorating buildings (Lackney, 1996). This was examined in different academic programmes and postgraduate research, as seen in example from McGufey & Brown (1978), Plumley (1978), Chan (1979), Edwards (1991) and Cash (1993). It was also portrayed in academic journals and books, including the work of Berner (1993), Bower and Burkett (1987), Earthman, Cash and Berkum (1995) and Education Writers Association’s Book (1989). Simultaneous research topics focused on the student population in relation to student attainment. Results indicated that student lower grades correspond to the overall high school population (W. Fowler, 1992) or highly populated classrooms (Pate-Bain et al., 1992; Gump, 1987).

During the 21st century, research on spatial parameters and student achievement is still under investigation but developed quantitatively in its evaluation criteria and data samples. In a study on 3766 pupils distributed among 153 classrooms in 27 UK primary schools, Barrett et al. (2013) outlined the impact of the classroom design on the learning process, evaluated through learning progression of the student assessment grades in the subjects of reading, writing and mathematics. The tested design parameters are (1) the classroom connectivity, described as wayfinding to classrooms and corridor orientations; (2) flexibility of the classroom, modelled as the space allowance for various teaching methods and group formations; (3) classroom furniture typologies; and (4) environmental parameters of natural lighting, air quality, temperature and noise levels. The study revealed that “key design parameters explain 16% of the variation in pupils academic progress achieved” (p.118). Student performance was recorded to be higher in classrooms that connect to wider and clear corridor pathways (easier wayfinding). Findings also explained that the student performance prevailed for classroom configurations that afford numerous teaching methods and diverse student activities. Finally, high variations in the type and colour of furniture and the amount of natural lighting from multiple orientations, both, correlate to higher student performance.

In a similar research project, C. Tanner (2000) established a scoring system for the school building, based upon 39 design features which are correlated against the student grades. The building scoring included (1) the school walkability, expressed through clear circulation and promenade connections to key outdoor spaces; (2) allocation of indoor spaces, relative to green and play areas; and (3) conditions of student comfort (e.g. ceiling height, dining space furniture, student storage spaces and availability of student computers). The scoring was
applied on 44 US primary schools (22679 students) and correlated against the student grades. Findings inferred that design features, such as defined and simple circulation and a balanced combination of outdoor and indoor spaces, significantly impact the student performance.

In summary, research investigated correspondences between the school building and the student achievements. Earlier studies focused on building conditions and the student population, indicating that building deterioration and higher populations negatively impact the student performance. More recent studies still valued the student attainment but implemented a more quantitative methodology, based on multiple spatial factors that create a score for each school. Wider corridors, easier way-finding and diversified classroom layout and furniture correlated to higher student attainment.

2.7.3 Research on School Buildings and Student Behaviour, Experience and Satisfaction

Another research scope studies the school design in relation to the student life, portrayed through the student behaviour, experience and satisfaction inside the school building, rather than focusing on student attainment (Lackney, 1996).

Older studies (late 20th century) analysed the classroom in terms of spaciousness (area and ceiling height) and degree of open perimeter which are evaluated against the student behaviours (Weinstein, 1979). Ahrentzen and Evans (1984) indicated that spaciousness has insignificant impact on student behaviour, whereas the percentage of open perimeter is inversely proportional to student positive behaviour, i.e. more openness yields uncontrolled student activities. A similar study deduced that the student shorter attention span, higher frequencies of purpose-less movements and louder conversations are associated to open classrooms than traditional closed classrooms (Zifferblatt, 1972). Nevertheless, open classrooms were proven to encourage peer interactions and cooperative learning although requiring more teacher control (Downing & Bothwell, 1979). Finally, another study focused on the classroom furniture layout, concluding that front-sitting students are enthusiastic about teaching activities, unlike back-sitting students, who have a negative attitude toward the class. Other students linger for proximity to their peers for affiliation and interactions (Walberg, 1969).

In the 21st century, while still studying the school building, researchers diverged from focusing on student behaviours or grades into the student learning experience and satisfaction (Daniels et al., 2019). This approach goes in line with perceptions of educational spaces as attractors for students throughout their learning experience, connecting to what Marmot (2017) described as a ‘sticky’ campus where students are eager to spend longer times learning. Walden (2015b) discussed multiple design features, such as the spatial layout, furniture and equipment, as key contributors to the student positive experience which were examined through empirical research. For instance, Hopland and Nyhus (2015) discussed a nation-wide research project in Norway which studied student satisfaction with the school design, through a mandatory year-ten survey. Students evaluated classrooms, outdoor areas and restrooms, the quality of lockers and showers and building cleanliness. Data of 3893 students for five academic years (2007-2008 until 2011-2012) demonstrated that student satisfaction is proportional to good building conditions. This referred to classrooms with various learning tools, outdoor spaces that afford multiple activities and good condition
toilets, lockers and showers. It also reflects on the student overall performance when correlating satisfaction to attainment records.

A more detailed research project was conducted by Daniels et al. (2019), using mixed-method data of school interviews, questionnaires, observations beside documents from the architecture firms which designed the schools. Findings explained that the school design shapes the student experience through opportunities of learning practices; yet, not in a deterministic manner. Successful school designs ‘mirror’ the learning practices intended by teachers. Otherwise, the management transformed open learning spaces into compartmented classrooms, thus, reshaping the student experience who miss on collaborative, activity-rich environments, as teachers favour the traditional class experience. Finally, the research discussed the importance of a balanced design of private and public spaces, such that students experience the sense of safety when being visible but not ‘over-seen’ which makes students insecure and lack their private space.

In summary, the aforementioned research projects investigated the implications of school design on student behaviours, experience and satisfaction. In terms of the student behaviours, open classrooms encourage peer interactions and cooperative learning, but they shorten the student attention span, create louder conversations and yield more purpose-less movements, contrary to behavioural patterns inside closed classrooms. In various furniture layouts, front-sitting students are enthusiastically engaging in class activities, unlike back-sitting students. Furthermore, student satisfaction corresponds to flexible classrooms with various furniture and tools, outdoor spaces that afford diverse activities and good condition toilets, lockers and showers. This research provides further insights on the student behaviours and satisfaction inside the school building, discussed in chapter 10.4. Finally, for a better student experience, the school design matches the student learning practices chosen by the management, and the design balances public and private settings, where students feel safe by supervision but not insecure from being controlled.

2.7.4 Research on School Buildings and Student Well-being

Another field of research focuses on the student wellbeing in relation to the school design. It grows beyond examining the student achievements and social life to interpret the design implications on the student physical and mental health (Anderson & Graham, 2016). Its importance is further justified, since “children who experience a greater sense of holistic wellbeing are: more able to learn and assimilate information in effective ways; more likely to engage in healthy and fulfilling social behaviours” (Awartani et al., 2008, p.54).

Hughes et al. (2019) developed a student wellbeing framework, extracted from cumulative literature, mainly the work of Fraillon (2004), Burke (2014), Simmons et al. (2015) and Watson et al. (2012). It described six interrelated dimensions: (1) physical wellbeing of safety and the state of being energetic; (2) cognitive wellbeing of solving problems and being creative; (3) social wellbeing in terms of interactions, peer relations and belonging to social groups; (4) psychological wellbeing of self-esteem and feeling identity; (5) emotional wellbeing of feeling happy and satisfied; and finally (6) existential welling of feeling home at school. Empirical studies investigated those dimensions while occasionally combining multiple dimensions which fall under the broader definition of mental wellbeing, in contrast to the physical
wellbeing which, although connecting to mental wellbeing, is a separate studied category. The multi-faceted perception of wellbeing is the prime reason for expanding the investigation of learning practices, beyond intellectual activities (e.g. studying, reading, etc.), to include all individual and collaborative self-directed activity types (e.g. games, performances, relaxations, etc.), as elaborated through cases studies in chapter 5 and re-visited for the study of different informal spaces (chapters 6-9).

Empirical studies explain the impact of the school building on various wellbeing dimensions. Hughes et al. (2019) conducted mapping activities and tours with students of three Australian schools. Findings suggested that emotional wellbeing is improved when students belong to their assembly space, spend more time in social groups in the playground and utilise their libraries for diverse activities (mainly relaxations). Contrarily, student wellbeing deteriorates, expressed through feeling insecure, in spaces like corridors and staircases, where students mix with older year-groups. Kariippanon et al., (2018) investigated multiple student wellbeing dimensions through interviews with twelve school principals, 35 teachers and 85 students. They inferred that flexible spatial layouts and furniture contribute to the student psychological wellbeing and comfort during different learning practices. Furthermore, the school design positively impacts the student social wellbeing when promoting positive interactions, supported by a student-centred pedagogical programme. This matches results of another study by Anderson and Graham (2016) that indicated improvement in student mental wellbeing within school environments which allow students to personalise their spaces, mix with their peers and collaboratively exchange their knowledge.

Studies on the student emotional wellbeing link to the concept of school connectedness, as discussed through an inter-disciplinary literature review by Rowe et al. (2007). School connectedness defines the student sense of belonging and attachment to the school building (Loukas, 2007), when they are able to personalise their spaces according to preferences (Graumann, 1976) and feel possessive of their environment (Lynch, 1976). The school building evolves from a space to a ‘place’ personalised to students, before growing further as a ‘home’ (Daniels et al., 2019). Certain spatial parameters impact school connectedness, therefore, the student emotional wellbeing (Rowe et al., 2007), for instance, the classroom layout, the degree of illumination and use of colour and materials and the outdoor playground design and landscape, as studied by St Leger (1999) and declared by the World Health Organisation (1996). Finally, further spatial factors (impacting emotional wellbeing and connectedness to school) comprise the allocation of social spaces and recreational break-out areas for student interactions (Pasalar, 2003).

While preceding studies investigated various dimensions of the student mental wellbeing, further research explore the physical wellbeing. Through a scoping review of 14 recent studies (after 2004), Ucci et al. (2015) argued that student physical wellbeing is improved through higher physical activity, being embraced by certain school designs that possibly reduce sitting patterns and triggers movements, hence, connecting again to the school configurational potential to induce movements and encounters (Hillier, 1996). To measure the student physical activity, as influenced by the school design, Ucci et al. (2015) excluded references to play areas or gyms where physical activities are driven by the activity type or teacher instructions. A similar strategy was followed in this research to evaluate student movements and encounters, derived from the school configurational properties with no influence from
sports (studied for playgrounds in chapter 9.2.1). Moreover, alongside the impact of the building as whole on physical activity, the smaller scale of the classroom and its furniture typology are also argued to improve the student physical activity through less sitting behaviours which therefore contribute to the physical wellbeing (Marmot & Ucci, 2015). Finally, it was also argued that student physical activity ties to psychological wellbeing and self-confidence, as students positively perceive their bodies (Stein et al., 2007; Konu et al., 2002).

In summary, the school building impacts the student wellbeing either physically or mentally, where the latter comprises emotional, psychological and social wellbeing. Emotional wellbeing is defined through student connectedness to the school building and is improved through personalised spaces that satisfy diverse student needs; spaces that afford grouping (e.g. assembly spaces and playgrounds) or individual relaxation (e.g. libraries); unlike closed staircases or corridors that trigger insecurities, when students are confronted by older students. Furthermore, spaces that trigger interactions positively impact the social wellbeing, while flexible learning spaces (with multiple furniture typologies and layouts) positively impact the psychological wellbeing. Finally, physical wellbeing correlates with higher physical activity and less sitting behaviours, thus, connecting to the school design potential to trigger movements, outside spaces that host sports by instruction.
Space syntax research, as seen in the early work of Hillier and Hanson (1984), was described by Peponis et al. (1997) as: “a method for describing the relational structure of built space in conjunction with the development of theories regarding the generic social function and cultural meanings associated with buildings” (p.761). This is based on analysing the building configuration through accessibility and visibility relationships that influence the social life of users inside the building (Peponis et al., 1997), therefore, becoming the foundation of school building analysis in this research, through methods presented in chapter 3 and applied in chapter 4. In that essence, space syntax theories, methods and tools portray a quantitative field of research that describes the social dimension of buildings and their occurring activities. This field of research has branched off into distinct types, to study buildings of knowledge creation, as seen in Hillier and Penn’s (1991) work on science labs; and buildings of knowledge sharing, as seen in studies on libraries (Koch, 2004; 2015; Capillé & Psarra, 2014). Research also includes studies on interaction and collaboration in offices (Koutsolampros, 2021; Sailer et al., 2016); appreciating art in museums (Hillier and Tzortzi, 2006); shopping department stores (Koch, 2007); healing and curing in hospitals and healthcare Facilities (Haq & Luo, 2012; Pachilova & Sailer, 2020). Finally, similar to this research, previous space syntax research discussed school building configuration and the student social life inside the school, as elaborated through examples (later on) in this section.

Hillier (1996), through examples of French houses, described how integrated spaces seem to be frequently passed by and have the most everyday activities in the building. In this research (and other studies presented in this section), this idea is argued to apply to the school building, where integrated informal shallow spaces have high student co-presence, encounters and interactions, in addition to further learning activities, representing the everyday activities inside the school. Since interactions are key events in the social life of buildings (Hillier & Hanson, 1984), it is argued that configurational studies on school buildings link to social collaborative learning (Vygotsky, 1978), perceived through student interactions (Mutekwe et al., 2013) and self-directed activities (Gibbons, 2002). Nevertheless, the programme of the school building impacts the everyday student social life (Hillier & Penn 1991), according to social rules imposed on space which control activities. Hence, the building configuration and programme either yield a ‘long model’, which restricts student interactions through social rules; or a ‘short model’ which triggers movements, encounters and interactions (Hillier, 1996). This links back to the ratio of events-to-rules, where more social rules yield more control and less activities (Hillier & Hanson, 1984 – section 2.5.3). This also links to Bernstein’s notion of framing (control) as discussed earlier (section 2.6.3).

After introducing space syntax research on diverse building typologies, several syntactic studies on school buildings are presented in chronological order. Firstly, Pasalar (2003) compared four secondary schools in the US, using axial-lines analysis, defined as the longest and fewest straight lines of visibility that extends in space (Hillier & Hanson, 1984). The spatial analysis was supported by observational analysis of the student behaviours. The study indicated that higher rates of student interactions are induced through highly accessible and shorter pathways. The mixing and socialisation of students of different grades are conditional to higher levels of visibility and permeability of the school layout. Furthermore, Pasalar (2007) discussed different informal spaces, such as main entrances, study lounges, outdoor play
areas and corridors, for their potentiality to promote interactions for different group formations. Pasalar concluded her study by stating that: “Creating smaller schools is assumed to reduce the isolation that often causes the alienation and violence among students, they also increase social interaction and learning abilities of students” (Pasalar, 2007, P.51).

Secondly, Kishimoto and Taguchi (2014) investigated 76 primary schools in Japan, evaluated through their results of three syntactic measures: (1) integration which is a measure of accessibility, defined as the average depth of space in the school; (2) mean connectivity which is the average count of immediate spaces connected to each space; and (3) intelligibility which is the integration value divided by the connectivity. Results portrayed a correlation between student movement patterns and the spatial integration of the school buildings. Moreover, teacher assessments indicated that interactions between students of different grades is maximised in larger school layouts, whose configurations yield higher intelligibility. As for the teacher spatial preferences, they favoured highly intelligible but segregated spaces for their activities. The study concluded that schools of smaller size and fewer classroom-count are more suitable for teachers as they match the teacher supervision preferences. They are also suitable for student interactions.

A different yet creative approach was pursued by Sailer (2015) who performed another space syntax study on the fictional Hogwarts School of Witchcraft and Wizardry. The study utilised visibility graph analysis\(^1\) to describe the spatial configuration of the building. The study also used the Harry potter book series and movies as a method of collecting observation data about the student learning practices and interactions across different spaces. Learning formats were classified as individual, peer or taught and were cross-referenced into their respective locations in the building. Findings suggested that: “teaching styles vary and the spatial design of the school supports this well with different classroom layouts...by far the highest proportion of peer learning took place in the common rooms, dormitories and courtyards” (Sailer, 2015, P.8). The study perceived the learning process as a social process which is not limited to classrooms but actually grows in atria, corridors, outdoor spaces, and other public or student-owned spaces. This understanding of learning and learning spaces is set for this whole research.

In a recent book chapter, Sailer (2018) investigated five secondary schools in the UK and Europe while focusing on corridors to explore “the degree of choice for moving around, and the degree of overlap between movement and occupation” (Sailer, 2018, p.108). The study included configurational analysis that are discussed alongside the spatial portrayal of Bernstein’s (1971) classification (boundaries) and framing (control) which is similarly followed in this research discussion (chapter 10.3). Findings illustrated how the degree of movement choice varies for different school buildings either locally (direction of movement towards left or right) or globally (from one space to another). Findings also highlighted how design openness creates an environment where movements and activities are spatially blended. It is concluded that “configurational analysis presented here has challenged the clear-cut categorisations of schools as open or closed and instead has drawn a nuanced picture of

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\(^1\) Visibility graph analysis studies the inter-visibility between building spaces that are connected to each other through dividing areas using grid units of a set size. It is the main type of analysis used in this research.
different spatial qualities giving rise to different social behaviours” (Sailer, 2018, p.108), and space is capable of influencing the pedagogic practices, rather than just reflecting them.

In summary, research on the school building configuration implemented space syntax theories, methods and tools to discuss the implications of the school design on learning practices. The spatial configuration influences movements and encounters, thus, impacting student interactions and activities (Hillier, 1996) which are perceived as key elements for knowledge exchange (Jonassen, 1999) from a social learning perspective (Vygotsky, 1978). Pasalar (2003) proved that highly accessible pathways promote student interactions inside the school. Kishimoto and Taguchi (2014) deduced a correlation between student movements and the spatial integration of school buildings. Finally, Sailer (2015) highlighted the role of informal spaces to host peer learning activities, while her later study highlighted the corridor as an important learning space of interactions, determined through the degree of choice for local and global movement patterns (Sailer, 2018).

2.8 Summary of the Literature Review

School education shapes modern societies and future generations (Dewey, 2004). There is a relationship between the school building and the embodied learning practices (Daniels et al., 2019). It is derived from the broader relationship between space and activities, whether perceiving space through its underlying social construct (Hillier & Hanson, 1984), prioritising the role of environment on behaviour (Mead, 1934) or highlighting the individual experience (James, 1904; Gibson 1969). This socio-spatial relationship emphasises the study of learning theories and their spatial portrayal. Simultaneously, affordances constitute the key concept that explains the translation from theory to space. It defines how the environment accommodates actions (Gibson, 1979) through possibilities for learning practices in space (Rietveld and Kiverstein, 2014).

There are three main learning philosophies which are perceived from a spatial perspective. Firstly, behaviourism explains learning through the environment, its stimuli and reinforcements (Skinner, 1968). Reinforcement is spatially portrayed through feedback, and the school affords this two-way channel between teachers and students (Cooper, 1993), since the school design potentially brings students and teacher together or separates them apart (Sailer, 2018). Secondly, cognitivism recognises knowledge delivery by the teacher (Cooper, 1993) which renders the spatial model of the closed classrooms (Lackney, 2005) that affords typical teaching activities, like lecturing (Davis, 2004).

Thirdly, constructivism acknowledges the mind that constructs knowledge individually through experiences (Jonassen, 1999a) or collaboratively through interactions and self-directed activities within learning communities (Vygotsky, 1978). The school building supposedly affords the student interactions which form an integral part of self-directed learning activities, beside other intellectual activities, all guided through student autonomy and growing simultaneously as student-centred learning techniques (Loyens et al., 2008). These practices urge a transformation in the school design. The classroom is re-designed to afford group sitting (Taylor et al., 2009) and support diverse furniture and tools for collaborative tasks (Weinstein, 1981). Moreover, open-plan classrooms emerge to afford flexible spatial arrangements and a less controlled learning environment. Finally, informal
learning spaces are recognised to afford student interactions and self-directed activities outside classrooms (Wanless, 2016). They are shaped through the spatial configuration which induces student movements, encounters and subsequent interactions (Hillier, 1996). Informal learning spaces include presentation spaces, study spaces, lounges (Lackney, 2015; Pasalar 2003), the school libraries (Oblinger, 2006), assembly and dining areas (Hughes et al., 2019), corridors (Sailer, 2015; 2018) and playgrounds (Knapp, 2007).

A different approach explained learning from a curriculum perspective which is Bernstein’s pedagogic framework. It introduced classification as the degree of curriculum boundaries; and framing as the degree of teacher control over learning practices (Bernstein, 1971; 1975). Both ideas have spatial representations. Classification translates to physical boundaries, either strong or weak, which governs the degree of insulation between school spaces on a global scale, e.g. between wings of different years (Sailer, 2018); or on a local scale, e.g. the porosity of learning and communal spaces (Fouad & Sailer, 2019). Framing refers to spatial control, either strong or weak, as influenced by the spatial arrangement of entrances and controlled-access circulation (Hillier & Hanson, 1984), glass partitions of high visibility and less control (Sailer, 2018) or closed classrooms with full teacher control (Sailer, 2015).

Despite the relationship between learning theories and space, there is inadequate knowledge about how schools operate (Franz, 2019) which needs investigation (Daniels et al., 2019) through post-occupancy evaluation (Olatunji, 2013). Existing research links the school design to diverse scopes. For example, research on student achievements concluded that building conditions influence the student attainment (Gump, 1987). Recent studies created a spatial scoring system for schools, and the results correlated against student attainment (Barrett et al., 2013). Further research focused on the student behaviour, concluding that open learning spaces encourage interactions and collaborative activities but shorten the student attention span and yield noisiness and purpose-less movements. Furthermore, student satisfaction corresponds to flexible classrooms with various furniture and outdoor spaces that afford diverse activities. The student experience is enriched when students feel safely supervised but not insecurely controlled (Daniels et al., 2019). Research studies also focused on the student mental and physical wellbeing, concluding that personalised spaces, assembly spaces with groupings and libraries with relaxations improve the emotional wellbeing (Rowe et al., 2007), unlike closed circulation where students are confronted by older year-groups (Hughes et al., 2019). Spaces that trigger interactions improve social wellbeing (Kariippanon et al., 2018; Anderson & Graham, 2016). Physical wellbeing is improved through school designs that increase physical activity (Ucci et al., 2015) and reduce sitting patterns (Marmot & Ucci, 2015).

Finally, a field of study implements space syntax tools to analyse buildings, through highlighting the school configuration which influences the student movements, co-presence, encounters, thus, impacting their interactions and activities (Hillier, 1996), as key elements for social learning (Vygotsky, 1978). For example, the work of Pasalar (2003) showed higher rates of social interactions inside the school, being induced through highly accessible, shorter and intelligible pathways. Kishimoto and Taguchi (2014) deduced a correlation between student movement patterns and the school configurational integration. Finally, Sailer (2015) highlighted the role of informal spaces, such as courtyards and common rooms to afford peer learning activities. Sailer (2018) also introduced corridors as vital interactive learning spaces, shaped through the student degree of choice for movement.
In the end, this literature review has provided a foundation of the main research parameters, prior to unfolding their methods of investigation (next chapter 3). Literature clarified the relationship between learning theories and their spatial manifestation, as explained through affordances (possibilities), before discussing the school building, which is investigated (through cases studies) for its potentiality in chapter 4. The literature review also sets the background for understanding learning practices and their relationship to school design, as elaborated in chapter 5. Literature explained on how the school building is designed to afford interactions and self-directed activities, relying on constructivist ideas of social collaborative learning which is explored within informal learning spaces, such as corridors, libraries, dining spaces and play areas (chapters 6-9).
3 Methodology

This research is a mixed-methods study of qualitative and quantitative data that answers research questions on the potentiality of the school building design to afford the actuality of learning practices of student interactions and self-directed activities. 'Mixed methods' are widely used in educational research (Ponce & Pagán-Maldonado, 2015). It is argued that successful studies on the society’s environment-behaviour relationship (which applies to the school building and the student activities) integrate methods to measure the environment and behaviours independently (Barker, 1968). Accordingly, this research is divided into two phases of independent methods to study the school design and the student learning practices, guided by the school managerial operation.

This chapter introduces two research phases (section 3.1) which investigate with the potentiality of the school design (section 3.1.1) and the actuality of the building operation (section 3.1.2), thus, responding to the research questions presented earlier in the introduction (introduction 1.4). The research phases require data which is collected from multiple case studies (section 3.2). The chapter proceeds to describes the research design (section 3.3) of qualitative surveying techniques and quantitative spatial analysis and observations. Finally, the chapter describes the sequence of data collection (section 3.4) and data processing and compilation (section 3.5). The chapter summary is section 3.6.

3.1 Research Phases

There are two phases that investigate the school building in terms of the design potentiality and the building actuality. The first phase (design potentiality) is concerned with the spatial design, while the second phase (building actuality) is concerned with the school operation and existing student activities. Hence, the two phases answer the main research question: How does the spatial design of the school building afford the student learning practices, expressed through interactions and self-directed activities? The details of each phase answer the research sub-questions as described below.

3.1.1 Design Potentiality

The design potentiality, as the first phase of this research, studies the way by which a team of architects (i.e. the design team) considers their choices and priorities during the design process, before studying the spatial design outcome in terms of configuration and functions. Design decisions (taken by the design teams) illustrate the transmission of design from endless possibilities to a final spatial design (constructed in real life), following the decisions and intentions of the project’s team of architects. It comprises multiple stages, starting with schematic design, proceeding to the development phase and reaching the documentation stage and administration during construction (Chintis, 2020).

Studying the design decisions of each team of architects (of the three firms) reveals how these school buildings are distinguished from other schools or different building typologies, according to the design brief and the school management criteria. The study of the design decisions answers the first research sub-question which stated: What are the main design
intentions and decisions, pursued by the team of architects during the design process, that yield the final spatial design of the school building?

Alongside studying the design decisions, the research analyses the output spatial design of the school building. It focuses on studying the spatial configuration as the primary method of evaluating and comparing school buildings. Following space syntax theories (mainly the work of Hillier, 1996), the spatial configuration itself is argued to highly contribute to student movements which yield patterns of encounters and interactions which are perceived as social learning practices. Further self-directed activities are influenced by the spatial configuration and its role in setting a quiet or vibrant atmosphere. Nevertheless, those interactions and self-directed activities are impacted by the functionalities allocated to building spaces, as attractors to students. Hence, the research also studies the distribution of functionalities alongside the configurational analysis.

Configurational analysis decodes syntactic properties of accessibility and potential movements, interactions and self-directed activities inside the school, while functional analysis reveals the allocation of functionalities as attractors to student occupancies. Thus, both analyses (configuration and function) answer the second research sub-question: What is the potentiality of the spatial design, relative to the spatial configuration and function allocation, that triggers student interactions and further self-directed activities?

In summary, the design potentiality, as the first phase of this research, focuses on the spatial dimension of the school building; starting from the design decisions that shape the final spatial design, and proceeding to analyse the design outcome in terms of configurational and functional properties that impact the possibilities for student learning practices of interactions and self-directed activities.

3.1.2 Building Actuality

The second phase of the research investigates the actuality of the building in terms of the student learning practices. The research investigates the distribution of interactions and self-directed activities which are both highlighted in the literature review (sections 2.3; 2.6.2) for their role in social learning and constructivist gain of knowledge. The focus inside the school is within various informal spaces (outside classrooms; also highlighted in literature section 2.6.2), such as circulation spaces, libraries, dining spaces and play areas, especially during in-between class periods (circulation periods) and break times when students are granted a degree of freedom to move and meet. Still, the student learning practices are impacted by the school management operational scheme, including schedules and regulations; teacher guidance and supervision; and student preferences in different engagements. Accordingly, data on those factors is collected as part of studying the building actuality.

The outcome of studying the building actuality identifies patterns of the existing learning practices (interactions and self-directed activities) which are compared the school design potentiality. Hence, it concludes the degree of fulfilling the original design intentions, and how did the school operational scheme alter the design created by the team of architects, i.e. migrate from the original design. Accordingly, this phase answers the third research sub-
question: What are the actual practices of student interactions and self-directed activities within informal spaces of the school building as a result of the school operation?

In summary, the study of building actuality is the study of occurring learning practices of student interactions and self-directed activities inside informal learning spaces, according to the student free movements and impact by the school management regulations, schedules and student preferences.

The completion of the two phases defines the relationship between the design potentiality and the building actuality, which presents the actual learning practices afforded inside the school. From diverse possibilities offered by the learning environment, there are certain patterns of learning practices. Affordances are presented as possibilities for student interactions and self-directed activities, influenced by the environment as a rich landscape of affordances and the user social practices which impact the actuality of learning practices (literature 2.5). Affordances in the school are primarily created through the spatial function and configuration, reflecting the design potentiality (phase one). Affordances are thereafter constrained through the operational scheme of management regulations, teacher guidance and supervision and the student needs which all shape the actual student interactions and activities (phase two).

3.2 Case Studies

The research uses multiple cases studies to investigate the design potentiality and the building actuality of the school. For the design potentiality, the research selected three architecture firms (A, B and C) to investigate the design decisions taken by the team of architects during the design processes, according to a selection procedure as follows. Firstly, information was collected about multiple architecture firms, specialised in school buildings and based in London to facilitate communications (since research is based in London). Secondly, the search was narrowed down to firms of more than 15 years of experience in educational projects. The selection then filtered out firms whose projects are not recent, i.e. mostly before the 2000’s. Finally, the projects of each firm were examined by the researcher, as a trained architect, to select three firms whose designs have various building typologies.

The chosen architecture firms are referred to as A, B and C. Information is obtained from their offices and their websites. Firm B has the highest total number of projects (120), followed by firm A (102), then firm C (83). Firm C has the most educational projects (41), followed by A (39) and B (24). The projects of the three firms are highly recognised among the architecture community, established through multiple awards. Table 3.1 summaries information of the three architecture firms.

<table>
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<tr>
<th>Table 3.1: Projects and Awards of the Three Firms</th>
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<td>Total number of projects</td>
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<td>Educational projects</td>
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<td>39</td>
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<td>A</td>
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<td>87</td>
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After selecting the three architecture firms (A, B and C), eleven secondary school from their projects were selected to study the design potentiality through configurational and functional analysis. The main selection criterium is to maximise the building typologies to include school of compact design, wing structures, courtyards and campus environment. Furthermore, the research excludes multi-functional buildings, for instance, schools with a museum space or a public theatre within which impact the final design and operation. The floor plans were provided by each firm.

Table 3.2: Total area (m²) and Layouts of the Eleven Case Studies (Lighter Yellow is the Playground)

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<th>A2</th>
<th>A3</th>
<th>A4</th>
<th>B1</th>
<th>B2</th>
<th>B3</th>
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<td>Area</td>
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<td>11724</td>
<td>21298</td>
<td>8314</td>
<td>12352</td>
<td>20156</td>
<td>48961</td>
<td>35912</td>
<td>20087</td>
<td>11316</td>
<td>7686</td>
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</table>

The selected cases include school A1, A2, A3 and A4 by firm A; B1, B2 and B3 by firm B; and C1, C2, C3 and C4 by firm C, all having different layouts, as illustrated in table 3.2. Whilst intending to study four schools from each firm, only three buildings from firm B fit the research criteria. Figure 3.1 shows the school geographical locations without identifying which school belongs in each location, thus, maintaining an anonymous representation. All schools are in London except for two UK schools (labelled green and turquoise). There are two schools very close to each other (labelled black and grey).
Out of the eleven schools studied for their design potentiality, two schools were selected for on-site observations. The selection criteria intended to avoid certain characteristics. Firstly, the research avoided small schools (e.g. C1, A4, C3) and big schools (e.g. B3, C4, A3) in terms of total areas (indicated in table 3.2). Secondly, the study excluded campus environments (A3, A4, C2), because multiple buildings and outdoor circulation are hardly observed by a single researcher, especially in adverse weather. Furthermore, schools that miss on informal spaces (e.g. libraries or assembly spaces) were rendered not suitable for observations. Finally, the study excluded schools outside London, since the researcher and their department are based in London, and field work further away is expensive, considering daily commuting for long observation schedule periods (more than two months; 8:00 am until 4:00 pm).

The selected schools for observations are A1 and B1. They have similar populations and are mid-size schools in terms of area; B1 ranks 6th and A1 is 7th among the eleven cases. Both schools have the largest diversity of spatial functions, without missing informal spaces. Their designs comprise double loaded corridors which is a common circulation typology within schools. A1 represents the dense compact building typology that is abundant in London (where sites are small). B1 represents the common typology of wing structures and the typical number of floors (three-storeys). Both schools have their play areas onsite with no extensions.
In summary, the research selected three architecture firms that are experienced in school projects to study the key design decisions pursued by the team of architects during the design processes. Eleven schools were selected from those three firms to study the design potentiality and evaluate the spatial design through configurational and functional analysis. Finally, the research decides on two projects (A1 and B1) to be investigated for their building actuality. Figure 3.2 illustrates the selected cases for each task.

![Figure 3.2: Cases Studies to Investigate the Design Decisions, the Spatial Design and Building Actuality](image)

### 3.3 Research Design – Mixed Methods

After deciding on the case studies, this chapter describes the methods used to collect data from those cases. This research contributes to studying school buildings through a research design of mixed methods. Combining qualitative and quantitative data is common when the subject of study is composed of multiple parameters, perceived qualitatively and quantitatively (Greene & Caracelli, 2003).
In this research, there are diversified qualitative and quantitative methods within one research phase and between the two phases (figure 3.3), because different methods have different advantages relative to the subject of study, i.e. the research parameters (Queirós et al., 2017). For instance, as part of investigating the design potentiality (phase one), the design decisions (happening during the design process) are studied through qualitative interviews, each conducted with the lead architect (and director during school projects) from the three chosen firms, to explore their intentions and priorities while focusing on the communications prior to the final design. As for the spatial design (outcome of the design process), it is evaluated through quantitative spatial analysis of functions and configuration, mainly using space syntax measures.

The building actuality (phase two) also combines qualitative and quantitative data. Qualitative interviews are conducted with members from the school management and teachers to understand the school operation, regulations and perceptions of the learning practices. Quantitative student questionnaires are also issued to understand their spatial and activity preferences. Furthermore, quantitative observation techniques (e.g. snapshots and gate-counts) are utilised to record the student interactions and self-directed activities and their distribution within informal learning space, like the corridors, libraries, dining spaces and play areas. The following sections elaborates on each method and its data.

3.3.1 Architect Interviews

During phase one of the research, the design decisions (by the design team) are evaluated through qualitative in-depth interviews, conducted with one director (involved in the selected school projects) from each of the three firms (A, B, and C). Interviews are tools to explore meanings and intentions (Clifford et al., 2010). While design is a collaborative task performed by a team of architects, the lead architect (as a representative) discussed the design decisions of the whole team towards the final design during the interview. The lead architects (of the three firms) also revealed the perceptions of the design team towards the school main spaces and the student self-directed activities. Interviews also explored the communications between the team of architects and the school management.
There are certain technicalities of the interviews. Each interview took place through a scheduled meeting between the researcher and the lead architect inside their office which lasted 30-45 minutes. Interviews were semi-structured, referring to an intermediate delivery method between the rigidly ordered questions and the spontaneous dialogue (Williamson, 2018; Dunn, 2016). The questions allowed the lead architect to present new ideas which redefined the route of the remaining interview (Valentine, 2005). There was a series of main questions with sub-questions associated with key decisions in the design process (appendix 13.1.4). If the architect’s answer was incomplete or unrelated to the question, the researcher asked related sub-questions. When sub-questions were answered, the researcher moved to the next main question. Interviews were recorded and transcribed (appendix 13.1.5).

During each of the three interviews, the researcher discussed (with the architect) one school as an example. This school is included within the eleven schools, studied for their design potentiality. The chosen schools (for interview discussions) were A1 by firm A, B1 by firm B and C1 by firm C. The examples fit a certain profile. Each is a state secondary school, i.e. funded by the government and provides free education. It is fully designed by the architecture firm and not a joint project with any other firm, thus, the design decisions are solely by the firm’s team of architects assigned for this project. It is also not an addition or extension to an existing building. Finally, each school was completed and operating for more than three years, i.e. beyond the testing phase which occur at the early opening of any UK school.

During interviews, the three architects used materials of floor plans, sketches, design alternatives to describe the school design and major decisions while referring to the exemplary school. Interview discussions revealed the events from the project initiation until the final set of drawings and external factors that impacted the design. Discussions also explored the main design features within school buildings, the team of architects’ intention behind the chosen configuration and the lead architect perceptions on informal learning spaces and student self-directed activities. The outcome of studying the design decisions (during the design process) is integrated in chapter 4 in the discussion of design potentiality and referenced in chapters 6-9 in the investigation of informal learning spaces.

3.3.2 Management and Teacher Interviews

During studying the building actuality (phase two), the researcher conducted interviews with members from the management and teachers at school A1 and B1. In this context, interviews have an 'interpretive' nature linked to the social meanings and experiences of the subject of study (Williamson, 2007). Interviews represent first-person data to express staff and teacher views on the building (Daniels et al., 2019) as the user-group in-control of the school (Sailer, 2018), i.e. school inhabitants (Hillier & Hanson, 1984).

Those interviews are semi-structured and lasted for 35-45 minutes inside the school offices. Firstly, there were interviews with members of the school management (appendix 13.5.3), including the principal and the assistant principal of school A1; and the deputy head and the building facilities manager of school B1. Interviews were recorded and transcribed (appendix 13.5.4). Responses explained the building operation, school regulations and the management perceptions of informal learning spaces and self-directed activities.
There are further semi-structured interviews (different questions) with two teachers from each school (appendix 13.6.3), also recorded and transcribed (appendix 13.6.4). Interview discussions explained the student daily schedules, the logic behind the student circulation routes between classes and during breaks and the teacher perceptions of informal learning spaces and self-directed activities. Interview data (either with teachers or management) is explained along the study of the school building actuality (chapter 5) and is referenced throughout the discussion of the relevant informal spaces (chapters 6-9).

3.3.3 Student Questionnaire

Parallel to teacher and staff interviews, the research issued online student questionnaires for both schools. It is an efficient technique to collect first-person data of students (Daniels et al., 2019) to understand their needs in the school (K. Tanner, 2018). Student questionnaires allow collecting a large sample of opinions, i.e. more representation of the population, without direct contact with the students, abiding by the conditions of the research ethical application (appendix 13.3). The online questionnaire form (appendix 13.7.4) was sent to each school management, to be forwarded to students. There was no control over the number of students filling the questionnaire, being an optional exercise. Accordingly, the data sample varies between both schools. In A1, 10% of the secondary student population filled the questionnaire, compared to 52% in B1. The low percentage of answers in A1 is acknowledged. Accordingly, questionnaires are not used on their own (to draw conclusions), but they are always combined with other data types, mainly the quantitative observations (described in the next section), to support arguments about the student preferences or activity types.

This questionnaire investigates the student needs and preferences especially during breaks. Questions link to various informal spaces under investigation, such as corridors, dining spaces, libraries and playgrounds which are expected to accommodate diverse student self-directed activities. The outcome reveals the student spatial preferences for interactions, social and intellectual self-directed activities, performed individually or collaboratively. It also explains some student behaviours, captured during onsite observations (section 3.3.4). The questionnaire results were compiled as comparative charts of the two student groups (appendix 13.7.5) which are referenced in discussions of the building operation and the student interactions and self-directed activities (chapter 5-9).

3.3.4 Onsite Observations

On-site observations are conducted to study the design actuality (phase two), in terms of the student movements, interactions and self-directed activities inside school A1 and B1. Observations, as used in this thesis, are quantitative techniques that follow the ‘positivist’ approach, perceiving social life as a measurable reality, quantifiable and analysed (Williamson, 2007). Empirical observations are quantitative, conditional to organising the research variables and selecting relevant measurement techniques that record precise numerical data (Neuman, 2014), to understand social patterns (Garfinkel, 1967), like interactions (Garfinkel, 1974). In this research, the society is the student population, and the context is the school building, mainly informal spaces of circulation, libraries, dining spaces, and play areas.
There are certain technicalities for the observations. They were performed by the researcher through a series of visits, after being granted access to schools A1 and B1, according to the ethical application 6118/006 (appendix 13.3.1). Observations lasted eight weeks (distributed across non-consecutive days). The observation times varied, but the researcher was typically present for the whole school day (8:00 am until 3:00 or 4:00 pm; according to the departure time). Observations of the two schools were not performed simultaneously, since the researcher had to spend the whole day at one school. A1 observations were designed and completed before repeating the same methods for B1. There are two reliable techniques of quantitative observations, commonly used among space syntax community of researchers. These are snapshots and gate-counts, as elaborated below.

### 3.3.4.1 Snapshots

The main observation technique is snapshots which plots (on floorplans) actions and activities in space at an instant time period. They are described in the space syntax software manual as a “method for recording both stationary and moving activities, and it is useful when a direct comparison is being made between two types of space use” (Vaughan, 2001, p.7). One snapshot is a cross-sectional study within a single time frame, but snapshots are always repeated across multiple times for the same space, rendering the outcome as a longitudinal study (across time). They portray a ‘Panel study’, which represents data for the same members of a specific society (Babbie, 2010). Snapshots represent a standard tool of space syntax research and as such feature in a multitude of studies. A particularly thorough example of applying the snapshot method successfully is presented by Koutsolampros (2021) for office buildings, which comes after Koutsolampros et al. (2015) have discussed, through statistical testing, the rigour of the snapshot method.

There are certain objectives for snapshots. They capture the student locations, interactions and movements which are thereafter used to identify the student learning practices of self-directed activities (beside interactions), especially inside the school informal spaces, like corridors, libraries, dining spaces and play areas. Alongside the student location, snapshots annotated certain attributes which include the student activity type, locomotion, group formation and group size. Snapshots require a location plan that divided the school spaces into observable areas (zones and sub-zones), each monitored according to a pre-set schedule. The zone boundary depends on the area of each space, visual boundaries and different levels in the buildings. Each zone was covered by the researcher at a time, before moving to the next zone. The same zone is observed over different times of the day, and the process is repeated over the full observation period, to record a set of scenarios that can be considered representative for commonly reoccurring activity scenarios in space. A1 and B1 have different snapshot zoning, relative to each school layout.

For A1, there are four zones, each representing one level of the school building (figure 3.4). Level 1 is zone A, including two dining spaces (A-x and A-y) and the outdoor play areas which are sub-divided into the central amphitheatre (A-z), the sports courts (A-v) and the backside (A-q). Level 2 is zone B of the library (B-x), another dining space (B-y) and the remaining play areas (B-z). Level 4 is zone C. It is divided into three subzones (C-x, C-y and C-z from left to right). Level 5 is zone D, divided into similar three subzones (D-x, D-y and D-z). Level 3 is
excluded from observations, being the teachers and staff main spaces with limited student-access. Level 6 is also excluded, being the sixth form base, i.e. not part of the secondary school nor accessed by secondary students.

School B1 has three observation zones on three levels (figure 3.5). Level 1 is zone A, divided into subzones A-x, A-y, A-z and A-v. Subzone A-x is the northern school wing and A-z is the southern wing. A-y includes the entrance hall, one staircase, two dining spaces and the courtyard between the two wings. A-v is the main playground of seating areas and pitches. Level 2 is zone B, which includes B-x (northern wing), B-z (southern wing) and B-y which is the connecting circulation and the library. Level 3 is Zone C of the same division but missing C-y, because the two wings do not connect. The western school block (on level 1 and 2) is excluded from observations, being the sixth form base, which secondary students do not access.
Alongside the location-plan, snapshots have a schedule. It reflects the research focus through concentrating observations outside the class period, when teachers have less control over the student activities. This includes the circulation periods between classes and break-times, when student interactions and self-directed activities are expected to densify. The schedule also includes the morning arrival times and the afternoon departure time. Extra snapshots are captured in corridors and common areas during class times to understand their operation during these times, if students are outside classes, and what do are they doing.

There are certain scheduling technicalities to ensure the accuracy and reliability of snapshots. Each snapshot takes approximately 13 minutes to be recorded. The schedule accounts for enough recording time and extra time to move from one snapshot location to another. The schedule is a template that is followed to achieve full coverage of the observation plan while ensuring each area is covered on different times of the same day and different weekdays. Table 3.3 shows two examples of a one-day observation schedule for school A1 and B1.
Table 3.3: One Day Observation Schedule Example (A1 Left and B1 Right)

According to the observation plan and schedule, snapshots are recorded on printed floor-plan copies. They are scanned, and the data is digitised using GIS software. Figure 3.6 shows an example of a digitised snapshot where the activity, posture and group number are displayed for every dot (student).
Beside their visual representations, snapshot data is utilised in the tabular format. Each point has five attribute categories: (1) snapshot time, (2) snapshot location, (3) activity observed, in addition to (4) an ID and (5) an identity as a student or teacher. Firstly, the snapshot time is tabulated through the day number (series of visits; 1-40), the snapshot time (8:30-16:45) and period (circulation, break or class time). Secondly, the snapshot location is defined according to the floor level (e.g. 1, 2, 3), the location subzone (e.g. B-x), the location name (e.g. library) and its number (e.g. 206). Each dot is also georeferenced (X and Y coordinates). Thirdly, the activity observed is recorded in terms of type (e.g. talking), locomotion (e.g. sitting), groupness (yes or no) and group size (e.g. 5). Finally, there is a unique ID to distinguish each dot, beside specifying it as a student or teacher. Table 3.4 shows the data entry for one captured dot, while full tabulated data sets are in appendix 13.8.

Table 3.4: Data Entry for Each dot in the Snapshots

<table>
<thead>
<tr>
<th>Attribute title</th>
<th>Possible Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>A1 or B1</td>
</tr>
<tr>
<td>id</td>
<td>Integer number</td>
</tr>
<tr>
<td>Who</td>
<td>Student / teacher</td>
</tr>
<tr>
<td>Day number</td>
<td>Integers number</td>
</tr>
<tr>
<td>Time</td>
<td>HH MM</td>
</tr>
<tr>
<td>Circulation / Break / Class</td>
<td>Morning break / lunch break / circulation / class</td>
</tr>
<tr>
<td>Level</td>
<td>1, 2, 3, 4, 5</td>
</tr>
<tr>
<td>Subzone</td>
<td>A-x / A-y / A-z / A-v / A-q, B-x / etc.</td>
</tr>
<tr>
<td>Location</td>
<td>Classroom/ corridor/ library etc.</td>
</tr>
<tr>
<td>Location number</td>
<td>Integer number</td>
</tr>
<tr>
<td>Activity</td>
<td>Alone / talk / study / etc.</td>
</tr>
<tr>
<td>Posture</td>
<td>Sit / Stand / Move</td>
</tr>
<tr>
<td>Groupness</td>
<td>Yes / No</td>
</tr>
<tr>
<td>Group size</td>
<td>1,2,3,4 etc.</td>
</tr>
<tr>
<td>X coordinate</td>
<td>Real number</td>
</tr>
<tr>
<td>Y coordinate</td>
<td>Real number</td>
</tr>
</tbody>
</table>
3.3.4.2 Gate-counts

The second observation technique is gate-counts which quantifies the number of passers-by in a defined space, through creating virtual gates and counting the people passing through them (Vaughan, 2001). Within the school, gate-counts capture student movements, preferred routes and directions of flow. The gate locations were chosen in both schools to cover critical thresholds, connection points and vital access-corridors, especially within and around informal spaces, like corridors, libraries, dining spaces and play areas.

There are certain gate-count technicalities, regarding recording and compilation. The typical gate-count is recorded for five minutes, and results are aggregated to 60 minutes, i.e. estimating the hourly flow. In this research, gate-counts are compiled differently, for five minutes rather than hourly rates. Since a regular break (i.e. circulation period between classes or between classes and breaks) is five minutes, the flow rates have been averaged to flow per five minutes to indicate number of students passing during this single break. Each gate has two directions of flow. Direction 1 is defined as north or east, and direction 2 is south or west, recorded as discrete values.

For school A1 and B1, there is a plan of the gate locations, following the same zoning created for snapshots. Gate names are derived from the zone (A, B, C, etc.), the subzone (x, y, z, etc.) and a unique number. For A1, gates concentrate on level 1 at the dining areas (Ax1, Ax2, Ay1, Ay2) and the play areas, including the amphitheatre and its staircases (Az1 and Az2), the sport courts (Av1 and Av2) and the backside (Aq1, Aq2 and Aq3). On level 2, gates monitor the library (Bx1 and Bx2), the east dining (By1 and By2) and the play area at the main entrance (Bz1) and the opposite south-east corner (Bz2). On upper levels 4 and 5, each subzone has multiple gates to cover the corridors and staircases, from the floor plan right-end and spreading anti-clockwise to capture movements in both internal and external corridors. Gates are illustrated on figure 3.7.
B1 gate distribution (figure 3.8) follows the previous logic from A1. On level 1, the northern wing of the school is covered through gates Ax1, Ax2 and Ax3, while gates Az1, Az2 and Az3 monitor the southern wing. The entrance, dining spaces and the courtyard between wings are covered through gates Ay1, Ay2, Ay3, Ay4 and Ay5. The main play areas are recorded by gate Av1, Av2 and Av3. On level 2, the wing structure is similar to level 1, i.e. Bx1, Bx2 and Bx3 covering the northern wing; and By1, By2 and By3 covering the southern wing. The intermediate zone, including the library and the C-shaped circulation, is monitored using gates By1, By2 and By3. The same sequence repeats for level 3.
Alongside the gate distribution-plan, there is a schedule to record the gate-counts, being integrated in the previous schedule of snapshots, also focusing on circulation periods between classes; the break-times (beginning, during and ending); morning arrival times and afternoon departure time. Extra slots are recorded during the class-times to explore the student movements (if existent) during these periods. Table 3.5 shows two schedules for school A1 and B1 on a single day.

Table 3.5: One-Day Schedule of Gate-counts (A1 Left and B1 Right)

The gate-counts results are tabulated to compile the records of different days. Each gate is recorded three times during circulation periods, three times during breaks and two times during a class period (full set presented in appendix 13.9). The average is calculated for each period separately, and the cumulative column displays the total numbers of passers-by during all observed times (A1 in table 3.6; B1 in table 3.7). Counts are displayed for each direction and aggregated for both directions. The count variances between both directions sometimes reveals certain circulation patterns, as discussed in chapter 6.2.2.
Table 3.6: Gate-counts per 5 Minutes (A1)

<table>
<thead>
<tr>
<th>Gate Name</th>
<th>Circulation Time</th>
<th>Break Time</th>
<th>Class Time</th>
<th>Cumulative</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct on 1 (North / East)</td>
<td>Direct on 2 (South / West)</td>
<td>Both Directions</td>
<td>Direct on 1 (North / East)</td>
</tr>
<tr>
<td>Ax1</td>
<td>3 1 4 39 16 55 0 1 1 42 18 60</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ax2</td>
<td>5 8 13 34 10 44 1 1 2 40 19 59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ay1</td>
<td>1 1 2 22 8 30 1 0 1 24 9 33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ay2</td>
<td>10 2 12 20 10 30 0 0 0 30 12 42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Az1</td>
<td>1 2 3 21 24 45 0 0 0 22 26 48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Az2</td>
<td>2 4 12 9 21 0 0 0 14 11 25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Az3</td>
<td>5 0 1 28 7 35 0 0 0 29 7 36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Av1</td>
<td>2 3 5 18 12 30 0 0 0 20 15 35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Av2</td>
<td>2 3 5 22 21 43 0 0 0 24 24 48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Av3</td>
<td>0 0 0 18 15 33 0 0 0 18 15 33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bx1</td>
<td>1 1 2 15 13 28 0 0 0 16 14 30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bx2</td>
<td>2 2 4 10 10 20 0 0 0 12 12 24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bz1</td>
<td>4 2 6 1 0 1 0 0 0 5 2 7</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bz2</td>
<td>3 2 5 8 8 16 2 1 3 13 11 24</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bz3</td>
<td>2 2 4 19 30 49 1 1 2 22 33 55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bz4</td>
<td>0 0 0 14 13 27 0 0 0 14 13 27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cx1</td>
<td>17 12 29 3 2 5 1 0 1 21 14 35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cx2</td>
<td>1 0 1 0 0 0 1 0 1 2 0 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cx3</td>
<td>8 19 27 5 5 10 1 1 2 14 25 39</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cx4</td>
<td>17 4 21 5 5 10 0 0 0 22 9 31</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cx5</td>
<td>9 18 27 6 3 9 0 0 0 15 21 36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cy1</td>
<td>27 14 41 4 4 8 1 1 2 32 19 51</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cy2</td>
<td>0 1 1 0 0 0 0 1 1 0 2 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cy3</td>
<td>6 23 29 2 3 5 1 0 1 9 26 35</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cy4</td>
<td>40 7 47 0 0 0 0 1 1 40 8 48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cy5</td>
<td>29 12 41 1 8 9 2 1 3 32 21 53</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cy6</td>
<td>19 16 35 8 5 13 3 1 4 30 22 52</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cy7</td>
<td>6 3 8 6 5 11 2 2 4 13 10 23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cz1</td>
<td>5 1 0 1 0 1 0 0 0 1 0 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cz2</td>
<td>12 28 40 1 0 1 0 0 0 13 28 41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cz3</td>
<td>24 88 112 3 4 7 3 1 4 30 93 123</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cz4</td>
<td>39 22 61 2 5 7 0 0 0 41 27 68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cz5</td>
<td>1 0 1 0 0 0 0 0 0 1 0 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cz6</td>
<td>17 16 33 4 3 7 1 0 1 22 19 41</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dx1</td>
<td>9 12 21 0 0 0 0 0 0 9 12 21</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dx2</td>
<td>3 2 1 0 0 0 0 0 0 0 0 0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dx3</td>
<td>32 21 53 4 5 9 1 1 2 37 27 64</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dy1</td>
<td>16 2 18 1 1 2 1 1 2 18 4 22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dy2</td>
<td>0 0 0 0 0 0 1 1 2 1 1 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dy3</td>
<td>24 15 39 0 0 0 0 0 0 24 15 39</td>
<td></td>
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</tr>
<tr>
<td>Dy4</td>
<td>6 14 20 2 2 4 2 1 3 10 17 27</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dy5</td>
<td>33 22 55 0 3 3 3 4 7 36 29 65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dy6</td>
<td>11 8 19 2 3 5 3 1 4 16 12 28</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Dz1</td>
<td>0 0 0 1 2 3 0 0 0 1 2 3</td>
<td></td>
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<tr>
<td>Dz2</td>
<td>0 0 0 0 0 0 0 0 0 0 0 0</td>
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<tr>
<td>Dz3</td>
<td>14 6 20 6 4 10 2 0 0 22 10 32</td>
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<tr>
<td>Dz4</td>
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<td>Dz5</td>
<td>9 12 21 1 1 2 0 0 0 10 13 23</td>
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<tr>
<td>Dz6</td>
<td>6 1 7 3 0 3 0 0 0 9 1 10</td>
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</table>
3.3.4.3 Challenges and Considerations During Fieldwork Observations

There are different challenges during field observations. The common risk is ‘reactivity’, where students (or teachers) change their behaviours, unlike their ordinary attitude upon the introduction of the researcher into the school (Babbie, 2010). Students possibly modify their behaviour to match the hypothesis under investigation (Goldstein, 2011), especially that they have been briefed about the research and the researcher presence (appendix 13.4). Fortunately, the impact of the researcher presence fades away (approximately four days from starting), and students revert back to their normal routines.

In consideration of the student temporary behavioural changes, the first-week data was discarded. The period was considered as a warming-up for the researcher to memorise their routes around the buildings, the movement shortcuts and suitable spots for snapshots. Moreover, the researcher disengaged themselves completely from the school environment and the student society which is easier, since they are not a staff member nor a student, but an outsider to the subject of study (Marshall & Rossman, 2006). Nevertheless, there is an unavoidable degree of engagement, being present in space, and the researcher is aware of their impact on the studied environment.

3.3.5 Configurational Syntactic Analysis:
Alongside observations, there are main spatial analysis of the school floor-plans configuration through space syntax tools. Koch (2019) stated that “translation(s) from ‘space’ to ‘graph’ is what enables a large part of the findings of the field in that it allows for qualitative and correlational testing of hypothesis as well as investigative work”. The analysis is performed using DepthmapX, version 0.7.0 (C. Sailer & Koutsolampros, 2019). Depthmap is also used to perform analysis of isovists (Turner & Penn, 1999) for some interior spaces of the informal spaces in the school (e.g. corridors, libraries and dining spaces). Data is exported as comma separated values (CSV) which is processed in GIS software, to apply queries and combine with another data set of spatial functions (section 3.3.6). To create the spatial models, plans are plotted and organised on CAD software before being transferred (as DXF files) to Depthmap software for visibility graph analysis (VGA)². There are certain parameters to be set to produce the final syntactic analysis, such as the model type, either visibility or accessibility, the grid size and the selected syntactic measures, as described below.

3.3.5.1 Analysis Models: Accessibility vs Visibility

Depthmap provides accessibility or visibility analysis of the floor plans according to the boundaries drawn within the imported model. Accessibility models establish connections between various spaces based on what is accessible from one point to every other point. Hence, furniture and walls are barriers beside any obstacle which is not crossed, even see-through glass partitions. Accessibility models portray where students reach, being configurationally deep or shallow. As for visibility models, they express connections between spaces according to the visibility field from each point to all other points. The previous glass partition is not a barrier nor furniture below 70 cm. Figure 3.9 illustrates the differences between accessibility and visibility analysis of the same space (A1 library).

The research relies on accessibility models for the eleven case studies to study their spatial configuration and the embedded potentiality (chapter 4). While there is not a model type presumed as better than the other (Koch, 2019), in this research context, accessibility models

² Visibility graph analysis studies the inter-visibility between building spaces that are connected to each other through dividing areas using grid units of a set size.
are more suitable (than visibility models) to investigate the research questions which are more focused on understanding the student destinations for activities and their selected routes which are more associated to accessibility.

Alongside serving the research scope, the choice of accessibility models (rather than visibility models) is also driven by critical reasons that impact the analysis validity. Visibility models are rendered less accurate in this research context. The transition from floor plans to a spatial model for analysis requires accurate preparations of the drawings while taking critical decisions of what counts (or does not count) as boundaries (Koch, 2019). If visibility models are to be studied and analysed, not all walls should be regarded as boundaries. For instance, not all glass partitions guarantee visibility, being constrained by the glass opacity, height of the glass section (windowsill) and other surrounding furniture. Similarly, not all partitions obstruct visibility, being relative to their height. The floor plans (as provided by the each firm) are not detailed enough to be a reliable source of which spaces visually connect (or not). Moreover, visibility models require multiple visibility links, added for spaces that connect visually (but separate physically) which are abundant in the studied schools, considering the multi-levelling, open playgrounds, atria and glass partitions. While floor plans do not provide the full picture, visibility model preparations require visiting the studied schools and mapping all spaces to guarantee accurate results. This is not applicable in this research according to the ethical application that grants access only to two schools.

Visibility models are suitable for analysing interior spaces, as used to evaluate the upper floor corridors (chapter 6) and the school libraries (chapter 7) for the two schools which were visited by the researcher and mapped for their furniture, i.e. boundaries fully understood. The research experimented with visibility models of two schools (A1 and C1) to study how different the results are from accessibility models. Additionally, there were methods developed to combine the visibility and accessibility models. However, these data sets (of combined models) are isolated from this research and presented in a separate paper that explored school design potentiality for interactions and activities (Fouad & Sailer, 2019).

Having decided on accessibility models, there are certain procedures to prepare the schools for analysis. The models are drawn from the floor plans, provided by the architecture firms, such that the main boundaries are mostly the outer envelopes of the spaces (e.g. main walls, partitions, columns). Accessibility links are added between floor through staircases and elevators. This is straightforward with no ambiguity (unlike the complicated links for visibility models). The researcher also chose to have all floor plans without furniture, due to the following reasons. Fewer floor plans have furniture inside offices and classrooms, while most schools miss that level of detailing (not provided by the firms which just label spaces, e.g. classroom). Moreover, the three firms (which produced the plans) did not include the furniture of the informal spaces, such as the dining area, social spaces or libraries, despite existing in the school. To keep equal measures for all schools, the researcher needs to map the furniture in every school which requires visiting each site (not granted in the ethical application). Finally, from the researcher experience with schools, the classroom interior furniture is always changing in layout (by the teacher), and sometimes it is replaced with different pieces upon school operation, i.e. not the same as the drawn pieces on the floor plans. Hence, for consistency, spaces are evaluated for accessibility without the furniture. This decision avoids the amplification of segregation for the spaces where furniture is drawn
(mostly classrooms); and avoids the amplification of shallowness of other spaces whose furniture, although existing, is missing from the drawings (mostly social and dining spaces).

### 3.3.5.2 The Spatial Model Boundaries

Apart from selecting the model type, syntactic analysis requires boundaries, set to determine the extent of the area to be analysed. Boundaries are easily defined on upper levels, being bound by the outer building walls. Nevertheless, defining the analysis boundaries is challenging on the ground level. In this research, boundaries were chosen as the building footprints and including all adjacent or overlapping play areas. For campus environment (A3, A4, C1), defined boundaries included the secondary school buildings, play areas and in-between spaces, without expanding to non-secondary school buildings. Two schools (A2 and C3) have access to large fields, pitches and tracks outside the school site, hence, not part of the analysis.

### 3.3.5.3 Analysis Grid Size

Alongside the model type and boundaries, VGA requires setting a grid size, as the unit of dividing the floor plans. Each grid unit carries configurational properties. For one space, the value of any syntactic measure (e.g. visual mean depth) is the average value of the grid units within this space. The grid size determines the accuracy of analysis and the accuracy of comparing different spaces or buildings. Smaller grids yield more accurate models and analysis results. The researcher experimented with grid sizes 0.2mX0.2m, 0.4mX0.4m, 0.8mX0.8m and 1.0mX1.0m.

The research decided on 0.4mX0.4m grid size, according to the following reasons. Coarser grid sizes (1.0mX1.0m or higher) are excluded for their low accuracy, since they capture different spaces of different functions within the same grid unit which distorts the results when averaging values for one space (e.g. the library). The variance between results diminishes below 0.8X0.8 grid unit, rendering 0.4X0.4 and 0.2X0.2 as suitable options. Their differences are negligible with approximation to two decimal places. It was proven when test-running the analysis for schools of smaller total areas. Analysis at 0.2X0.2 grid was also excluded, since it runs for weeks before crashing for large schools. For consistency reasons, the research keeps all analysis at 0.4X0.4 grid unit which is also the average area occupied by a standing student, thus, providing a visualisation of possible occupancies.

### 3.3.5.4 Analysis Measures

This research relied on one key measure which is Visual mean depth, to compare the configuration of different spaces. Visual mean Depth calculates the mean global number of visual turns to reach one specific point from every other point in the building. Its values are descriptive to how configurationally deep or shallow a space is, in comparison to other spaces. For a space, a higher value of visual mean depth (compared to other spaces), signifies a higher number of turns needed to reach the space, i.e. a segregated space. Low values of visual mean depth reflect a shallow space that is more accessible in the whole system (Koutsolampros et al., 2019).
3.3.6 Functional Analysis

Beside configuration analysis, the research performs functional analysis on the school buildings which comprises defining the school typology, identifying functionalities (e.g. classrooms, libraries, dining spaces, etc) and assigning categories of spatial functions (formal learning spaces vs informal learning spaces). These are described as follows.

Defining the school building typology is important, being argued to influence the functional allocations, relative to the circulation network which itself defines the building typology (Kliment, 2001). For instance, the number of corridor spines, their shape and distribution influence the allocation of staircases and common spaces (e.g. dining areas) which impact the spatial potentiality for activities, as elaborated in chapter 4.15. Kliment (2001) classified school typologies (presented in table 3.8) as (1) centralised resources with double-loaded classroom wings, (2) centralised resources with single-loaded classroom wings, (3) centralised resources with classroom clustering, (4) dumbbell double-loaded classroom wings, (5) dumbbell with classroom clustering, (6) spine with double-loaded classroom wings, (7) spine with single-loaded classroom wing, (8) courtyard with double-loaded classroom wings, (9) courtyard with classroom clustering, (10) a campus or a multi-grade campus with outdoor circulation between buildings and (11) a compact urban block in a tight site. The typologies of the eleven schools are discussed in chapter 4.12 in relation to the design potentiality.

Table 3.8: Building Typology According to Corridor Network as Illustrated by Kliment (2001)

<table>
<thead>
<tr>
<th>Building Typology according to corridor network</th>
<th>Layout Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Centralized resources with double-loaded classroom wings</td>
<td><img src="image1" alt="Diagram" /></td>
</tr>
<tr>
<td>Centralized resources with single-loaded classroom wings</td>
<td><img src="image2" alt="Diagram" /></td>
</tr>
<tr>
<td>Centralized resources with classroom clustering</td>
<td><img src="image3" alt="Diagram" /></td>
</tr>
<tr>
<td>Dumbbell double-loaded classroom wings</td>
<td><img src="image4" alt="Diagram" /></td>
</tr>
<tr>
<td>Dumbbell with classroom clustering</td>
<td><img src="image5" alt="Diagram" /></td>
</tr>
<tr>
<td>Spine with double-loaded classroom wings</td>
<td><img src="image6" alt="Diagram" /></td>
</tr>
<tr>
<td>Spine with single-loaded classroom wing</td>
<td><img src="image7" alt="Diagram" /></td>
</tr>
<tr>
<td>Courtyard with double-loaded classroom wings</td>
<td><img src="image8" alt="Diagram" /></td>
</tr>
<tr>
<td>Courtyard with classroom clustering</td>
<td><img src="image9" alt="Diagram" /></td>
</tr>
<tr>
<td>Campus / Multi-grade Campus</td>
<td><img src="image10" alt="Diagram" /></td>
</tr>
<tr>
<td>Compact Urban Block</td>
<td><img src="image11" alt="Diagram" /></td>
</tr>
</tbody>
</table>
Alongside building typologies, the research investigates different functionalities assigned by each architecture firm (e.g. classes, studios, library, dining space, corridors, play areas, etc.) and their allocation during the design process. The floor-plan labels (provided by the firms) on each space were similar. Minor naming variations were unified. For instance, firm B referred to libraries as learning resource centres which was re-labelled (as library) to facilitate comparing functions across different schools. Beside recording the function, certain geometric attributes were calculated for each space, such as the area and perimeter, as well as the floor level of each space, all performed through GIS software.

The research is interested in spatial functions as formal or informal learning spaces while focusing on informal spaces for their spatial potentiality (chapter 4), following constructivist views on collaborative learning as a social process of interactions and self-directed activities outside the formal setting (literature chapter 2.6.2). Accordingly, the research re-classified the functional labels (e.g. classrooms, halls, etc.) into formal or informal spaces. Formal spaces are classrooms, seminar rooms, studios, laboratories and learning services. Informal learning spaces are circulation spaces (corridors and staircases), common spaces (dining and assembly spaces, halls, social areas), outdoor spaces (terraces and playgrounds) and the school library. Office are perceived as formal spaces yet classified in their own category which is examined for the mixing of student and teacher spaces in chapter 4.15. Services (e.g. toilets and MEP spaces) are outside the research scope.

There are certain technical steps to finalise the functional analysis. The floor plans were vectorised using CAD software. They were exported to GIS software to add functional attributes to each space, including type (e.g. library), formality (formal teaching or informal learning space) and being indoor or outdoor. Although circulation spaces are considered as informal learning space, they were distinguished in a separate category to facilitate their analysis in chapter 6. Geometric attributes of area, perimeter and the floor level were recorded for each space. The count and total area of each spatial category were derived.

3.4 Sequence of Data Collection and Analysis

There is a sequence of events to obtain school analysis and observations. While the research design described two phases (spatial potentiality and building actuality) and different methods, the process of obtaining data is not linear, i.e. multiple tasks overlap. Firstly, the researcher contacted multiple firms and settled on the selected three firms to arrange for interviews and acquire the school floor plans (eleven schools) which were subsequently analysed using DepthmapX. The researcher, thereafter, conducted the architect interview, while working on processing the plans in GIS.

Another sequence of tasks describes data collection inside the school buildings which was maintained for the two studied schools A1 and B1. Firstly, after acquiring school access, following the ethical application 6118/006 (appendix 13.3), the researcher prepared the observation plans and schedules. One visit was made to the school building to check the feasibility of the zoning and schedules which were modified accordingly. Spaces in the building, that are different from the floor plan, were marked and adjusted in the drawings and the analysis, for example, an extra door in the building that is not on the drawings or vice
versa. Existing furniture in the building (missing from the drawings) was also plotted. After that, the student questionnaire was submitted to the school management to be reviewed and forwarded to students.

With the updated floor plans ready and questionnaires submitted, regular daily visits to the school building were initiated following the observation schedule. After the initial warming-up period, three days focused on gate-counts in different zones to provide an image of the student distribution, thus, informing the researcher about areas of possible challenges in snapshots. After that, another schedule was resumed which comprised performing snapshots and gate-counts. Throughout the five observation weeks, the researcher arranged and conducted interviews with members of the school management and teachers. This whole sequence was conducted for school A1 and repeated for B1. It was not possible to work simultaneously on data collection in both schools, because all data was collected by one researcher, spending the whole day at one school.

3.5 Data Processing and Compilation

Following the completion of observations and spatial analysis (both of quantitative nature), data sets were tabulated to allow for investigation multiple correlations and extracting statistical information that describes the relation between the spatial design and the student learning practices of interactions and self-directed activities. This involved several processes of (1) compiling the function and configuration analysis to discuss the spatial potentiality (chapter 4), (2) digitising and tabulating the observation data and (3) merging the spatial and observation data together to discuss the building actuality (chapter 5) and elaborate on different informal space (chapters 6-9).

3.5.1 Compiling the Spatial Analyses

Compiling the spatial analyses refers to combining the configurational and functional analysis using GIS software. The function data was already recorded as attributes on GIS for each building, while the configuration data was imported from Depthmap to GIS as a CSV file. The study performed a spatial join (function coded in GIS) between both data sets. There are two types of data combinations which yield two different outcomes in terms of the data format.

In one method, function data sets are transferred onto the syntactic data composed of grid units. Each grid unit of the VGA, carrying analyses measures (visual mean depth), acquired further attributes of spatial function, like type of space (e.g. classroom, corridor, library, etc.), function category (e.g. formal, informal, office or services), floor level (1, 2, 3, etc) and further geometric attributes of area and perimeter. Table 3.9 shows a sample from this combination.

<table>
<thead>
<tr>
<th>School</th>
<th>Configurational (syntactic) data based on the VGA analysis of grid units</th>
<th>Organisational data added to each grid unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>Grid point Reference</td>
<td>Grid point x position</td>
</tr>
<tr>
<td>Grid point Reference</td>
<td>Grid point x position</td>
<td>Grid point y position</td>
</tr>
</tbody>
</table>
Another method involves transferring the configuration data onto function data. Each space, described by functional attributes (function, category, level, etc.), acquired an average value of the visual mean depth. This is described as the aggregated VGA value. For instance, the school library, categorised as an informal learning space, located on level 2 with area of 200 m², is also defined by the average aggregated visual mean depth value of 3.49. Table 3.10 shows a sample of this data.

Table 3.10: Configurational Data Projected on the Functional Properties of Each Space

<table>
<thead>
<tr>
<th>Organisational data</th>
<th>Configurational (syntactic) data added to each individual space</th>
</tr>
</thead>
<tbody>
<tr>
<td>School</td>
<td>Space unique ref</td>
</tr>
<tr>
<td>A1</td>
<td>68816</td>
</tr>
<tr>
<td>A1</td>
<td>68816</td>
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</tbody>
</table>

The latter data set (table 3.10) is formed of different spaces and their average visual mean depth, in contrast to the former data set (table 3.9) of grid points. Figure 3.10 is an example of the same floor plan showing the two formats of data compilation. On the left side, VGA of the visual mean depth is displayed, each grid unit having a unique value. Contrarily, the right illustration portrays the aggregated VGA, displaying the average visual mean depth for each space.

Figure 3.10: VGA of Grid Units (Left) vs Agregated VGA of Each Space (Right)

3.5.2 Processing Observation Data

To process the observation data, snapshots and gate-counts were digitised and tabulated for each school. While tabulating the gate-counts was simple, snapshot required time to plot the recorded dots on GIS software, thus, acquiring a geo-reference (X and Y coordinates). The main data set of snapshots has several attributes. Some were recorded on-site (e.g. activity type), and other attributes were extrapolated when the observation data is digitised and compiled (e.g. what category is that activity). Table 3.11 shows all observational attributes while identifying which ones were added during compilation.

Table 3.11: Observation Attributes (Recorded on Site and Added in Office)
### Attributes recorded during the snapshot

<table>
<thead>
<tr>
<th></th>
<th>School</th>
<th>ID</th>
<th>Day number</th>
<th>Time</th>
<th>Circulation / Break / Class</th>
<th>Level</th>
<th>Subzone</th>
<th>Location</th>
<th>Location number</th>
<th>Activity type</th>
<th>Posture</th>
<th>Groupness</th>
<th>Group population</th>
<th>Who</th>
<th>Attributes added after digitisation and compilation</th>
</tr>
</thead>
<tbody>
<tr>
<td>id</td>
<td>Integer (1,2,3, etc.)</td>
<td></td>
<td>Integers (1,2,3, etc.)</td>
<td>HHMM (1130, 1145, 1150, etc.)</td>
<td>Morning break / Lunch break / Class time / Circulation</td>
<td>1, 2, 3, 4, 5</td>
<td>A-x/A-y/A-z/A-v</td>
<td>Classroom / Corridor / Dining / Outdoor Gym / Library / Office / Playground / Seminar Staircase / Studio / Terrace / Toilet</td>
<td>Integer (1,2,3, etc.)</td>
<td>List of possible 84 (e.g. talk, eat, etc.)</td>
<td>Sit / stand / Move</td>
<td>Yes</td>
<td>Integer (1,2,3, up to 34)</td>
<td>Student</td>
<td>Teacher</td>
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### 3.5.3 Merging Spatial and Observational Data

After compiling spatial analyses and processing observations, the last step is to merge both sets through a spatial join, performed on GIS software. Observations of snapshots, defined through the multiple attributes listed before (section 3.5.2), were linked to the configuration and function analysis already compiled in one data set (section 3.5.1). For example, one recorded student dot (with location, timing, activity and group formation) acquired spatial information of where the student was located at that time which included function of space (e.g. dining area), category of space (informal space), area, floor level and the configurational value of visual mean depth. The added attributes to the existing observation data are listed in table 3.12. The final data set is used to investigate how the student interactions and self-directed activity patterns (obtained through observations) relate to the spatial function and configuration of the school, either from a holistic approach (chapter 5) or within individual informal spaces (chapters 6-9).

#### Table 3.12: Functional and Configurational Attributes Added to Observation Data

<table>
<thead>
<tr>
<th>Extra Attributes added to observation data from spatial analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Functional Attributes</strong></td>
</tr>
<tr>
<td>Area of single space</td>
</tr>
<tr>
<td>Perimeter of single space</td>
</tr>
<tr>
<td>Spatial functionality</td>
</tr>
<tr>
<td>(e.g. Classroom, Dining, Corridor, etc)</td>
</tr>
<tr>
<td>Space functionality category</td>
</tr>
<tr>
<td>(Formal / Informal / Circulation / Offices / Services)</td>
</tr>
<tr>
<td><strong>Configurational attributes</strong></td>
</tr>
<tr>
<td>Visual Mean Depth</td>
</tr>
</tbody>
</table>

### 3.6 Summary of the Research methods
This research investigates the relationship between the spatial design of the school building and the student learning practices of interactions and self-directed activities. For that scope, the research is divided into two phases to study the design potentiality and building actuality. The design potentiality is evaluated through the design decisions (undertaken during the design process) which filter out infinite design possibilities into a final spatial configuration with embedded functional duties, which provides possibilities for student learning practices. The building actuality is evaluated through the occurring learning practices of interactions and self-directed activities, as shaped through the management operation scheme, regulations, teacher guidance and supervision and the student needs and preferences.

To study the school design potentiality, multiple case studies were selected, examined through qualitative and quantitative methods. Case studies included three architecture firms (A, B and C), studied for their design decisions (during the design processes) through qualitative semi-structured interviews. Eleven secondary schools (designed by these firms) were evaluated for their design output through quantitative analysis of functionalities and their areas, building typologies and configurational analysis using space-syntax tools. The main syntactic measure used is visual mean depth, measuring the configurational shallowness or segregation of school spaces, based on accessibility models of the floor plans.

To study the building actuality, two schools (A1 and B1) were selected (of eleven cases), examined through quantitative observations and qualitative surveying techniques. Quantitative observations comprise gate-counts (to record movements) and snapshots to capture the student interactions and activities. Observations focus on informal spaces, like corridors, libraries, dining spaces and playgrounds during breaks and circulation times. Moreover, qualitative semi-structured interviews with members of the management and teachers revealed the school regulations, schedules, teacher input and supervision. Finally, Quantitative questionnaires investigated the student spatial preferences. Data collection was not a linear process; however, tasks and events overlap within the same school building (A1), before repeating for the second school (B1). Table 3.13 summarises the research phases, case studies and methods of investigation.

In the end, this methodology is designed to reflect how the school building shapes the affordances (possibilities) for learning practices, determined through spatial functions and configuration which exhibit the potentiality to induce student movements, encounters, interactions and self-directed activities. Nevertheless, affordances are further impacted by the management regulations, teacher guidance and supervision and student preferences which all filter out some possibilities in space and shape the occurring learning practices.
<table>
<thead>
<tr>
<th>Research Phase</th>
<th>Case studies</th>
<th>Investigated Material</th>
<th>Method of investigation</th>
<th>Data Type</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Potentiality</strong></td>
<td>Design process</td>
<td>Three architecture firms</td>
<td>Architect intentions, objectives of school design.</td>
<td>Semi-structured interview with director from the firm</td>
</tr>
<tr>
<td></td>
<td>Spatial configuration and function</td>
<td>Eleven secondary school buildings (from the three architects)</td>
<td>Configurational Accessibility. Functional analysis, geometric attributes</td>
<td>Space Syntax Analysis (Depthmap) (Functional allocation (GIS software)</td>
</tr>
<tr>
<td><strong>Building Actuality</strong></td>
<td>Student Learning Practices</td>
<td>Two schools designed by two of the three architects</td>
<td>School regulations and scheduling</td>
<td>Teacher guidance and supervision, Teacher interviews (semi-structured)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Student preferences and needs</td>
<td>Student Online Questionnaire</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Actual movements, interactions and self-directed activities</td>
<td>Snapshots</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4 Potentiality of the Spatial Design

This chapter studies the design potentiality as one of the two research phases (design potentiality and building actuality) which explains the school design implications on the student learning practices. The design potentiality reflects the possibilities offered in space to maximise and diversify (or minimise) the student learning practices, i.e. the affordance for student interactions and self-directed activities. Potentiality is shaped through the spatial configuration as the prime contributor to movements and encounters that yield interactions. It is also influenced by the spatial functions which impact the student occupancies in spaces for various self-directed activities. The spatial design (configuration and functions) is the product of the design process, distinguishing the school building from endless design possibilities according to the team of architects’ decisions. Considering the aforementioned spatial parameters, this chapter explains the design potentiality of eleven secondary school buildings, designed by three architecture firms and selected following specific criteria (methodology 3.2). The chapter focuses on (1) the school spatial configuration and (2) spatial functions, relative to (3) the design decisions taken during the design process. Hence, it answers the research sub-questions concerned with the design intentions and decisions pursued by the team of architects during the early stages of design; and the potential of the spatial design to promote student interactions and self-directed activities.

This chapter examines the school spatial functions and the team of architects’ decisions of mixing or insulating functionalities. The chapter also illustrates the implications of those decisions on the school configuration, analysed through the syntactic measure of visual mean depth (described in methodology 3.3.5). The study thereafter investigates the relationship between spatial function and configuration, compiled in a single data set (described in methodology 3.5.1). The aforementioned data explains the school design potentiality for interactions and student self-directed learning activities. This detailed narrative is repeated for the eleven case studies but presented in this chapter for one main school from each of the three architecture firms: A1 (section 4.1), B1 (Section 4.5) and C1 (section 4.8). For the other schools, this chapter presents their design potentiality as the outcome of analyses (sections 4.2-4.4; 4.6-4.7; 4.9-4.11), while the detailed analyses are elaborated in appendix 13.2, exactly as presented for A1, B1 and C1. The chapter proceeds to compare the eleven buildings, according to the results of function analysis, size (area) properties and building typologies (section 4.12). Furthermore, it presents a comparison of the spatial configuration of the eleven schools and the important design decisions that shape the building accessibility (section 4.13) which brings in the final discussion of the configuration of functions and its variances (section 4.14). Eventually, the chapter summaries the main functional and configurational properties that maximise the school design potentiality for various learning practices of interactions and self-directed learning (section 4.15). The chapter summary is section 4.16.

4.1 School A1

4.1.1 Function Analysis
School A1 is designed by architecture firm A. It is described according to the function allocation and strategic decisions in the design process (by the team of architects). A1 has 17 functionalities organised in a compact urban block (figure 4.1). The relatively small site has consequences on the design, as described in the interview with architect A (appendix 13.1.5). For instance, the building expanded vertically to six levels, to satisfy the required total area. Upper-floor spaces are compact except for the open studios. The playground is divided onto two levels (1 and 2) to provide enough play spaces for students. Hence, the play areas perforate three dining spaces on level 1 (figure 4.2). There are two extra dining units on level 2, yielding a total of five units. The architect justified the need of five dining units to match the school’s five houses which is a division system for the student population into separate groups (houses), each having their own spaces. The design also implemented five staircases and five open studios, one for each house. The main building entrance is through the double-height hall on level 2.

Learning spaces are distinguished by their formal vs informal setting as introduced in the literature review (2.6.2) and defined in the methodology (3.3.6). A1 formal spaces are classrooms and studios where teaching activities occur, being controlled by teachers. The
team of architects for school A1 concentrated the formal classrooms and studios on upper levels 4, 5 and 6 (figure 4.3) which account for 19% of the total school area (figure 4.4). On the other hand, informal spaces are areas outside the classroom where students have freedom to perform self-directed activities, such as A1’s play areas, dining units and the library on the lower two levels (1 and 2); beside the terraces on the upper floors. Informal spaces compose 50% of the school area distributed among 21 spaces.

On the upper floors, there is a mix of functionalities of classrooms, studios and offices. Among the allocated classrooms and offices, the design highlights five central open studios. Each studio (as decided by the team of architects) is assigned to one house (student group), intended to accommodate large-group sessions of student collaborative learning activities, supervised by teachers, as explained in the architect interview (appendix 13.1.5). This allocation exhibits possibilities for student-to-teacher interactions, as the student and teacher spaces are proximate, and their routes coincide. Still, there is no mixing of formalities in the immediate zone, since all the spaces have the formal nature. However, the peripheral informal terraces break this monotonous and diversify the formality on the holistic scale of the whole floor.

Architect A described the design criteria for circulation spaces to primarily facilitate movements which is a challenge, considering the six levels. For that, they created five vertical cores to secure one staircase to each of the five houses. In terms of horizontal circulation, external corridors on level 1 and 2 are designed as pathways that blend into the outdoor spaces. Contrarily, upper-floor corridors are defined as an internal double-loaded network, running east-to-west. Still, internal corridors merge into open studios, only bound through the studio furniture organised by teachers. The team of architects also implemented a parallel external network to distribute the circulation load. Those decisions led to an increased count of circulation spaces (64) as seen in figure 4.3, compared to other schools. The total circulation spaces account for 16.5% of total area.

4.1.2 Configuration Analysis
Architectural design decisions and functional allocations have implications on the spatial configuration of the school building, expressed on the holistic scale of the whole building. This is explained through the syntactic measure of visual mean depth (VMD) where higher values reflect higher segregation (methodology 3.3.5)\(^3\). Firstly, designing a multi-levelled school yields relatively segregated upper levels (figure 4.5), illustrated through the high average visual mean depth of level 5 (6.25) and level 6 (7.07). Nevertheless, distributing play areas over two levels and connecting them through multiple outdoor stairs and a stepped seating (amphitheatre) contribute to the relative shallowness of levels 1 and 2 (4.91, 4.74; table 4.1).

Table 4.1: Visual Mean Depth (VMD) of the Whole Building and Each Level (School A1)

<table>
<thead>
<tr>
<th>Grid units</th>
<th>Count</th>
<th>Mean VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole building</td>
<td>84825</td>
<td>5.40</td>
<td>3.79</td>
<td>9.25</td>
</tr>
<tr>
<td>Level 1</td>
<td>25365</td>
<td>4.91</td>
<td>3.79</td>
<td>8.33</td>
</tr>
<tr>
<td>Level 2</td>
<td>15084</td>
<td>4.74</td>
<td>3.79</td>
<td>6.54</td>
</tr>
<tr>
<td>Level 3</td>
<td>6446</td>
<td>5.70</td>
<td>3.81</td>
<td>8.10</td>
</tr>
<tr>
<td>Level 4</td>
<td>10578</td>
<td>5.71</td>
<td>4.07</td>
<td>7.40</td>
</tr>
<tr>
<td>Level 5</td>
<td>9361</td>
<td>6.25</td>
<td>4.52</td>
<td>8.41</td>
</tr>
<tr>
<td>Level 6</td>
<td>7940</td>
<td>7.07</td>
<td>5.22</td>
<td>9.25</td>
</tr>
</tbody>
</table>

\(^3\) Since Visual Mean Depth measures the number of turns to reach a space from all other space, higher values mean higher segregation (more turns) and low values mean lower segregation, i.e. more configurational shallowness. Figure 4.5 has an inverted colour ramp to keep the colour red as an indication of shallowness. So, more redness means less visual mean depth (less turns), hence, more integration.
The architects’ design decisions have implications on the configuration of individual spaces. For example, the openness of level 1 and 2, intended to maximise the playground area, renders the central amphitheatre as a highly accessible space in the school, as illustrated on the aggregated VGA values (figure 4.6; compiled according to methodology 3.5.1). Openness and permeability are also portrayed for the upper-floor open studios, being shallower than most of the partitioned spaces in their respective levels. Their boundary-less design blends into the even shallower circulation corridor and connects to staircases which are the shallowest spaces of each level.

Further design decisions impacted the accessibility of individual spaces, relative to the circulation configuration and the continuation (or interruption) of corridor loops. For instance, the two central staircases are connected primarily to the internal corridor and secondarily to the external corridor. Accordingly, on all upper levels, external corridors are always more segregated than the internal ones, while both networks still connect at the central cores. Contrarily, for the eastern and western peripheries (figure 4.6), the team of architects either decided to connect both networks through the terrace (e.g. level-4 west end) or break the loop through allocating a single-access service space (e.g. level-4 east end). The corridor configuration and potentiality are revisited in chapter 6. These decisions impacted the accessibility of the peripheral classrooms and more significantly the terraces. On level 4, eastern-side spaces are slightly more segregated than the western-side which is inverted on level 5. The consequences of the peripheral configurations are revisited in the discussion of terraces (chapter 9).
4.1.3 Configuration of Functions

Beyond discussing spatial function and configuration separately, this research explores the degree to which spatial functions have distinct configurational properties using a compiled data set of functional and syntactic analysis (methodology 3.5.1). The visual mean depth values of the VGA pixels are plotted against the function properties (which are transferred to every pixel) in an analysis of variance – ANOVA test (figure 4.7). There is a statistically significant variance (P value <0.0001) that is moderately strong (R² = 0.55). In other words, there is a 55% probability that each function in the design (e.g. classrooms) varies in its accessibility (measured through the visual mean depth) from another function (e.g. library).

Following the proven variance in configuration of different functions, the average visual mean depth of each spatial function is listed (table 4.2). Gym space, halls and the playground areas are highly accessible. Dining spaces, library, staircases and corridors are in the mid-range. Classrooms, seminar rooms and terraces are the most segregated. The standard deviation suggests that the average visual mean depth values of certain functions (e.g. dining, library, halls and gym) truly represent the visual mean depth of different spaces of that type; in contrast to other functions (e.g. toilets and services) whose standard deviation is high, thus, the average is not an indication of true accessibility. Finally, data indicates that corridors have a high range of values, suggesting their spread over shallow and deep spaces in the plan.

Table 4.2: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School A1

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>6.31</td>
<td>0.58</td>
<td>4.83</td>
<td>8.53</td>
<td>3.70</td>
</tr>
<tr>
<td>Corridor</td>
<td>5.70</td>
<td>0.76</td>
<td>3.89</td>
<td>8.25</td>
<td>4.36</td>
</tr>
<tr>
<td>Dining</td>
<td>4.89</td>
<td>0.28</td>
<td>4.15</td>
<td>5.96</td>
<td>1.81</td>
</tr>
<tr>
<td>Elevator</td>
<td>5.84</td>
<td>0.86</td>
<td>4.38</td>
<td>8.71</td>
<td>4.33</td>
</tr>
<tr>
<td>Gym</td>
<td>4.51</td>
<td>0.16</td>
<td>4.25</td>
<td>4.63</td>
<td>0.39</td>
</tr>
<tr>
<td>Hall</td>
<td>4.64</td>
<td>0.25</td>
<td>3.90</td>
<td>5.01</td>
<td>1.11</td>
</tr>
<tr>
<td>Learning service</td>
<td>6.92</td>
<td>0.44</td>
<td>6.02</td>
<td>7.89</td>
<td>1.87</td>
</tr>
</tbody>
</table>
Alongside identifying the accessibility of each function, the study investigates the accessibility of the spatial categories of formal and informal learning spaces. Figure 4.8 illustrates the average visual mean depth of multiple formal, informal and circulation spaces, where each dot signifies one space in the school. Informal spaces distribute along the whole accessibility spectrum, with one group of spaces in the lower (shallow) end and another group in the middle range of accessibility spectrum. In contrast, all formal teaching spaces have a relatively smaller range and are concentrated towards the upper (deeper) end of the spectrum. Finally, while circulation spaces are considered as informal learning spaces, they are distinguished in a separate category to observe and evaluate their configurational properties as main informal spaces studied in chapter 6. They have the widest range of values, yet, shifted towards the shallow end and mid-range accessibility spectrum.

![Figure 4.8: Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces](image)

### 4.1.4 Design Potentiality of School A1

School A1 is a compact urban block of six levels. Its small site triggered vertical distribution of functionalities – 17 different functions allocated by the team of architects in firm A. The school divides its spatial resources in terms of dining spaces, staircases and studios into five sets, each serving one house (group of students) which reduces the potential student mixing and subsequent interactions between different houses. Still, the amphitheatre and surrounding play areas are the shallowest spaces, reflecting the potentiality for high
movements and the capacity to bring students together for interactions and collaborative activities along the stepped amphitheatre. A1 has unique large open studios and peripheral terraces on the upper floors, served through two networks of internal and external corridors. Open studios promote vibrant collaborative self-directed activities, whereas segregated terraces (mixed among formal spaces) potentially accommodate quieter self-directed activities or student relaxations away from other highly accessible and vibrant informal spaces, such as the playground or dining spaces which satisfy different types of student activities and sports.

The spatial properties of school A1 yield significant moderate variance in the configurational properties of each function (P value <0.0001 and $R^2=0.55$), hence, higher chances (55%) to identify a function based on its configuration, due to the variation of functionalities between lower (accessible) and upper (segregated) floors. In other words, formal teaching spaces (dominating upper levels 4 and 5) do not mix with informal spaces of dining spaces, the library, play areas on lower levels (1 and 2). Yet, there is a possibility for open studios to operate as informal spaces for student occupancies during breaks, if allowed by the management. In that case, open studios potentially maximise collaborative self-directed activities among students in response to the expected student encounters between passers-by and occupiers of the open spaces. There are also possibilities for student encounters and interactions with teachers, whose offices are opposite the open studios.

After discussing school A1, the same sequence of analysis is carried out for the remaining case studies of firm A which include school A2, A3 and A4. The upcoming sections (3.2-3.4) focus on the design potentiality of each school, deduced from functional and configurational analyses of each school, while the detailed analysis (similar to A1’s) are unravelled in the appendix 13.2.

4.2 School A2 – Design Potentiality

![Figure 4.9: VGA for the Visual Mean Depth, School A2](image)
School A2 (figure 4.9) is another multi-levelled compact design school. Its small site influenced the architects’ decisions to vertically allocate a mix of functionalities within the same zone, yielding a mix of formalities for levels 1, 2 and 4. This is portrayed through allocating student informal spaces (e.g. library or terrace) among other classrooms or teacher offices, hence, diversifying the degree of formality in interactions (student-to-student vs teacher-to-student) and the types of self-directed activities (quiet vs vibrant) within each level. The mixing of formalities on the lower levels yields some formal space to become shallower than informal spaces which is not common among the eleven case studies, where formal spaces are mostly segregated on upper floors (informal spaces are shallower). The variation of accessibility of formal functions (e.g. classrooms) and the mixing of functions and formalities while maintaining similar degrees of accessibility within the lower levels, both, weaken the significant configurational variance of different functions, being the lowest of all schools ($R^2=0.37$). This is not detrimental, since it is associated to mixing formalities and configurational diversity.

Moreover, the tight site drove the team of architects to prioritise which functionalities to occupy the lower levels. Accordingly, level-1 dining space exhibits high potentiality to mix students and yield patterns of self-directed activities, relative to the furniture setup and following its configurational shallowness and proximity to dense movements along the main circulation spine. This is alongside its original functionality to serve all students, as an attractor for eating activities during breaks, i.e. further mixing the students. Contrarily, level-2 sports court has a closed layout with minimal frontage to the main corridor. It was a design attempt to minimise distractions to teaching spaces on the same level. Thus, it is more segregated with less potential for vibrant activities, defying the natural atmosphere of play areas. The same segregation applies to level-four library which is an enclosed cellular space. However, this configuration possibly maximises the student occupancies for quiet and high-concentration self-directed intellectual activities, suitable for the library space.

The team of architects simplified the circulation network to a single double-loaded corridor, equipped with floor vents that allow the vertical flow of light and air. Minimal branching of the corridors translates to high accessibility and direct connection to most of spaces. Yet, floor vents reduce the corridor width, thus, minimising the potential for student groups to occupy the corridor sides for interactions or activities. The potentiality is further minimised, considering the expected high movements (congestions) along a single corridor network (unlike A1’s two networks). Moreover, highly accessible un-branched corridors secure relative shallowness of some formal teaching spaces (classrooms and studios) within each level; however, their closed design limits their potential for student self-directed activities outside class times. The detailed analyses of school A2 are presented in appendix 13.2.1.
School A3 (figure 4.10) is a single storey campus environment whose functionalities are horizontally distributed among five blocks within a campus environment. This configuration increases the accessibility of the whole site. There is a configurational hierarchy of accessibility starting from the shallowest open playground or courtyard (global centres), towards the main space of each block that connects to outdoors, for instance, the corridor of the northern block or the dining space of the south western block. Finally, the hierarchy reaches the least accessible inner side of the block such as classrooms (northern block) or dining services (south western block). The configurational shallowness of the spaces in-between blocks (courtyards and play areas) increases their potentiality to accommodate student movements and interactions alongside their functionality as vital routes between blocks. While those centres promote global mixing between passers-by and occupiers of the play areas, their potentiality for vibrant collaborative self-directed activities is possibly hindered due to the lack of furniture, despite their large areas.

The design of each block (in the campus) portrays a single dominant function, for example, the dining area in the accessible south-western block, formal classrooms in the less accessible northern block and offices in the segregated south-eastern block. The insulation of functionalities and monotonous of accessibility (within block spaces but varying between blocks) yield a strong significant variance in configurational properties of functions ($R^2=0.72$). This reflects a strong definition of the configuration of each function. Accordingly, students possibly occupy the segregated classrooms that support formal teaching activities or the shallower informal zones (dining space and play areas), with no mixing of functionalities (nor formalities). Hence, during break times, there is minimal potentiality for student self-directed activities around classroom which is conditional to proximity and mixing with informal space.
Furthermore, the insulated clusters limit encounters between students and teachers through separation of their spaces, thus, reducing the potential for student-to-teacher interactions. The detailed analyses of school A3 are presented in appendix 13.2.2.

4.4 School A4 – Design Potentiality

School A4 (figure 4.11) is part of a multi-grade campus of different building typologies of which two blocks (of three levels and a single level) represent the secondary school spaces. On level 1, there is separation of functionalities between the two buildings, for example, the social space in one block while the dining space in another. Considering break-time activities, this design minimises the mixing of students who either occupy the dining space or the social space. This separation minimises the student encounters and interactions, especially as the spaces, although being configurationally shallow, are not along a common circulation route. While the team of architects of firm A did not emphasise the dispersal of horizontal movements, they maximised vertical movements along social space through a wide, shallow stepped seating space across level 1 and 2 with an adjacent open staircase. This design promotes interactions between passers-by along the stairs and others socialising on the stepped seating.

School A4 portrays variations in accessibility of different clusters within the same level, in respect to the allocation of staircases and the branching of corridors. Still, the design does support this configurational diversity by mixing functions. In contrast, each function is isolated in one cluster (e.g. studio cluster) and exhibits similar accessibility properties which are different from the configuration of the other clusters. This design yields a significant strong variance in configuration of different functions ($R^2=0.71$). Nevertheless, the stepped social space breaks level-2 formality of isolated classroom cluster and office cluster by providing a retreat for collaborative self-directed activities, especially being allocated close to the classroom cluster. There are also high chances for student-to-teacher interactions at the upper end of the stepped seating (towards level 2), as students encounter their teachers around the cluster of offices. Level 3 only comprises formal classrooms and is expected to have minimal self-directed activities, unless the management allows student occupancies in
segnered closed spaces during breaks which is a less common scenario. The detailed analyses of school A4 are presented in appendix 13.2.3.

With completion of the four schools by firm A, the research proceeds to present the schools designed by firm B. Every school is studies following the same sequence of analysis performed for firm A projects. Similarly, the first school (B1) is fully presented (similar to A1). The other case studies (B2 and B3) are only discussed for their design potentiality, while their detailed analyses are elaborated in the appendix (13.2.4 and 13.2.5).

4.5 School B1

4.5.1 Function Analysis

![Figure 4.12: Building Wings, Connecting Block and the New Extension under Construction in School B1](image)

B1 is the first school studied from firm B projects. It is a three-level school, structured of two wings on all levels and a perpendicular connecting block (figure 4.12). This layout is defined as ‘centralised resources with double-loaded classroom wings’ (kliment, 2001). The choice of double-loaded corridors fits the wing structure to define each branch and distribute the wing spaces around the corridor. Yet, the use of double-loaded corridors yields compact cellular spaces which are poorly lit and poorly ventilated within the wing structure. Hence, the design implemented floor vents to increase the flow of air and light on the upper floors (used also by firm A in school A2). The school is going through construction work to add an extension to the existing building (outlined on the plan in red). The work does not interrupt the school functionality, since it is in a separate adjacent site that is expected to connect to the existing building when construction is complete.

![Figure 4.13: B1 Plans; Coloured by the Spatial Functions](image)
There are strategic design decisions that impacted the allocation of spatial functions in B1. The decision of creating two separate wings is driven by the intention to create different departments according to the design brief. While the previous section 4.4 (school A4) portrayed the insulation of functionalities in different clusters, the design of school B1 mixes functions in one cluster. Yet, it portrays a different type of insulation, i.e. departmental insulation through spatial boundaries of separate wings (figure 4.13). Departmental insulation even extends to completely disconnecting the two wings on level 3, such that there is no circulation between both sides. Nevertheless, the school nowadays is on the way to migrate from departmental separations, portrayed through the new extension which will connect the whole building into a closed loop.

Apart from the departmental wing structure, there are further design decisions that shape the functionality allocation, mainly concerned with the common block of the whole building. For example, the team of architects designed an open central dining space on level 1, equally distanced from both wings and along the main corridor. Few years after the beginning of operation, the team of architects (involved in the original design) added a second closed dining unit to satisfy the increased school population. It is situated towards the east, across the main circulation corridor and occupies part of the courtyard between both wings. On level 2, in the same prime location as the main dining on level 1, the team of architects allocates the library space as an open space along the main circulation route, with three corridor frontages.

While school B1 does not portray insulated clusters of mono-functions, it portrays insulated formalities, as formal and informal spaces do not mix. The team of architects integrated a mixture of functions in each wing, for instance classrooms, teacher spaces and services; yet, they all have the same degree of formality (figure 4.15), rendering each wing as an organisation of formal spaces (except for circulation corridors, perceived as informal spaces). Maintaining the same formal organisation across three levels explains the high count of formal spaces (59). They compose 28% of the total area (figure 4.16). As for the informal spaces, they compose 42% of the total area. They concentrate within the connecting block that encompasses the dining spaces and multi-purpose halls on level 1 and the library on level 2. This is alongside the outdoor spaces of the courtyard and the sports courts. The school has no outdoor spaces on the upper floors (figure 4.14), not in the form of terraces nor external corridors, unlike the scheme implemented by the team of architects in firm A (school A1 and A2) and actually implemented by the other team in firm B in their other two schools (B2 and B3).
4.5.2 Configuration Analysis

The design decisions associated with the wing structure and the connecting block impact the spatial configuration of the whole building, expressed on the scale of every level. On level 1, the high degree of openness for most of the spaces in the connecting block increase its accessibility in comparison to the less accessible cellular spaces within each wing (figure 4.17). Still, the difference in accessibility is not major, due to the direct connection of both wing to the connecting block and the multiple connections along the wings towards the courtyard and the playground which further bridges the accessibility gap. Contrarily, there is a clear decrease in accessibility from level 1 to the upper floors. The clear difference in the average visual mean depth (table 4.3) from level 1 (4.54) to level 2 (5.95) and level 3 (6.82) results from the closed insulated wing and the lack of open spaces inside the wing.

Table 4.3: Visual Mean Depth (VMD) of the Whole Building and Each Level (School B1)

<table>
<thead>
<tr>
<th>Grid units Count</th>
<th>Mean VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole building</td>
<td>78310</td>
<td>5.14</td>
<td>3.39</td>
</tr>
<tr>
<td>Level 1</td>
<td>50432</td>
<td>4.54</td>
<td>3.39</td>
</tr>
<tr>
<td>Level 2</td>
<td>18562</td>
<td>5.95</td>
<td>3.50</td>
</tr>
<tr>
<td>Level 3</td>
<td>9316</td>
<td>6.82</td>
<td>4.22</td>
</tr>
</tbody>
</table>

The study of visual mean depth through the aggregated VGA (figure 4.18) reveals the impact of certain design decisions on the configuration of individual spaces. For instance, the
courtyard is not the shallowest space (compared to other indoor open), despite being centralised with multiple overlooking spaces. This is because its accessibility is primarily determined through the number of connections to other spaces which was reduced in the original design. Furthermore, the decision of blocking one corridor, such as the branch connecting the two wings on level 3, influences the segregation of multiple spaces inside both wings. At the same time, allocating equal number of vertical cores per wing does not guarantee equal accessibility, since it is being affected by the overall configuration in relation to the lower floor levels (1 and 2), as well as the positioning of the staircases. That is why the spaces of the southern branch are more segregated than the northern branch spaces on level 3.

Figure 4.18: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School B1

4.5.3 Configuration of Functions

The study of configurational properties for spatial functions in school B1 (figure 4.19) portrays a significant moderate variance in accessibility of different functions (P value <0.0001 and $R^2=0.57$). Dining spaces, halls and playground are the shallowest (lowest average for visual mean depth). Corridors, stairs, studios and social spaces are in the mid-range. Classrooms and
the library are the deepest areas in the plan (table 4.4). Comparing the strength of this variance to the previous two schools (A3 $R^2=0.72$ and A4 $R^2=0.71$), B1 signifies lower variation in functional configuration. This is the result of mixing different functions in a closed, insulated wing (department) which has minimal variation of accessibility across its spaces. It is unlike the insulation of different functions in separate clusters, each having distinct configurational properties, being the case for school A3 (clustering across different buildings) or A4 (clustering across different levels).

Table 4.4: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School B1

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>6.33</td>
<td>0.69</td>
<td>4.22</td>
<td>7.91</td>
<td>3.69</td>
</tr>
<tr>
<td>Corridor</td>
<td>4.96</td>
<td>0.88</td>
<td>3.42</td>
<td>7.79</td>
<td>4.37</td>
</tr>
<tr>
<td>Dining</td>
<td>4.04</td>
<td>0.24</td>
<td>3.46</td>
<td>4.36</td>
<td>0.90</td>
</tr>
<tr>
<td>Elevator</td>
<td>5.46</td>
<td>0.66</td>
<td>4.34</td>
<td>6.99</td>
<td>2.65</td>
</tr>
<tr>
<td>Hall</td>
<td>4.09</td>
<td>0.61</td>
<td>3.39</td>
<td>6.89</td>
<td>3.50</td>
</tr>
<tr>
<td>Kitchen</td>
<td>4.12</td>
<td>0.25</td>
<td>3.63</td>
<td>4.84</td>
<td>1.21</td>
</tr>
<tr>
<td>Learning service</td>
<td>8.00</td>
<td>0.52</td>
<td>6.80</td>
<td>8.79</td>
<td>1.98</td>
</tr>
<tr>
<td>Library</td>
<td>6.18</td>
<td>0.31</td>
<td>5.24</td>
<td>7.23</td>
<td>1.98</td>
</tr>
<tr>
<td>Office</td>
<td>5.99</td>
<td>0.74</td>
<td>4.21</td>
<td>7.80</td>
<td>3.58</td>
</tr>
<tr>
<td>Playground</td>
<td>4.52</td>
<td>0.50</td>
<td>3.40</td>
<td>5.54</td>
<td>2.14</td>
</tr>
<tr>
<td>Seminar</td>
<td>5.93</td>
<td>0.32</td>
<td>5.81</td>
<td>6.81</td>
<td>1.00</td>
</tr>
<tr>
<td>Service</td>
<td>6.16</td>
<td>1.28</td>
<td>3.62</td>
<td>7.93</td>
<td>4.30</td>
</tr>
<tr>
<td>Social space</td>
<td>5.48</td>
<td>0.50</td>
<td>4.30</td>
<td>6.01</td>
<td>1.71</td>
</tr>
<tr>
<td>Stairs</td>
<td>5.16</td>
<td>0.69</td>
<td>3.50</td>
<td>6.89</td>
<td>3.39</td>
</tr>
<tr>
<td>Studio</td>
<td>5.31</td>
<td>0.61</td>
<td>3.96</td>
<td>6.81</td>
<td>2.85</td>
</tr>
<tr>
<td>Toilet</td>
<td>5.59</td>
<td>0.82</td>
<td>3.63</td>
<td>7.46</td>
<td>3.82</td>
</tr>
</tbody>
</table>

The accessibility of formal and informal spaces is studied through figure 4.20. Formal spaces have the widest range due to their spread over three levels where level 1 is shallow, but the upper levels are highly segregated (especially level 3). Contrarily, informal spaces have a compact range of values which is shifted towards the shallow end of the spectrum, because they are mostly composed of open spaces (except one hall) and are located on level 1 (except level-2 library). Circulation spaces are in the shallow and mid-range spectrum with a more stretched range than informal spaces, since they exist on every level (shallow and deep). Nevertheless, circulation spaces maintain their relatively accessible configuration, being the shallowest on upper levels. That is why their range is not stretched as formal spaces.
4.5.4 Design Potential of School B1

School B1 is a three-level school of separated departments across multiple wing-structures. Each wing is an insulated cluster of formal spaces (classrooms, studios and few offices) of similar accessibility for all spaces in each wing. However, there is high variation of accessibility across wings where one function repeats at different configurations. These properties yield a significant moderate variance of configurations for different functionality ($R^2=0.57$). The lack of informal spaces among formal teaching spaces, beside the monotonous accessibility, reduce the potential for diversified self-directed activities or student interactions, especially within the closed cellular design. The only possible form of interactions might happen in wing corridors, as students move towards classrooms (functional attractors); yet easily hindered if congestions happen along the narrow corridors. This setting is also expected to minimise the possibilities for student-to-teacher interactions, although the corridors serve the student and teacher spaces (classrooms and offices).

The school separates its common resources in the highly accessible perpendicular block connecting both wings, including level-1 dining areas and level-2 library and theatre. The open-plan dining area maximises the potentiality for student movements, especially at its peripheries. This configuration yields dense encounters and interactions by connecting occupiers (where furniture concentrates) to the passers-by along the vital corridor between both wings. While the library and theatre are less accessible, the design ensured their allocation along the main circulation loop, especially the library which has an open plan design with frontages on three corridor segments. Similar to the dining space, the library portrays high potentiality for interactions between passers-by and occupiers inside. The open-plan layout also promotes vibrant collaborative activities, alongside its default functionality as attractor for student intellectual activities. However, these conditions lower its potential for
quiet self-directed activities (e.g. individual studying, reading or writing). Finally, the theatre is completely partitioned and its potential occupancies as an informal space (for quiet self-directed activities) is dependent on the school allowing students during breaks.

4.6 School B2 – Design Potentiality

The design of school B2 maximises openness and accessibility on level 1, where the informal dining spaces, social piazzas and multiple halls are located alongside formal classroom clusters (figure 4.21). This mixing of formalities and high configurational accessibility maximise the potential for student learning practices. Firstly, student cross over the social piazza on their route between the different formal classroom clusters, thus, promoting student encounters and interactions. Moreover, students possibly occupy the informal shallow centres between class-times for quick collaborative self-directed activities while being close to their formal destination; or for long-period occupancies during breaks. The same potentiality applies to level-2 library space, situated within the shallowest location and along the main corridor. There is also a shallow open staircase that links the library to the main social piazza, hence, emphasising the library as a through-movement pathway between floors which further increases the student encounters and interactions, maximises vibrant activities inside the library; yet minimise its potentiality for quiet intellectual activities. Finally, the mix of teacher offices among classrooms promote teacher-to-student interactions.

Informal spaces (on level 1 and 2) lack the degree of privacy required for quieter self-directed activities which is facilitated within level-three peripheral terraces. The relative segregation of terraces yields a less vibrant environment, still, being close to classrooms and along the main spine. They play a crucial role to break the monotony of the highly formal arrangement of cellular classrooms. The bigger northern terrace has an adjacent cluster of teacher offices which possibly maintains a degree of supervision for the segregated space. Finally, terraces possibly attract students for relaxations away from the busier lower levels. In general, there is high variation of accessibility between levels, each comprising different functionalities. Formal teaching spaces do not mix on upper floors, distributing classrooms within the segregated level 2 and studios within the more segregated level 3. These spatial properties yield a significant strong variance in configuration of different functions ($R^2=0.67$). The detailed analyses of school B2 are presented in appendix 13.2.4.
School B3 (figure 4.22) is the largest footprint of all case studies, composed of multiple arms that repeat over three levels and connect through the largest and shallowest central courtyard on level 1. The courtyard has the potential to mix students from different clusters, increasing their encounters and interactions, mainly for long-period occupancies during break-times or shorter periods, when students cross-circulate between different clusters. The space is covered with a skylight making it suitable for longer interactions, socialisation and collaborative student self-directed activities, regardless of the outside weather conditions. It is also adjacent to a large dining space which is expected to exhibit the same potentiality, alongside being an attractor for eating activities during breaks.

On the local scale of the cluster (arm), each one is an insulated cluster with a shallow local courtyard (informal space), around which formal spaces are distributed. There is a configurational hierarchy from the accessible courtyard and circulation, towards the less accessible classrooms (or studios) and other more segregated formal spaces. This pattern repeats across multiple cluster, all having the same configuration for the same functions which yields a significant strong variance in configurational properties of different functions \( (R^2=0.70) \). This design maximises the potentiality for student self-directed activities within the local central courtyard, where students stay to work collectively while being one step from their opposite classrooms. They are also encountered by local passers-by in the cluster along the open circulation which further maximise their interactions. The segregated classrooms provide a quieter environment for quiet self-directed activities, if allowed by teachers. On the upper levels, this potentiality diminishes due to the absence of the informal core (being an atrium). Each cluster comprises formal classrooms and offices, except for the informal corridor which is also reduced in width by the central atrium. The detailed analyses of school B3 are presented in appendix 13.2.5.

After completing the case studies of firm B, the research proceeds to present the schools designed by firm C. Following the same method, the first school (C1) is fully presented (similar to A1 and B1). The other case studies (C2, C3 and C4) are discussed for their design potentiality, while their details are elaborated in appendix (13.2.6; 13.2.7; 13.2.8).

4.8 School C1
4.8.1 Function analysis

C1 is a renovation project for an older existing school on site. The lead architect in firm C discussed how their design decisions led to preserving the structure of certain areas of the old building, refurbishing other zones and completely re-building new spaces in other zones (figure 4.23).
The lead architect explained how the building layout is shaped through the horizontal circulation which is the key design feature to connect the preserved building parts, renovated areas and the newly built spaces (interview; appendix 13.1.5). For that purpose, the team of architects created a main spine on level 1 while altering its width from the typical narrow corridor on the peripheries towards a wider central piazza, thus, creating an indoor gathering space as part of the circulation (referred to by the lead architect as the arcade). On the upper levels, the team of architects re-implemented the spine with wider open piazzas while allocating spaces along a linear arrangement or extending T-shaped corridor branches to create clusters (figure 4.24).

The allocation of functionalities is influenced by the design brief that suggested the creation of departments. Accordingly, the team of architects decided to create linear wings on each level. On the ground level, there are two wings. The northern wing is mainly offices, halls and a dining space with one classroom, a seminar room and two studios. Contrarily, the southern wing is dominated by the studios. The main spine does not extend to connect both wings which suggest cross circulation over the courtyard. On the contrary, on level 2, the spine extends between both wings, where each wing is an independent department with classrooms (or studios), a local dining space and a large circulation piazza as the social space. The same pattern repeats on level 3 but for only the northern wing (level-3 floor area is reduced to half).

The creation of independent departments on upper levels with mixed functionalities yields mixing of formalities (figure 4.26). Firstly, the school library, as an informal space, is allocated on level 2 among the formal spaces of the northern wing. Secondly, each wing (either on level 2 or 3) has its local informal spaces of a social piazza and a dining space alongside the formal teaching spaces, arranged linearly along the corridor. The formal spaces have a very high count (100 spaces) in the school and account for 27% of the total area (figure 4.27). Still, informal spaces have larger area coverage (46%), courtesy of the courtyard and the playground spaces on level 1 (figure 4.25). The only wing that does not portray a mix of formalities is the southern wing on the ground level (all formal spaces).
4.8.2 Configuration Analysis

Figure 4.27: C1 Categorisation of School Spaces (Areas and Counts)

Figure 4.28: VGA for the Visual Mean Depth, School C1
The accessibility of level 1 is mainly influenced by the circulation network, being the primary contributor to connect the departmental wings horizontally through the spine and courtyard (figure 4.28). The high porosity of the wing corridors to the outside areas renders a highly accessible ground level with minor variations in the visual mean depth. In the northern wing, the boundary of the spine or the wider circulation (arcade) blends into the courtyard where both areas have similar degrees of shallowness. Even the southern wing which is not connected by the spine is still highly accessible due to multiple access points to the courtyard. The only less accessible spaces are the deep office (sub-divided and nested spaces) inside the northern wing.

The accessibility of the upper levels, especially level 2, is mainly influenced by the design and allocation of the vertical cores. There are eleven staircases distributed within the wings to connect level 1 and 2. This is reflected on the overall visual mean depth of level 2 (4.74) which is not steeply deeper than level 1 (3.61), as seen in table 4.5. This variation is the lowest among all case studies (between level 1 and 2). Then, there is the role of the circulation spine, the open piazza and open dining space (of each wing) in order to maintain an even accessibility for the whole level 2. As for level 3, it is more segregated (VMD 5.80), since not all staircases continue to level 3 (fewer vertical cores), and there are also narrower branching corridors and closed cellular spaces, with no open piazzas.

<table>
<thead>
<tr>
<th>Grid units Count</th>
<th>Mean VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole building</td>
<td>236060</td>
<td>4.15</td>
<td>2.70</td>
</tr>
<tr>
<td>Level 1</td>
<td>148552</td>
<td>3.61</td>
<td>2.70</td>
</tr>
<tr>
<td>Level 2</td>
<td>61237</td>
<td>4.74</td>
<td>2.82</td>
</tr>
<tr>
<td>Level 3</td>
<td>26271</td>
<td>5.80</td>
<td>3.42</td>
</tr>
</tbody>
</table>

The aggregated VGA of the visual mean depth (figure 4.29) further highlights the impact of the horizontal circulation spaces. On the ground level, it clarifies the similarities between the central courtyard (as a cross circulation route between north and south wings) and the spine and the wider circulation arcade (as the main connector from east to west). Those spaces equally form the shallowest zone of the school and are distinguished from the slightly less accessible adjacent sports courts, located towards the western end. This difference is not clearly signified on the pixelated VGA but clarified in the aggregated VGA. Furthermore, the aggregated VGA reveals the impact of creating branches from the main spine on level 3. It renders deeper clusters of spaces, being the most segregated in the school, in contrast to the shallower linearly arranged spaces along the spine.
4.8.3 Configuration of Functions
Configurational properties of each spatial function are investigated (figure 4.30). There is a significant moderate variance in accessibility of different functions (P value <0.0001 and $R^2=0.48$). The playground, social spaces, dining areas and corridors have the highest accessibility. Staircases, halls, library and seminar rooms are in the mid-range. Terraces, classrooms and offices are the deepest areas in the plan.

The school has the weakest configuration variance of functions in the cases of firm C and the second weakest in the eleven schools. This happens as a result of the departmental clustering where the team of architects mixes classrooms (or studios) together with a local dining space and a social piazza to create an independent wing (like a smaller school). This design strategy yields a zone of multiple functionalities and formalities which is characterised by similarities in configurational properties. In C1, those spaces are equally shallow. This is different than departmental wings by firm B (school B1) which clustered mono-functional spaces (mainly formal classrooms) and separated wings with clear configurational variances.

The second reason for the relatively weaker variance is the high porosity of level 1, leading to equal accessibility of most of the spaces which happen to have different formal and informal function. The same also applies to level 2 which has similar shallowness to level 1. This can be proven from studying the standard deviation (table 4.6) which portrays low values for most of the functions (<1.0 except terraces). This means that the weaker variance in configuration of function is not derived from allocating the same function at different locations of different configurational properties. However, it is derived from the even configuration within one zone which has variations in functionalities and formalities. This is noticed in the similarities in the average mean depth of different functions, such as the library (VMD 4.41), seminar rooms (4.71) and studios (4.80).

Table 4.6: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School C1

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>5.01</td>
<td>0.70</td>
<td>3.04</td>
<td>7.37</td>
<td>4.33</td>
</tr>
</tbody>
</table>
The accessibility of formal vs informal spaces is studied through figure 4.31. Again, it illustrates the similarities in configurations between formal and informal spaces, supporting the previous argument of equal accessibility for different formalities. They have very similar ranges, while the formal spaces are denser and having seven deeper spaces, and the informal spaces are fewer and have two shallower spaces. Circulation spaces also have a similar range but more shifted towards the shallower end, as expected to be the shallowest space on each level, with one outlier staircase in the very deep end of the spectrum.

<table>
<thead>
<tr>
<th>Room</th>
<th>Corridor</th>
<th>Dining</th>
<th>Elevator</th>
<th>Hall</th>
<th>Kitchen</th>
<th>Learning service</th>
<th>Library</th>
<th>Office</th>
<th>Playground</th>
<th>Seminar</th>
<th>Service</th>
<th>Social space</th>
<th>Stairs</th>
<th>Studio</th>
<th>Terrace</th>
<th>Toilet</th>
</tr>
</thead>
<tbody>
<tr>
<td>92</td>
<td>3.97</td>
<td>3.93</td>
<td>4.72</td>
<td>4.21</td>
<td>4.20</td>
<td>5.06</td>
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<td>4.96</td>
<td>3.36</td>
<td>4.71</td>
<td>4.88</td>
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</tr>
<tr>
<td>88</td>
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<td>0.83</td>
<td>0.87</td>
<td>0.61</td>
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<td>0.75</td>
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<td>0.97</td>
<td>0.94</td>
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<td>0.72</td>
<td>0.99</td>
<td>1.21</td>
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</tr>
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<td>2.88</td>
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<td>3.25</td>
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<td>3.27</td>
<td>3.84</td>
<td>3.04</td>
<td>2.70</td>
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<td>3.15</td>
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<td>66</td>
<td>8.88</td>
<td>6.38</td>
<td>7.13</td>
<td>5.59</td>
<td>4.86</td>
<td>7.09</td>
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<td>7.38</td>
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<tr>
<td>56</td>
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<td>3.69</td>
<td>2.34</td>
<td>0.97</td>
<td>3.82</td>
<td>0.98</td>
<td>4.34</td>
<td>1.83</td>
<td>3.52</td>
<td>4.71</td>
<td>1.82</td>
<td>3.04</td>
<td>3.89</td>
<td>2.71</td>
<td>4.49</td>
</tr>
</tbody>
</table>

Figure 4.31: C4; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces
4.8.4 Design Potential of School C1

Being a renovation project, the design team invested in the horizontal circulation network of C1 to connect the newly added zones to the renewed and preserved spaces. They altered the width of the main spine to create wider gathering piazzas along the circulation which are highly porous towards the courtyard between the two wings. The whole ground level especially the spine, social piazza (labelled arcade space) and courtyard are highly accessible. Movement patterns are expected longitudinally along the spine and piazzas or transversely across the courtyard as a shortcut between the two wings. The spaces provide optimal conditions for student mixing, encounters and interactions. The patterns can also grow into collaborative self-directed activities towards the southern end of the courtyard, closer to the cluster of studios as students collaboratively perform intellectual activities.

Similar configuration exists on level 2, where the design maintains two large piazzas (one within each wing as part of the extended spine) which exhibit high potentiality for student mixing, interactions and self-directed learning, especially closer to the studios. Nevertheless, the team of architects mix more formalities, where each wing has its own local dining space, hence, becoming an independent cluster. Although the local dining spaces have deeper configuration (in the northern wing) and a closed boundary (in the southern wing), their allocation is crucial to diversify the formality of level 2 (mainly teaching spaces). Beside their accommodation of eating activities during breaks, local dining spaces possibly accommodate quieter self-directed activities outside breaks, if students of each wing (department) are granted the freedom to individually or collectively revise before an exam, work on a project or finish an assignment.

The same potentiality applies to the library space (level 2 north wing), i.e. to accommodate student self-directed activities following its closed boundary that yields a quieter studious environment yet not being the typical formal classroom controlled by teachers. While the school design portrays independent departments that do not promote student mixing (if each student-group stayed within their department), the library is expected to attract the whole student population, not only students of its local department, where it is located. It facilitates student mixing, cross-department interactions and self-directed activities for longer activity periods especially during breaks, similar the courtyard and piazzas. In the end, the repetition of the same function within independent departments of different configurations and the overall similarities in configuration of the whole building, both, weaken the significant variance in the configuration for different functions ($R^2=0.48$). It is the second weakest of all school.

4.9 School C2 – Design Potentiality
School C2 (figure 4.32) is a campus environment of four blocks, each having different floor levels. While two blocks (eastern and southern) connect internally, circulation between all blocks is mainly through the common shallow courtyard with no defined routes. This design maximises the potential for student mixing from different blocks, their encounters and interactions, especially among passers-by themselves and with others occupying the courtyard. The courtyard has an irregular shape with side pockets between the buildings which possibly attract student away from the busy centre yet being visually and distantly proximate to the centre. Students in those pockets possibly create groups and connect with students passing-by (and teachers) while maintaining a degree of privacy.

The ground level has mixed functionalities inside each block (classrooms, studios and offices). However, only two blocks (southern and western) exhibit mixing of formalities and a configurational hierarchy. It begins with an accessible corridor and public informal space (e.g. library or dining space), allocated on the external side of the block side (towards the central courtyard). Accessibility decreases towards the inner segregated private formal spaces (e.g. studios) of each block. The two blocks have high potential for interactions along their wide shallow corridors and student self-directed activities within the informal library or dining spaces. Nevertheless, this potentiality is limited to the local student-group of each block separately, i.e. no student mixing across blocks. This results from allocating two separate dining spaces of closed boundaries. The design could have yielded further global mixing and interactions if the dining spaces (or other informal spaces) opened their boundaries towards the courtyard or even towards the side pockets, instead of having access gateways only from the circulation corridor of the block. Still, this configuration sustains a quiet and studious environment for the informal spaces of each block, where individual self-directed activities are supported while keeping vibrant collaborative activities for the common courtyard.

Contrary to the ground level, upper floors exhibit limited potentiality for informal learning practices. They comprise insulated and less accessible clusters, each of a different formal functionality. Even the classrooms and studios do not mix inside each block. The only potentiality for student interactions is exhibited within corridors which are relatively wider and possibly accommodate some local student gatherings along their movements between classrooms, if the management implements a circulating scheme where students do not stay in one classroom throughout the school day. Finally, the hierarchy of functionality and its corresponding hierarchy of accessibility (on level 1) as well as the insulation of clusters and
the non-mixing of functionalities on the upper levels contribute to a significant, very strong variance in configurations of different functions – strongest among all case studies ($R^2=0.75$). The detailed analyses of school C2 are presented in appendix 13.2.6.

4.10 School C3 – Design Potentiality

School C3 (figure 4.33) is another building renovated by firm C, composed of a single compact building block. Functionalities distribute over two levels without prioritisation of allocating formal spaces on the upper floor (unlike most other schools). Consequently, C3 has more formal classrooms in shallow spaces than segregated spaces, reflecting a diverse range of formal spaces accessibility. However, the team of architects does not invest this potentiality to diversify the types of learning spaces in one zone. Instead, they clustered spaces of one function together, separating functionalities and formalities which yields a significant strong variance in configuration of functions ($R^2=0.62$). The team of architects also unified a modular closed layout for all formal functions, thus, reducing their potentiality for collaborative self-directed activities. The design also minimises the student movements or mixing between different classroom clusters (along different routes), thus, reducing interactions, especially if the student sessions are kept within their formal cluster, with no need to migrate to another cluster.

Similar to formal classrooms, the team of architects maintained the closed cellular design for the informal dining space and courtyard (except playground). The corridor (in-between the dining and the courtyard) is expected to have high movement flows especially during break times which could have accommodated dense patterns of interactions and activities that blend among the circulation, dining space and courtyard. However, defined boundaries yield a narrow corridor which has low potentiality for student occupancies (risk of congestions). Students are expected to move into the dining space (east) or courtyard (west), to avoid
blocking the narrow pathway which hinders student mixing, encounters and interactions, and it further defines activities by the spatial function assigned by the design team, i.e. eat in the dining space or socialise in the courtyard. The detailed analyses of school C3 are presented in appendix 13.2.7.

4.11 School C4 – Design Potentiality

School C4 (figure 4.34) is the last case study, and it is part of a multi-grade campus whose secondary school is represented through one building of three levels. The school has a simple design of a single double-loaded spine with linear arrangement of different functionalities. The design of the school yields similar configurational accessibility across each level but changes from one level to another (more segregation). There are also different configurational clusters (ranges of accessibility) for each function in the school. These factors contribute to a significant strong variance in the configuration of functionalities ($R^2=0.73$).

The design does not mix functions on level 1, such that the offices are clustered at the western-end and the classrooms dominate the rest of the spine. This insulation minimises the potential for student-to-teacher interactions and reduces the teacher natural surveillance over the student spaces which possibly influences the management to assign independent supervisors for the corridors. Contrarily, the open-plan social space on level 3 has higher potential for student collaborative activities, especially since it is close to the classrooms. There are also proximate teacher offices next to the social space, to monitor the student activities.

On level 1 and 2, there are interesting pockets projecting from the circulation, either between classrooms on level 1 or in front of each classroom on level 2. Being part of the circulation, these spaces are recognised as informal break out spaces. They portray the optimal design to accommodate student self-directed learning activities, especially when student meet and mix along the corridor; take a side-step into the pocket space to interact and start exchanging knowledge, through solving problems, sharing project ideas, revising or further similar self-directed activity. The spaces are possibly shortly occupied between the sessions, being adjacent to classrooms which eliminates the circulation time, or possibly used for longer occupancies during breaks, if permitted by the management. The detailed analyses of school C2 are presented in appendix 13.2.8.
After completing the discussion of the eleven schools, the following sections will present comparative discussions of all case studies, linking to functionalities, configurations, the inter-relation of both parameters and finally the resulting potentiality of the school design.

4.12 Comparison of Spatial Functions

4.12.1 Area allocations

<table>
<thead>
<tr>
<th></th>
<th>Number of floor levels</th>
<th>Area (square metres)</th>
<th>Total number of spaces</th>
<th>Number of main staircases</th>
<th>% outdoor spaces (play areas and terraces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>6</td>
<td>12218</td>
<td>253</td>
<td>5</td>
<td>46%</td>
</tr>
<tr>
<td>A2</td>
<td>6</td>
<td>11724</td>
<td>220</td>
<td>3</td>
<td>20%</td>
</tr>
<tr>
<td>A3</td>
<td>1</td>
<td>21298</td>
<td>117</td>
<td>NA</td>
<td>45%</td>
</tr>
<tr>
<td>A4</td>
<td>3</td>
<td>8314</td>
<td>107</td>
<td>3</td>
<td>47%</td>
</tr>
<tr>
<td>B1</td>
<td>3</td>
<td>12352</td>
<td>227</td>
<td>6</td>
<td>28%</td>
</tr>
<tr>
<td>B2</td>
<td>3</td>
<td>20156</td>
<td>188</td>
<td>5</td>
<td>41%</td>
</tr>
<tr>
<td>B3</td>
<td>3</td>
<td>48961</td>
<td>330</td>
<td>9</td>
<td>47%</td>
</tr>
<tr>
<td>C1</td>
<td>3</td>
<td>35912</td>
<td>314</td>
<td>11</td>
<td>36%</td>
</tr>
<tr>
<td>C2</td>
<td>3</td>
<td>20087</td>
<td>233</td>
<td>8</td>
<td>46%</td>
</tr>
<tr>
<td>C3</td>
<td>2</td>
<td>11316</td>
<td>158</td>
<td>7</td>
<td>44%</td>
</tr>
<tr>
<td>C4</td>
<td>3</td>
<td>7686</td>
<td>83</td>
<td>3</td>
<td>49%</td>
</tr>
</tbody>
</table>

This research explored data of functional allocations of eleven cases studies relative to the total areas and floor division (table 4.7) which comparatively defines the scale of each building. A1 and A2 are the highest buildings with six levels, while A3 is a single storey. School B3 has the largest total area and the highest number of spaces, followed by C1. Yet, C1 has more main staircases (11) than B3 (9) which impact its overall accessibility (C1 shallower than B3), as seen in the next section. School C4 is the smallest school in terms of area and number of spaces. The highest percentage of outdoor spaces is presented in school C4 (49%), B3 (47%) and A4 (47%), whereas school A2 has the lowest percentage (20%).
Area allocation for spatial functions reflects a hierarchy followed by teams of architects (during the design process) which distinguishes the size of each function in the eleven schools. Figure 4.35 presents the aggregate sum of areas for each function across each case study (e.g. \( \Sigma \) area of classrooms for each school), which indicates the domination of certain functions (e.g. playgrounds, halls and corridors). The study of areas for each spatial function is portrayed through an analysis of variance (ANOVA test) between the function of each space and its corresponding area in each school. Results indicate a significant variance in areas of different functions (p value <0.0001). In fact, the variance is strong for all schools as reflected from the \( R^2 \) values in Table 4.8. This suggests that functions have very distinct area properties from each other, beside the distinct configuration properties explained for each school (sections 4.1-4.11) and compiled in the next section 4.13.

**Table 4.8: Strength of the Coefficient of Variance (\( R^2 \)) in the Areas of Spatial Functions for Every School**

<table>
<thead>
<tr>
<th>School</th>
<th>( R^2 ) (Variance of areas for school functions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0.88</td>
</tr>
<tr>
<td>A2</td>
<td>0.89</td>
</tr>
<tr>
<td>A3</td>
<td>0.72</td>
</tr>
<tr>
<td>A4</td>
<td>0.97</td>
</tr>
<tr>
<td>B1</td>
<td>0.82</td>
</tr>
<tr>
<td>B2</td>
<td>0.99</td>
</tr>
<tr>
<td>B3</td>
<td>0.68</td>
</tr>
<tr>
<td>C1</td>
<td>0.88</td>
</tr>
<tr>
<td>C2</td>
<td>0.81</td>
</tr>
<tr>
<td>C3</td>
<td>0.61</td>
</tr>
<tr>
<td>C4</td>
<td>0.99</td>
</tr>
</tbody>
</table>

Acknowledging the significant variance in the sizes (areas) of different functions, Table 4.9 presents the mean area of each functional space, arranged in descending order. The largest eight functions (as singular spaces) in the school are playgrounds, halls, corridors, dining space, library, social spaces, terraces and gym. They are all informal spaces which portrays
their potentiality to satisfy the student large-group occupancies for interactions and collaborative self-directed activities within each singular space, unlike singular formal classrooms or studios which accommodate less occupancies and divide student-groups. Still, the potentiality for learning practices also varies according to the spatial configuration as previously discussed for each school and summarised in the upcoming section 4.15.

Table 4.9: Mean Area of Each Spatial Function

<table>
<thead>
<tr>
<th>Spatial Function</th>
<th>Mean Area (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Playground</td>
<td>3482.89</td>
</tr>
<tr>
<td>Hall</td>
<td>381.42</td>
</tr>
<tr>
<td>Corridor</td>
<td>310.19</td>
</tr>
<tr>
<td>Dining</td>
<td>200.34</td>
</tr>
<tr>
<td>Library</td>
<td>190.17</td>
</tr>
<tr>
<td>Social space</td>
<td>167.84</td>
</tr>
<tr>
<td>Terrace</td>
<td>118.71</td>
</tr>
<tr>
<td>Gym</td>
<td>118.30</td>
</tr>
<tr>
<td>Studio</td>
<td>98.22</td>
</tr>
<tr>
<td>Kitchen</td>
<td>85.00</td>
</tr>
<tr>
<td>Classroom</td>
<td>67.54</td>
</tr>
<tr>
<td>Seminar</td>
<td>66.51</td>
</tr>
<tr>
<td>Office</td>
<td>26.13</td>
</tr>
<tr>
<td>Stairs</td>
<td>24.87</td>
</tr>
<tr>
<td>Learning service</td>
<td>18.74</td>
</tr>
<tr>
<td>Service</td>
<td>17.47</td>
</tr>
<tr>
<td>Toilet</td>
<td>11.71</td>
</tr>
<tr>
<td>Elevator</td>
<td>5.18</td>
</tr>
</tbody>
</table>

Not only do informal spaces exhibit the largest area on their individual grain scale (e.g. social spaces > classrooms), but their aggregated total area is also significant in each school (figure 4.36). They form approximately 50% of each school except for A2 (32%) and A3 (65%). This is courtesy of the large area of the playground. Still, formal spaces signify a large portion of the school (between 17% and 27%) especially when compared to informal spaces apart from the playground (hatched orange bar in each school graph). In fact, smaller schools (A4, C4 and C3) seem to have low percentages of informal spaces (without accounting for the playground) compared to formal teaching spaces, suggesting that the latter (formal spaces) are favoured in small sites, i.e. more prioritised by the design team, when the site is tight. Furthermore, circulation spaces comprise a significant portion of each school area (13% to 20%), linking to their potential to accommodate interactions and student collective self-directed activities, according to their configuration, which either promotes or inhibits patterns of movements and encounters as elaborated in section 4.15.
4.12.2 Design Strategies for Function Allocation

The study of spatial functions reveals certain design decisions of distributing the school functionalities. One major design strategy is concerned with the degree of mixing of different functions. The lowest degree is non-mixing of functionalities which is pursued by firm A and C (two cases each). For that objective, the design team of architects created clusters of spaces, each composed of the same repeated function, mostly formal teaching spaces (e.g. classrooms) and services, while the only informal space is the circulation corridor within the cluster. In some schools, mono-functional clusters are distributed across different blocks within a campus environment (school A3 and A4). In other cases, they are separated across zones on the same or different levels (school C3); or distributed along a spine within one compact building (school C4). The non-mixing (insulation) of functionalities yields non-mixing of formalities, where formal spaces are separated from informal spaces. This design restrains the potential student interactions between class-times or during breaks and minimises the possibilities for self-directed intellectual activities.

Another scenario portrays the limited mixing of functions which is mostly associated with combining similar spaces of classrooms, studios or seminar rooms within the same wing as seen in school B1 (level 1) and school C2 (level 3). In that case, the room design, size and furnishing are different. Still, this spatial mode does not exhibit a mix of formality, where all the spaces are categorised as formal teaching spaces. There is another case where the classrooms are in close proximity to teacher offices, as seen in school A1 (level 3) and B1 (level 2). Although, this allocation does not reflect mixing formalities, since offices are also perceived as formal spaces, there are possibilities for student-to-teacher interactions to evolve. This is driven by the proximity of student and teacher spaces and the high frequencies of encounters between both entities along corridors (same route for both).

On the contrary, further mixing of functionalities reflects mixing of formalities. It happens on a global scale of one floor level, where the design includes informal spaces among the formal teaching spaces. For example, terraces are integrated at the peripheries of school A1 (level 4, 5) and school A2 (level 5 and 6), and the library is integrated among classrooms in school A2.
Furthermore, mixing of functionalities and formalities is also portrayed on the local scale of a cluster comprising formal and informal spaces. For example, the repeated cluster (arm) of school B3 has formal teaching spaces, office space and a social informal courtyard as the centre of the cluster. Also, the library, dining space, one hall and a studio are integrated in one block in school C2. The highest degree of mixing functions (and formalities) is portrayed in school C1, such that every wing is an independent cluster of formal classrooms, a social piazza, a local dining space and an office space. The mixing of functionalities and formalities is recognised as a main contributor (beside configurational accessibility and diversity) to maximise the potential for student-to-student interactions, student-to-teacher interactions and self-directed activities for short periods between classes or longer occupancies in breaks.

Finally, it is important to highlight the role of the building typology and horizontal circulation design which are utilised in the design to either isolate or mix functionalities (and eventually formalities). The campus environment is pursued by firm A in a design manner that isolates clusters of mono-functions (school A3 and A4), but in other designs, a campus contributes to mixing of functions, as illustrated in the building blocks of school C2. Similarly, wing-structured buildings divides functionalities across wings and creates a separate common-resources zone, as illustrated in school B1; or the wing structure guarantees the formation of independent wings that comprise a mix of formal and informal spaces (school C1). The same applies to the horizontal circulation design, where double loaded corridors bring different functions across one spine (school A2) or separate their allocation along another spine (school C4). Finally, single-loaded corridors separate different functionalities (school C3). Table 4.10 summarises the building typology and the mixing (or separation) of functionalities and formalities in each of the eleven schools.

<table>
<thead>
<tr>
<th>School</th>
<th>Building Typology</th>
<th>Main Circulation</th>
<th>Functionalities</th>
<th>Formalities</th>
<th>Unique Design Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Compact urban block</td>
<td>Double-loaded and single-loaded corridors (2 networks)</td>
<td>Mix on upper levels</td>
<td>Non-mixing of formalities Separated by levels</td>
<td>-House system -open learning spaces -multi-levelled playground</td>
</tr>
<tr>
<td>A2</td>
<td>Compact urban block</td>
<td>Double-loaded corridors</td>
<td>Mix on all levels</td>
<td>Mix on lower levels</td>
<td>Allocate library on level 4</td>
</tr>
<tr>
<td>A3</td>
<td>Campus environment</td>
<td>Double-loaded corridors</td>
<td>Non-mixing Clustered in different blocks</td>
<td>Non-mixing Clustered in different blocks</td>
<td>Single floor and courtyard</td>
</tr>
<tr>
<td>A4</td>
<td>Multi-grade campus</td>
<td>Double-loaded corridors</td>
<td>Non-mixing Clustered in different blocks and across levels</td>
<td>Non-mixing Separated by levels</td>
<td>Limited outdoor spaces</td>
</tr>
<tr>
<td>B1</td>
<td>centralised resources with classroom wings</td>
<td>Double-loaded corridors</td>
<td>Limited mixing within wings</td>
<td>Non-mixing (highly insulated by departments)</td>
<td>Disconnected wings on level 3</td>
</tr>
<tr>
<td>Case Study</td>
<td>Type</td>
<td>Corridors</td>
<td>Mixing</td>
<td>Hierarchy</td>
<td>Other Features</td>
</tr>
<tr>
<td>-----------</td>
<td>------</td>
<td>-----------</td>
<td>--------</td>
<td>-----------</td>
<td>---------------</td>
</tr>
<tr>
<td><strong>B2</strong></td>
<td>Compact urban block</td>
<td>Double-loaded corridors</td>
<td>Mixing on all levels</td>
<td>Mixing on level 1 and 2</td>
<td>Multiple open spaces on level 1</td>
</tr>
<tr>
<td><strong>B3</strong></td>
<td>Centralised resources with classroom clusters</td>
<td>Loop corridor around a courtyard</td>
<td>Mixed within the cluster</td>
<td>Mixed within the cluster. Hierarchy of formalities within cluster</td>
<td>The multiple arm structure</td>
</tr>
<tr>
<td><strong>C1</strong></td>
<td>Compact urban block</td>
<td>Double-loaded and single-loaded corridors</td>
<td>Mixing within the wings</td>
<td>Mixing within the wings</td>
<td>Multiple local dining spaces for each wing</td>
</tr>
<tr>
<td><strong>C2</strong></td>
<td>Campus environment</td>
<td>Double-loaded corridors</td>
<td>Mixed within each block</td>
<td>Mix on level 1 with Hierarchy of formalities. Non-mixing on upper levels</td>
<td></td>
</tr>
<tr>
<td><strong>C3</strong></td>
<td>Compact urban block</td>
<td>Double-loaded and single-loaded corridors (1 network)</td>
<td>Non-mixing Clustered along spine</td>
<td>Non-mixing Clustered along spine</td>
<td>Combining double and single loaded corridors in one network</td>
</tr>
<tr>
<td><strong>C4</strong></td>
<td>Elongated single spine</td>
<td>Double-loaded corridors</td>
<td>Non-mixing Clustered along spine</td>
<td>Non-mixing Clustered along spine</td>
<td>Break out space in front of each classroom</td>
</tr>
</tbody>
</table>

4.13 Comparison of the Spatial configuration

4.13.1 Comparative Accessibility of the School Buildings

![Comparison of Configurational Accessibility of All Case Studies](image)
The eleven case studies portray variations in their accessibility ranges, average values and concentrations along the spectrum (figure 4.37). School A3 is a single level building that has the lowest mean value (3.05), lowest minimum (2.19) and lowest maximum (6.45). School A2 is a six-level building which has the highest mean value (5.98) and highest minimum value (4.03). The higher the building levels, the more the spectrum of accessibility is pushed to the deeper end, yielding a higher average (and minimum) which applies to school A1 and A2. The highest maximum value is 10.22 within school C2, which also has the highest range of values. The lowest range of values is school A3.

While schools have different ranges of accessibility (visual mean depth), there are further variation in terms of the concentration of spaces within the shallow range (VMD<=3.75), mid-range (3.75-9.0) and deep end of the spectrum (VMD >=9.0). Figure 4.38 displays the histogram distribution of spaces (through the VGA pixels) along the visual mean depth, using unified X and Y axis scales. Schools A3, A4, B2, C4, C2 and C3 have their highest count histograms (most spaces) on the shallow end of the spectrum, suggesting an overall accessible environment where most of spaces are approximately four turns away from each other. The rest of the schools have their highest count in the mid-range. No schools have their highest count in the deep end, except C3 which has a second peak in deep spaces. There is a high variation in the distribution of the spatial configurations. There is one case of normal distribution as a bell curve (A2). There are two cases of even distribution across the spectrum (A1, B1), two case with skewed distribution towards the shallow end of the spectrum (B3, C1), two cases of bio-modal distribution (B3 and C2), and the other schools have a J shaped distribution (A3, A4, B2, C4, C3). These visual mean depth distributions are different due to the variations in configuration of the schools and the variations in design decisions and function allocations, as elaborated in the next sections.

![Figure 4.38: Histogram Distribution of Configurational Accessibility (Visual Mean Depth – VMD) in Each School](image)

4.13.2 Implications of Design Decisions on the Spatial Configuration

After comparing the visual mean depth of the case studies, those configurational properties are utilised to highlight the impact of various design decisions which primarily shape the accessibility of the school building. On the holistic scale, the small school sites lead to a need
to use multiple floor solutions, which further leads to increased overall segregation of the school (building average VMD), compared to other schools of lower number of floors. This is clearly portrayed for A2 and A1 which have the lowest accessibility respectively, and their ranges are shifted towards the deeper end (earlier figure 4.37 or histogram figure 4.38). In general, segregation of the school building increases across levels where the upper most level is the most segregated. However, the degree of increase in segregation from one level to another is not constant but controlled by the allocation of vertical core, their number and distribution in the plan. Staircases are the accessibility threshold on the upper floors, representing the lowest visual mean depth of the floor, while the circulation corridors contribute to distributing the accessibility patterns across the plan (yielding variations or even distribution). Thus, circulation spaces are not only rendered as critical hubs for student interactions and self-directed activities, but they also shape the accessibility of their destinations and subsequently interactions and activities within those destinations.

Another major design decision that impacts the configuration of the school is the creation of a single compact building block vs multiple insulated clusters. Compact buildings exhibit higher chances for local configurational changes (during the design process or upon operation) to impact the whole floor-level and subsequently the whole building. In other words, configurational changes have a global impact within compact blocks as portrayed in schools A1, A2, C3 and C4. On the contrary, the design of multiple clusters (portrayed through separate wings in one building or separate blocks within a campus) has a tree structure in a configurational sense which allows the design to have controlled accessibility of each cluster independently, since configurational properties are bound to each insulated cluster. In other words, each cluster is similar to a compact building within the whole building, and configurational changes have a local impact within this block. Hence, there are higher chances for variations of accessibility across different clusters of the same school, as seen in the accessibility variations between B1 wings (level 3) or the different blocks of campus A3, mainly relative to the design of linkage circulation between clusters. Nevertheless, in other schools, the design has separate clusters but maintains equal accessibility among the clusters as seen in the multiple standardised clusters of B3. The configurational diversity (or monotony) across different zones impacts the general atmosphere of the school as a vibrant space with more possibilities for collaborative self-directed activities or a quiet environment, more oriented for individual activities.

On the local scale of each cluster, the design team of architects unifies or diversifies the configuration of the spaces. In some schools, the whole cluster (of mono- or mixed-functionalities) has monotonous accessibility. This is portrayed within the equally accessible spaces of the northern classroom block in A3 (mono-functionality). It is also illustrated inside B2 wing of equally segregated mixed formal functionalities (classrooms, studios and offices). In other cases, the design team created a smaller configurational cluster as part of a block or a floor-level. It is realised in linearly arranged spaces along a spine, for instance, the northern section of B2 (level 2), where classes are equally shallow on this level. It is also portrayed as a cluster of spaces around a corridor branch, such as the equally segregated spaces in the southern section of school C3 (level 2). These zones reflect a distinct degree of accessibility different than other spaces within the same block or level. Contrary to the cluster of monotonous accessibility, the design team of architects configured other spaces to express a hierarchy of accessibility. It begins from a shallow centre (social piazza in school C1 or
courtyard in school C2); then the segregation increases gradually across the less accessible gathering corridor (C1) or hall (C2); and reaching the deepest classrooms (C1) or big studio (C2). The configurational diversity (or monotony) within a single zone (cluster, wing or building block) is expected to shape the diversity of possibilities for self-directed activities, either the vibrant type within shallow (integrated) spaces or the quieter type within deeper (segmented) spaces; providing that the functional allocation already secured the mix of informal spaces in each zone. This is a hypothesis investigated in the next chapter which discusses the school building actuality.

There are further design decisions that impact the configuration of the school building which are mainly concerned with the design of open or closed spaces, i.e. the plan porosity. Open spaces are the prime contributor to creating shallower areas within a school plan. They are portrayed in the form of open studios (school A1), open dining spaces (school A3, B1, B2, B3 and C1), social piazzas (school B2 and C1) and open-plan libraries (school B1 and B2) which are opposite to the closed cellular design commonly used for classrooms and offices in most of the schools. Courtyards are another common example of shallow spaces, yet their design does not always reflect an open space. For example, in schools A3 and C3, the design team of architects configured courtyards as large unroofed rooms with all-around boundaries. Still, the number of access point and connection to other spaces (especially the corridor) render the courtyard as highly accessible (e.g. smaller courtyard of A3) or relatively less accessible than other shallower surrounding spaces (e.g. western courtyard of C3). The aforementioned highly accessible spaces (i.e. open-plan spaces and courtyards) are argued to exhibit high potential for student movements as a natural route, rendered by configuration, especially if it coincides to be the main student circulation route chosen by the school management. Thus, shallow spaces promote student encounters and interactions which contribute to the learning practices in the school as discussed in the spatial potential of each school and summarised in section 4.15.

In the end, the study of different design decisions (pursued by the three architecture firms) and their implications on the design reflect a style for each firm. While teams of architects allocate formal and informal space which are influenced by design constraints, e.g. the site; still, there is a signature style of configuring those spaces. Firm A repeatedly mixed functionalities, where formal classrooms are often clustered with formal studios, whether of an open- or closed plan. Yet, they tend to slightly separate informal spaces (still on the same level). This diversity is emphasised in the architect interview who mentioned that “all the spaces have a variety of different seating arrangements and a variety of ways of learning available within them” (appendix 13.1.5). The style of firm C is similar to A while expressing more accentuation of this mixing of functionalities and formalities, where the informal space (e.g. piazza or local open dining space) fully blends with the formal classrooms. The lead architect stated that: “the traditional school with classrooms which become the kingdom of the teacher is part of the past” (appendix 13.1.5), hinting to the importance of those local informal hubs for learning activities. Finally, firm B seems to configure spaces slightly different than A and C. They minimise mixing formalities and consolidate the informal common resources on lower levels while maintaining their configurational properties as highly porous with minimal boundaries. Firm B dedicates upper floors mostly for formal classrooms or studios. Still, the library, as a common resource, is always centralised on an upper level, and
its local configuration exhibits a high degree of porosity unlike the surrounding cellular spaces.

4.14 Configurational Properties of Functions

The study of configurational properties of different functions indicates that all the case studies have a significant variance in the visual mean depth of different functions (p-value <0.0001). In other words, the accessibility value of each function is not randomised and is distinguished from other functions for various reasons. Firstly, for some spatial functions, there are design attributes fulfilled by the design team of architect which shape their configuration. For instance, corridors have multiple access points to spaces served along the circulation, and playgrounds are large, open and porous. These attributes render those functions as highly accessible spaces in each school. Moreover, there are further design decisions that reflect the spatial preferences of the design team and also yield similar configurational properties for each function. For example, design teams cluster classrooms or studios on upper floors which are usually segregated. Terraces are allocated at the peripheries of the upper levels which are even more segregated. Contrarily, halls are usually situated on the ground floors along main circulation which are highly accessible locations. In summary, there are distinct shallow and deep functions in the school, resulting from fulfilling the spatial attributes of some functions (e.g. corridor and playground) and the repeated decisions (by the design team) associated to allocating other functions (e.g. halls, classrooms and studios).

Acknowledging the significant variance in configurations of functions, there are certain patterns observed in the accessibility of the school functions, as signified through figure 4.39 which displays the visual mean depth of every function across all schools. There is not a single functionality that is always the deepest in the school. However, either formal classrooms or studios are always segregated in the schools (except school C3). Teacher spaces are in the middle of the accessibility spectrum relative to each school’s local spectrum. Informal dining spaces, libraries, social spaces, corridors and staircases are always relatively shallow or closer to the mid-range. Playgrounds and halls (also informal spaces) are always the shallowest spaces in all schools, unlike the upper-level open terraces which are always segregated.
Figure 4.39: Accessibility of Functions in Each School
The compiled average accessibility (from all schools) for each function and the range of values is displayed in figure 4.40. The graph also illustrates a gradient which is not the visual mean depth of space, but the frequency (count) of having spaces at that corresponding visual mean depth value. The more frequent spaces existing at each value, the darker the gradient colour. The count gradient is also logged to show all variation. The outcome supports the previous finding, as the graph highlights higher average segregation of classrooms and studios beside the overall higher count of those formal spaces (darker gradient) in the deep ends (even deeper than the average). This links to their constant allocation on the upper isolated floors. This configuration is unlike halls whose darker gradient (more count) is even shallower than the average, reflecting their allocation along the main ground floor shallow spaces. Libraries and dining spaces have almost equal deeper and shallower spaces than their average.

The study continues examining the significant variance in configurational properties of different functions. There is another inferred characteristic which is the variation in the strength of the correlation ($R^2$) from one school to another (table 4.11). It determines the chances of having configurational variations for functions of every school. For example, $R^2$ of 0.55 is moderate, signifying a 55% probability of variation in the configuration for functions in this data set (school A1). The strength of variance changes from one school to another according to certain design decisions that impact the allocation of functionality and their corresponding configuration as presented in the following discussion.

<table>
<thead>
<tr>
<th>School</th>
<th>R Square (Visual Mean Depth variance of functions)</th>
<th>Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>0.55</td>
<td>Moderate</td>
</tr>
<tr>
<td>A2</td>
<td>0.37</td>
<td>Moderate (weakest)</td>
</tr>
</tbody>
</table>

Figure 4.40: Accessibility of Functions (compiled from All Schools), Displayed as Average, Range and Density Across Range
Some schools portray insulation of functionalities as the design allocated the same function to multiple spaces within an insulated cluster (zone, block or level). If the mono-functional cluster is configured to exhibit high degree of accessibility monotonous of its spaces (either shallow or deep) yet very different than the accessibility of other functions outside the cluster, this design yields strong variance in the configuration of different functions. This is portrayed in school A3 ($R^2=0.72$) whose formal block has equally segregated classrooms, compared to other shallower blocks of the school campus. Contrarily, if the block has the same function with variations of accessibility among the spaces, this design yields a relatively weaker variance in configurations of different functions. This is shown in school A1 ($R^2=0.55$) where the studios and classrooms diversify their accessibility (visual mean depth values).

Finally, the repetition of the cluster with the same functional properties (mono or mixed) and same configuration (unified or diversified) further strengthens each of the previous scenarios, since the patterns become clearer in multiple clusters (e.g. school B3 repeated arms $R^2=0.70$).

There are other schools whose designs reflect the mixing of functionalities within the same cluster. If the cluster has similarities in the configuration of different functions, it is translated into a weaker variance in configuration of functions. This is illustrated in school C1 ($R^2=0.48$) whose level 2 wing spaces are evenly shallow and comprise different functions and formalities of a dining space, social piazza and classrooms. However, in other clusters, the design implements a hierarchy of accessibility of different functions, which is repeated in other clusters, thus, maintaining the same configurational properties for each function. This translates to a strong variance. For example, school B3 ($R^2=0.70$) has multiple clusters, each having a shallow courtyard and less accessible classrooms, hence, unifying the configurational properties of each function. Table 4.12 summarises the relations between functionalities and configuration and their impact on the configurational variances of functions.

**Table 4.12: Relationship Between Functional allocation and Configuration**

<table>
<thead>
<tr>
<th>Functionalities Allocation</th>
<th>Configuration</th>
<th>Configurational variance of functions ($R^2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mono-functional clusters</td>
<td>Monotonous accessibility</td>
<td>Strong Variance</td>
</tr>
<tr>
<td>Mono-functional clusters</td>
<td>Variation in accessibility (within one zone of adjacent space)</td>
<td>Weaker Variance</td>
</tr>
<tr>
<td>Mixed functions in cluster</td>
<td>Monotonous accessibility</td>
<td>Weaker Variance</td>
</tr>
<tr>
<td>Mixed functions in cluster</td>
<td>Hierarchy of accessibility (within one cluster form its centre to outer spaces) and repeat across clusters</td>
<td>Strong Variance</td>
</tr>
</tbody>
</table>
The strength of the configurational variance of different functions is neither desirable nor detrimental for the school design. In some cases, a weak variance reflects a diversified range of accessibility for each function, for example, studios in shallow and deep spaces which is a desirable spatial property offering a wide range of activities of different degrees of formalities and various concentration levels (quiet and vibrant) for individuals or groups. This is portrayed in schools A1 which exhibit high spatial potential, whereas their functions yield a weaker variance of configuration ($R^2=0.55$). An opposite scenario of monotony in accessibility of multiple spaces for one function is possibly yielding less diversification in the types of activities, hence, perceived as an undesirable scenario, although it is actually yielding stronger variance, as seen in school A3 ($R^2=0.72$).

Nevertheless, in other scenarios a strong variance is desirable when yielding high spatial potential. For example, it is indicative of the nature of some spaces in the school building, such as the dining spaces or courtyards to be shallow along the main accessible route which is also desirable for student encounters, mixing and interactions, as seen in school C2 ($R^2=0.75$). Furthermore, a hierarchy of accessibility across functions also yields a desirable strong variance, as seen in school B3 ($R^2=0.7$) where clusters possess high potential for local communications, interactions and collaborative self-directed activities within the shallow courtyards while deeper spaces satisfy quieter, focused activities. In summary, there are various scenarios of strong or weak variances which maximise the spatial potential of the school building for learning practices, all summarised in the next section 4.15.

### 4.15 The Design Potentiality for Learning Practices

The design potentiality to promote student learning practices is influenced by the following functional and configurational conditions. Firstly, the potential is maximised when the design provides variation of functionalities and formalities within a cluster of spaces, supported by diversified accessibility of the different functions. The formal classrooms mix with an open informal courtyard (ground level clusters of school B3), or the formal studios are clustered among an informal piazza (School C1). In other schools, at least those formal and informal spaces are within the cross-path of each other, such as the social piazza between classroom clusters in school B2 level 1 or the social rooms and adjacent classrooms in the western cluster of school C4 level 2 and 3. In those cases, the main circulation and social space are shallow and merge together to trigger movements along natural routes decided by configurational accessibility. Those spaces are also expected to maximise student mixing and encounters between passers-by and other occupiers which is a hypothesis investigated in chapter 5. This leads to student interactions along the circulation and grows into further activities on the corridor sides or within the social space (e.g. collaborative revision or doing homework). As for the classrooms, they are less accessible to provide a higher degree of privacy which translate to a lower level of distractions. They are used for formal teaching, still being available for individual self-directed activities (outside session time) that require a degree of concentration in a quiet space (e.g. individual reading).

This design strategy of mixing functionalities of different formalities repeats in other locations of the school while altering the functionality (i.e. type) of the informal space and the hierarchy of accessibility. In one scenario, formal spaces are shallower than the informal spaces, represented through peripheral terraces among multiple classrooms and studios (school A1...
level 4 and 5). The terrace potentiality does not rely on highly accessibility nor allocation along the vibrant corridors to trigger interactions. However, they are actually destinations for students to perform self-directed learning activities in a quiet atmosphere, still being close to their studios (e.g. large terrace on level 5 connected to art studio). A similar scenario is repeated in school B2; yet, the peripheral terraces are not segregated but equally accessible as the classrooms, thus, serving as a potential local retreat from the floor’s formal spaces. In different schools (C1 and C2), the design of the informal space is represented through the library (not courtyards nor terraces) which is equally accessible to the classrooms. This adds a degree of informality to the available local spaces, for self-directed learning activities to emerge, while students do not travel away from their formal class-zone. The design also induces global mixing as students from other departments visit the library which is in another department. These design alternatives diversify the student interactions and might encourage them to take part in collaborative intellectual activities. Thus, student gatherings are not solely linked to the school playgrounds nor being marginalised, as the case of fully formal floors (e.g. school A3 northern block). In the end, what defines the potentiality for student learning practices is the diversity of functionalities and its corresponding diversity of configurations.

The spatial potentiality for learning interactions is further amplified when the mix of formalities includes the allocation of teacher spaces among the formal and informal spaces. Within this functional allocation, the spatial configuration has to guarantee a level of supervision from the teacher unit towards the student activity spaces, not being in a highly controlling space that invades the student privacy nor being a highly segregated space, disconnected from activities. Alongside supervision, this spatial design adds a layer of diversity to the typical student-to-student interactions, by triggering the potential for student-to-teacher interactions. They take place along the circulation routes which serve both the student and teacher spaces; or within the informal spaces as part of the supervision process. Those interactions vary in their degree of formality according to their location of occurring (e.g. classrooms, corridors or courtyards). This happens for instance on the upper floors of school A2, where offices are situated among the formal closed classrooms and the informal library on level 4. Still, the design could have opened up the library boundary to provide more integration.

Even in the case of clustering multiple formal spaces to secure the required number (and area) of classrooms relative to student population, the spatial design either reduces or maximises the potential of student interactions and further activities. There is less potential for learning activities when the spaces exhibit a monotonous degree of accessibility. In most cases, the formal spaces are all segregated which reflect a quiet, formalised atmosphere, as seen in school A4 on level 3, C3 on level 2 and B1 on upper levels. In fewer cases, they are all equally accessible, portraying a vibrant atmosphere with potential distractions, such as school B2 on level 2 and C1 on level 1. Contrarily, variations in accessibility among adjacent formal spaces suggest the potential for diverse learning practices as displayed in the design of open studios and cellular classrooms in school A1. Outside the class time, student interactions possibly develop along the shallow circulation corridor and at its intersection with the open studios. Students also possibly disperse in the accessible open spaces to perform various self-directed activities of collaborative discussions and group-work, whereas quieter self-directed intellectual activities are reserved for cellular classrooms.
In the end, it is important to highlight the spatial potential of school A1 and B1, since the upcoming chapter discusses their actuality of student learning practices. In A1, high potentiality for student activities is exhibited in the shallow open studios which are open to the vibrant main corridor route, while the closed classrooms are expected to accommodate quieter activities. Student-to-teacher interactions are also expected along the same corridors which serve both student classrooms and teacher offices. The upper floor terraces complement this formal atmosphere being the close-by informal destination for students at the peripheries of each floor. This potentiality is missing from B1 whose isolated wing structure has cellular classrooms with no open learning spaces nor informal destinations. Yet, the centralised resources, either the ground-level dining space or level-2 library, provide an alternative for student activities, supported by their open-plan design that blends into the corridor to maximise the potentiality for student mixing and subsequent activities.

4.16 Summary of Studying the School Design Potentiality

This chapter has been concerned with the school design potentiality for student learning practices which portray a social process of interactions and further self-directed activities. The spatial configuration and functions of the school building are perceived as the main contributors to the learning process. In the school building, interactions (as a prime component of social learning) are shaped through the patterns of student co-presence and encounters which are driven from their movement patterns in the first place, hence, the importance of analysing the school spatial configuration that triggers (or inhibits) movements. Nevertheless, student movements in the school are also shaped according to spatial functions as attractors (final destinations), for example, daily movements into and from the dining spaces. At the same time, the spatial functions impact patterns of spatial occupancies and the occurring learning practices, especially within informal spaces, where students have freedom to perform individual or group self-directed activities, hence, the importance of studying the spatial functions.

Through the study of eleven secondary school buildings by three different architecture firms, there are certain functional properties of the school building. The design team (in coordination with the client team) distributes functions in the school building, where the area of each singular functional space is different than the other, proven through a significant strong variance in the area of each function in all schools. Within each school, the playground, corridors, dining space and library are always the largest singular spaces which indicate the potentiality of a singular informal space to accommodate large student groupings simultaneously, unlike smaller-sized classrooms of smaller-group occupancies. Moreover, functions, when classified as formal and informal, portray distinct patterns of area allocation, where aggregated informal spaces compose approximately 50% of the total school area. The large informal area satisfies the student dispersal for diverse activities, considering the expected high occupancies during breaks. Finally, circulation spaces, as potential informal spaces, are 13%-20% of school area, linking to their potentiality to induce student mixing, interactions and self-directed activities, providing their configurational accessibility that renders their operation as natural movement routes.
The spatial configuration yields variations in the accessibility of different schools relative to certain design attributes. Schools of more floor levels exhibit higher average for visual mean depth (lower accessibility), and configurational segregation increases across upper levels. The number of vertical cores and their distribution in the building determine the accessibility threshold on the upper levels. Then, it is the role of the horizontal corridor network to distribute patterns of accessibility, creating variations or an even distribution of accessibility across the floor-level. The porosity of the plan and degree of boundaries also play a major role in creating highly accessible spaces, such as open courtyards, social piazzas and dining spaces, in contrast to the relatively segregated cellular spaces, such as classrooms, studios and offices. School accessibility is also relative to the building typology, such that the accessibility of different spaces in a compact building is highly impacted by the configuration of the rest of the spaces. Contrarily, the creation of insulated clusters yields distinct independent configurations, either across different blocks in a campus or across multiple wings within a single building. Still, it is the decision of the design team to unify or diversify the configuration of those clusters.

From the study and analysis of the eleven school buildings, it is inferred that each school building is an embodiment of interrelated functional and configurational properties. The decision to isolate or mix functions either corresponds to patterns of monotonous or diversified accessibilities. In some cases, spaces are mono-functional and similarly configured, such as a cluster of segregated adjacent classrooms having the same interior layout and cellular outline. This design communicates limited potentiality for student interactions or self-directed activities. In other schools, spaces of the same functionality are diversified in their configuration which is mainly achieved through the porosity of the design, i.e. opening the boundaries of classrooms or studios. This design exhibits high potentiality for natural movements along the shallower routes, where student see and mix with others which yield patterns of interactions and possible student self-directed learning in the open spaces.

Contrary to mono-functional spaces, the team of architects (i.e. design team) creates clusters of mixed functionalities and formalities which are either arranged along a spine in a compact urban block, clustered in separate blocks of a campus environment or allocated within a wing structure. Mixed formalities sometimes exhibit limited variations of accessibility across the wing which yield similar learning environments in terms of isolation (or integration) and degree of quietness (or vibrance). In other schools, mixed functionalities represent a hierarchy of accessibility from a shallow centre and circulation corridor towards a less accessible space, most probably an informal hall or dining space, and reaching the segregated formal teaching spaces, either classrooms or studios. Hence, the hierarchy of accessibility matches a hierarchy of formalities, diversifying the potential degrees of interactions along the busy vibrant routes or quieter communications in less accessible spaces; and the same potentiality applies to self-directed learning activities. In some cases, even the shallow centres have hierarchies from a global centre connecting all clusters towards a local courtyard or social piazza of the local cluster.

Different functionalities have different configurational properties, portrayed through the significant variance in the accessibility of functions. Nevertheless, there are differences in the strength of these variances between different schools which is neither desirable not detrimental. Weak significant variance is possibly associated to desirable spatial properties,
such as a diversified range of accessibility for each function, for example, studios in shallow and deep spaces, offering a wide range of activities of different degrees of interactions and various concentration levels for individual or group self-directed activities. At the same time, a strong variance is possibly desirable when defining patterns of high accessibility within informal spaces, such as dining spaces or courtyards which promotes student mixing, encounters and interactions. Finally, a strong variance is also desirable when defining a hierarchy of accessibility among different functions for diversified degrees of formalities of interactions and diversified types of self-directed activities.

In sum, it is argued that higher diversification of functions, formalities and configuration maximise the potential for diverse types of self-directed activities to be conducted by students within vibrant or quiet spaces. The relatively segregated and quieter spaces attract students for individual self-directed activities, such as reading, writing or just relaxing. Contrarily, vibrant spaces of high accessibility attract students who mix with other groups that move along the shallow corridors, thus, creating patterns of collaborative self-directed activities between sessions or during breaks (e.g. group revisions and solving homework). There is also high potential for student interaction patterns which are recognised as exchange of knowledge in learning communities, happening along highly accessible routes, relative to the generative properties of the spatial configuration to induce movements, co-presence and encounters. The mixing of formalities yields various degrees of formal and informal interactions, especially when the teacher spaces are among the student spaces, thus, yielding teacher-to-student interactions alongside the existing student-to-student interactions.
5  Actuality of the School Building Operation

This chapter studies the actuality of school building operation in terms of the occurring student learning practices, and how those practices are influenced by the spatial design of configuration and functions. The spatial parameters (functions and configurations) define the spatial affordances of the school building for learning practices, in respect to the established relationship between the school building design and possibilities for student activities. This relationship is already discussed as the potentiality of the spatial design (previous chapter 4). Following that line of investigation, the research continues to identify actual activity patterns, embedded within the daily school operation, to examine how the building actuality has been informed by the design potentiality.

Patterns of learning practices were collected from two school buildings (selected in methodology 3.2). Learning practices have various forms, not bound to the classroom formal teacher-driven activities. Accordingly, the study focuses on student interactions and self-directed activities. Student interactions are perceived as collaborative learning incidents of knowledge exchange (literature section 2.6), and self-directed activities are vital learning techniques initiated by the students with a degree of autonomy (discussed in literature review section 2.3). This autonomy (freedom) in interactions or self-directed activities maximise the role of the spatial design to offer possibilities for learning practices to the students. While the typical forms of self-directed activities are recorded and acknowledged, like studying, reading, writing and revising or other similar activities, the perception of learning as a social process renders the importance of additional activities beyond those intellectual activities. This ties to the literature review (section 2.7) where learning expands beyond student achievements to include their experience, satisfaction and physical and mental wellbeing. Consequently, the research collected further student self-directed practices, such as physical activities of sports; relaxations, meditations and prayers, when students disconnect from the busy day; performances of singing, acting and dancing, when students express their talents; and eating activities to re-charge the student energy.

The aforementioned activities are primarily shaped through the spatial configuration and functions. Those spatial parameters outline the possibilities for learning practices embedded in the school environment, defined as affordances. Yet, they are further mediated through the school management input which filter out what translates from possibilities into actuality. Hence, the research understands the affordances of the school building for diverse learning practices of interactions and self-directed activities, which are recorded from operational school buildings, while primarily reflecting on the impact of the spatial design of configuration and functions on those activities.

The chapter begins with presenting existing learning practices in two schools (A1 and B1), composed of interactions and self-directed learning activities which have certain distribution in the school building and variations of activity types (section 5.1). After that, the chapter outlines the spatial affordances for student interactions and self-directed activities in the school building, primarily shaped through the spatial design of configuration and function (section 5.2). The study provides evidence through spatial analysis, observations and correlations while referring to the management rules (obtained from interviews) and student
preferences (obtained from questionnaires) that apply to different activities. The chapter summary is presented in section 5.3.

5.1 Learning Practices in the School Building

There are diverse learning practices taking place inside the school building. Through on-site observations of snapshots (explained in methodology section 3.5.3), learning practices were recorded from two schools (A1 and B1), selected out of the eleven schools that are studied for their spatial potentiality (chapter 4.1; 4.5). The criteria of selecting A1 and B1 were described in the methodology section 3.2. The research focuses on interactions, recorded as student communications, beside focusing on self-directed learning activities happening on daily basis. There are 11769 points (representing a student in place and their activity) recorded for school A1 across four levels (1, 2, 4 and 5) while excluding level 3 (teacher spaces) and level 6 (sixth form spaces). As for school B1, there are 5491 points recorded within three levels, except for the western block of the sixth form students (outside the secondary school scope). Student interactions and self-directed activities are distinguished from other recorded activities, like teacher-directed activities (figure 5.1). The former data set (of interactions and self-directed activities) is the research focus, utilised in all upcoming discussions, i.e. excluding teacher-directed activities.
5.1.1 Activity Distribution

Student Interactions and self-directed activities (blue dots on figure 5.1) are displayed as a heatmap (figure 5.2) to identify areas of high student concentrations across different zones and levels in a comparative representation of both schools. In both schools (A1 and B1), interactions and self-directed activities concentrate outside classrooms within informal

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4 As mentioned in the methodology, observations were performed at different times of the academic year in each school which is a limitation in this research. Simultaneous data collection was not possible, since all observations were done by one researcher.
learning spaces, investigated for their spatial potentiality in chapter 4. When comparing the two schools for equal days of observations, the main differences between A1 and B1 are within the lower levels (1 and 2), where higher concentrations of A1 are outdoors, whereas B1’s are indoors. A1 students concentrate on level 1 at the stepped amphitheatre, in front of the dining units, behind the building (playground backside) and other concentrations over level-2 bridge. As for B1, high concentrations are in the main entrance hall (level 1) which functions as an extra dining space during lunch breaks, at the queuing area to get food and on level 2 inside the library. The dining spaces of B1 have higher concentrations than A1’s. The variation of concentrations across different spaces is the first indication that the spatial design has an impact on the student learning practices inside the school building. Each area with high student concentration is further elaborated in its respective chapter, either the library (chapter 7), dining spaces (chapter 8) or play areas (chapter 9).
Figure 5.2: Student Interactions and Self-directed Activities as Concentration Clouds (A1 and B1)

5.1.2 Activity variations
Student concentrations portray variations in interactions and self-directed activities which are all recognised as learning practices in the context of this study. In school A1, there are 58 activity variations, while there are 36 variations in B1 (figure 5.3). There are general themes in both schools where certain activities dominate, such as talking, playing football and eating, while other activities are less frequent but of similar themes, despite their high diversity. Accordingly, this study clusters related activities into one category. For example, talking and shouting at each other are recognised as student interactions. The same applies to intellectual activities which include student patterns of studying, revising, reading, writing, painting, drawing and using the school computers and laptops for educational purposes (games and social media are blocked from the devices). Following this method, there are main activity categories in the school, all recognised as self-directed learning activities, following the

![Activity Count Displayed on Each Bar](image)

**Figure 5.3: Variations of Student Interactions and Self-directed Activity (A1 vs B1)**

The probability of the activity (on the graph y-axis) is the number of recorded activities of that type divided by the total number of activities. The clear differences (between A1 and B1) in the counts for certain activities are explained throughout the research, based on multiple factors. This applies for chapters 6, 7, 8 and 9, where activities are discussed per each informal space. For example, school B1 provides laptops for the students in its library, which does not happen in school A1, hence, the difference in the count of this activity (elaborated in chapter 7).
perception of social learning (literature section 2.6.2). This includes doing sports, eating activities, performances, chilling, playing games and spiritual activities, beside the two main categories of interactions and intellectual activities. Any activities driven by teachers are excluded, such as attending a class or tutorial and doing detention. Table 5.1 displays the main categories of student self-directed activities and their sub-activities. Those activities are thoroughly discussed according to their hosting informal learning spaces: corridors (chapter 6), libraries (chapter 7), dining spaces (chapter 8) and play areas (chapter 9).

Table 5.1: Categorisation of Activities in Both Schools

<table>
<thead>
<tr>
<th>Main Activity Categories</th>
<th>Variations of self-directed activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interactions</td>
<td>Shout - Talk – Scream – Talk at a bench</td>
</tr>
<tr>
<td>Intellectual</td>
<td>Draw - Explore - Laptop - Origami - Read - Revision - Rubik’s cube - Study - Colour – Computer - Get Book – Homework – Paint – Portfolio -</td>
</tr>
<tr>
<td>Sports</td>
<td>Ball - Football - Basketball - getting and throwing ball – Gym – Ping pong</td>
</tr>
<tr>
<td>Eating</td>
<td>Eat - Drink - Snack</td>
</tr>
<tr>
<td>Performance</td>
<td>Dance - Play Music - Rehearse Play - Sing – clap</td>
</tr>
<tr>
<td>Chill</td>
<td>Relax - Sleep - Stretch</td>
</tr>
<tr>
<td>Games</td>
<td>Cards - Carry each other - Chess - Coins - Game challenges – play elastic bands</td>
</tr>
<tr>
<td>Spiritual</td>
<td>Pray</td>
</tr>
<tr>
<td>Store/Retrieve</td>
<td>Locker – Put Bag</td>
</tr>
<tr>
<td>Solitude</td>
<td>Sit - Walk alone (without doing any other activity)</td>
</tr>
<tr>
<td>Waiting</td>
<td>Wait - Queue to class - Get food - Get laptop - Queue get food -</td>
</tr>
<tr>
<td>Watch</td>
<td>Watch</td>
</tr>
<tr>
<td>Clean Challenges</td>
<td>Chase - Jump - Roll in grass - Run</td>
</tr>
<tr>
<td>Physical challenges</td>
<td>Bag Fight - Fight - Push - Tie Fight</td>
</tr>
<tr>
<td>Misbehaviour</td>
<td>Climb Post - Flip on Sofa - Jump Fence - Mobile – Scream with water - Sneak Scooter - Spray Water - scream</td>
</tr>
<tr>
<td>Others</td>
<td>Comb hair - Party - Take Pictures - Wrap up - Write on hands</td>
</tr>
<tr>
<td>Teacher Driven Activities (recorded but not included in the study)</td>
<td>Detention - Attend class or tutorials run by teachers - Print - Search - Sent out of class</td>
</tr>
</tbody>
</table>
Following activity categorisation, student interactions and various self-directed activities are illustrated through their percentages of occurrence (figure 5.4). Interactions are highlighted in both schools, where A1 portrays higher percentage than B1. A1 interactions (64%) outweighs all the other activities, where the closest category is sports, coming second at 9%. Intellectual activities and staying alone (solitude) are ranked third (equally at 6%). As for B1, the percentage variation across categories is not as high as A1, where interactions are 39%, but eating is still a major activity not far behind in the second place (23%)\(^6\). Intellectual activities rank third (12%), and there are a lot of waiting in terms of queuing in B1 (10%) which is not common in A1. Doing sports comes next in the fifth place (7%). The variations of student interactions and activities are further elaborated in section 5.2, reflecting on how the spatial design affords, i.e. facilitates or restricts, their occurrence and distribution.

Variations in student interactions and self-directed activities are impacted by the school schedule which distributes activities across time. Each school (A1 or B1) has two schedules, separating year 7, 8 and 9 students from year 10 and 11. There are two lunch breaks at different times (1:00-1:50 and 1:50-2:40 in A1; 12:00-12:30 and 1:00-1:30 in B1). This explains dense interactions and variation of self-directed activities during these periods, when students have more freedom. Further interactions or activities (less frequent) occur in-

\(^6\) Eating activities in A1 are under counted because it takes place within 5 dining units simultaneously and the researcher only observes one unit at a time. However, if the percentage of eating in A1 (2%) is assumed to be duplicated five times for five dining units, it could rise to 10%. Still, it is less than the percentage of student eating in B1 (23%).
between class-sessions during the circulation periods. These patterns are illustrated on figure 5.5 where the colour gradient reflects the frequency of each activity (the warmer the higher the count). Lunch breaks are shorter in School B1 (30 minutes) than A1 (50 minutes) which has an impact on the dining spaces occupancies (chapter 8).

Alongside the schedule, student interactions and self-directed activities are also impacted by management regulations, their degree of strictness and implementation by teachers. During breaks, both schools allow students in the playground, dining spaces and the school library, but students are less welcomed to stay on upper floors. B1 strictly enforces these rules by closing down corridor accesses, keeping one access to level-2 library and warning students about loitering in corridors or classrooms (figure 5.6). Contrarily, school A1 provides more freedom to students, allowing them in corridors, terraces and open studios, thus, yielding more diverse activities on upper floors, higher for level 4 and 5 in A1 than level 2 and 3 in B1 (figure 5.7). The activity diversity on upper floor corridors is revisited in chapter 6.

Figure 5.5: Activity Distribution Across the School Schedule (A1 vs B1)

Figure 5.6: Signage in B1 for Corridor Regulations During Breaks
5.1.3 Summary of learning practices

While the school building has diverse learning practices, the research explores patterns of student interactions and self-directed learning activities, excluding teacher-driven activities. Self-directed learning practices are initiated by students in the form of intellectual activities, sports, performances and spiritual activities which all contribute to the student learning process. Within two observed school buildings (A1 and B1), there are variations in student occupancies across the whole building, specifically the informal spaces, which translate to variation in student concentrations, as displayed on the floorplan heat maps. For instance, A1 has higher outdoor occupancies in play areas, whereas B1 students concentrate indoors within specific functional boundaries, like the dining area and library. In both schools, variations of student occupancies correspond to diversified activity types and dispersed interactions, initiated by students and performed with a degree of autonomy (self-direction). Certain activities, such as interactions, sports and intellectual activities, dominate different spaces, while further activity alternatives are of lower counts. Those variations (in student occupancies and activity types) raise inquiries about the implications of the spatial design on student interactions and self-directed activities. Hence, the research explores the spatial affordances for those learning practices, in consideration of the spatial configuration and functions as main contributors to the occurrence of interactions and self-directed activities while acknowledging input from the management, teachers and students as mediators in the process of transcription from possibilities to actuality.

5.2 Spatial Affordances for Learning Practices
The previous section has introduced the learning practices recorded in two school buildings which represent the student occupancies of different interactions and self-directed activities. Considering the research interest in the spatial dimension of the student learning practices, this section investigates how the school design (configuration and functions) affords the student interactions and self-directed activities. The design is argued to exhibit a potentiality (for different possibilities of activities) which defines the spatial affordances for the student learning practices. Nevertheless, each type of activity relates to certain regulations, supervision patterns and student preferences which intertwine with the spatial parameters. Hence, the study presents the affordances of the school building as possibilities for learning practices, shaped through the spatial configuration and functions while referring to the input from the management and teachers and the student preferences.

The research starts by investigating the relation between the spatial functions and the variations of interactions and students self-directed activities, as recorded in A1 and B1. Spatial functions impact the distribution of activities in the school spaces. This is portrayed through a chi-squared test (categorical variables of activities vs functions; table 5.2) which portrays a significant difference (p-value<0.0001) in student activity distribution across spatial functions assigned by the design team in A1 and B1. In other words, each spatial function is recognised to have distinct activities. This results from certain spatial functions being attractors for specific possibilities of student activities, as assigned by the architecture design team and embraced by management, for example, intellectual activities in libraries and eating in dining spaces. The strength of correlation is higher for school B1 ($R^2=0.43$) than A1 ($R^2=0.27$), since B1 management is stricter in terms of limiting activities to spatial function assigned in the design, unlike A1 that allows more freedom for students.
Table 5.2: Percentage of Occurrence of Self-directed Activity in Each Spatial Functions (A1 vs B1)

<table>
<thead>
<tr>
<th>Column%</th>
<th>Classroom</th>
<th>Corridor</th>
<th>Dining</th>
<th>Gym</th>
<th>Hall</th>
<th>Library</th>
<th>Playground</th>
<th>Stairs</th>
<th>Studio</th>
<th>Terrace</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
<td>B1</td>
<td>A1</td>
<td>B1</td>
<td>A1</td>
<td>B1</td>
<td>A1</td>
<td>B1</td>
<td>A1</td>
<td>B1</td>
</tr>
<tr>
<td>Chill</td>
<td>0</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>Clean Challenge</td>
<td>0</td>
<td>0.3</td>
<td>0.6</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.1</td>
<td>2.4</td>
</tr>
<tr>
<td>Eating</td>
<td>0</td>
<td>1</td>
<td>0.9</td>
<td>40</td>
<td>35</td>
<td>0</td>
<td>0</td>
<td>0.4</td>
<td>0.7</td>
<td>1.2</td>
</tr>
<tr>
<td>Games</td>
<td>22</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.7</td>
<td>2.8</td>
<td>0</td>
<td>1.6</td>
<td>0.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Intellectual</td>
<td>33</td>
<td>43</td>
<td>0.4</td>
<td>0.2</td>
<td>32</td>
<td>3.4</td>
<td>0</td>
<td>6.9</td>
<td>86</td>
<td>14</td>
</tr>
<tr>
<td>Misbehaviour</td>
<td>1.8</td>
<td>0</td>
<td>0.8</td>
<td>0</td>
<td>1.6</td>
<td>0</td>
<td>0</td>
<td>0.9</td>
<td>0.1</td>
<td>1.6</td>
</tr>
<tr>
<td>Performance</td>
<td>5.4</td>
<td>0</td>
<td>0.1</td>
<td>0</td>
<td>0.3</td>
<td>0.7</td>
<td>0</td>
<td>0</td>
<td>0.8</td>
<td>0</td>
</tr>
<tr>
<td>Physical Challenge</td>
<td>0</td>
<td>1.4</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
<td>0.3</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1.3</td>
</tr>
<tr>
<td>Solitude</td>
<td>0.9</td>
<td>17</td>
<td>13</td>
<td>1.4</td>
<td>2.5</td>
<td>2.7</td>
<td>0</td>
<td>2.5</td>
<td>6.1</td>
<td>3.9</td>
</tr>
<tr>
<td>Spiritual</td>
<td>4.5</td>
<td>0.3</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Sports</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
</tr>
<tr>
<td>Store/retrieve</td>
<td>NA</td>
<td>0</td>
<td>7.8</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
<td>0</td>
<td>NA</td>
</tr>
<tr>
<td>Interactions</td>
<td>21</td>
<td>57</td>
<td>68</td>
<td>75</td>
<td>16</td>
<td>20</td>
<td>62</td>
<td>0</td>
<td>20</td>
<td>59</td>
</tr>
<tr>
<td>Waiting</td>
<td>12</td>
<td>0</td>
<td>7.9</td>
<td>3</td>
<td>6.9</td>
<td>35</td>
<td>0</td>
<td>0</td>
<td>0.9</td>
<td>8</td>
</tr>
<tr>
<td>Watch</td>
<td>0</td>
<td>2.9</td>
<td>0</td>
<td>0</td>
<td>0.4</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>3.7</td>
<td>0.2</td>
</tr>
</tbody>
</table>

While each spatial function has distinct student activities, table 5.2 also indicates that each spatial function incubates multiple activities, beyond the assigned functionality. For instance, student activities in the gym space (A1) are only 16% sports but also include relaxation (19%) and mainly interactions (62%). Consequently, it is inferred that while certain functions are attractors for activities, still, a single activity spreads across different functional spaces. This is further clarified in figure 5.8 that uses the same data set to compare the frequency of each activity category in each spatial function using a coloured gradient; warmer colours are denser activities. Functions accommodate more diverse activities in A1 than B1, relative to B1’s stricter rules and its earlier stronger correlation between function and activity. Yet, in both schools, student self-directed activities, especially interactions, disperse in multiple informal spaces of corridors, libraries, dining spaces and play areas. This brings in the role of the spatial configuration to shape the patterns of activities regardless of the assigned spatial function but relative to accessibility patterns (shallow vs deep spaces) that maximise the potentiality, i.e. the possibilities, for certain activities as discussed in the upcoming discussion.
After investigating the relation between spatial functions and student activities, the research continues to investigate the relationship between the spatial configuration and activities. It is investigated in both schools through plotting the accessibility of each space (measured through visual mean depth) against the type of activity occurring in that space (obtained from observing, categorising and geo-referencing activities to their locations; methodology 3.5). The study infers a significant variance (p value <0.0001) in accessibility of each activity in both schools (figure 5.9). This indicates that the dispersal of student interactions and the diversity of self-directed learning are shaped by the spatial configuration of the school building. The variance is weaker in A1 ($R^2=0.23$) than B1 ($R^2=0.44$) due to the free dispersal of certain activities in school A1 (e.g. intellectual activities) across different locations of different configurations (shallow and deep), as allowed by the management. In contrast, B1 has stricter rules for the location of each activity within assigned spatial functions which themselves exhibit specific configurations (significant variance in accessibility of function; chapter 4.14), hence, a stronger association correlation between activities and configuration.

Figure 5.8: Activity Diversification Across Spatial Functions
Following the proven relationship between the spatial design (of functions and configuration) and the student learning practices, in the upcoming two sections, student interactions and self-directed activities are explained for their variation and distribution in reference to the spatial configuration and function which define the design potentiality.

5.2.1 The Relation Between the Spatial Design and Student Interactions

While student interactions are recognised as social learning activities, i.e. part of self-directed activities, they are discussed separately due to their wide dispersal in the school, making it hard to explore all activities simultaneously. Interactions distribute in both schools as patterns of socialisation (e.g. talking, arguing, discussing, gossiping, etc.) which exist independently; or blend with other group activities (e.g. eating, performing, waiting and watching) across multiple functional spaces.

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Activities are ordered in the graph alphabetically with no intent to present one activity before the other.
Following the established significant variance (p-value<0.001; in both schools) in the configurational accessibility of different activities, the average accessibility of interactions is deduced which is similar for school A1 and B1 (4.55 and 4.50; table 5.3). Nevertheless, student interactions in A1 spread in shallower spaces in respect to their deeper building accessibility spectrum than B1. In other words, A1 is a more segregated building than B1 (average VMD: A1=5.40 > B1=5.14) and has a deeper accessibility spectrum (A1 range: 3.79-9.25 deeper than B1 range: 3.39-8.79) which indicate that similarities in the accessibility of interactions in both schools suggests shallower patterns for A1 than B1. This is further justified as A1 interactions are the shallowest activity in A1 (of 14 categories), but they are within the mid-range accessibility of B1 (ranked 7th of 13 categories). Moreover, B1’s standard deviation of interactions (0.72; table 5.3) indicates high variation from the mean, referring to the dispersal of interactions at different accessibilities, such as the shallow dining space and simultaneously the segregated upper-level corridors and social space next to pitches. In contrast, A1 interactions are concentrated along the shallow spaces and routes, such as the playground and corridors, thus, showing a lower standard deviation (0.43).

Acknowledging the similarities in configurational shallowness of the locations where A1 interactions occur, it is argued that A1 interactions are induced by the building configuration, not restricted to specific functions but supported by free movements, granted by the school management. This is portrayed in figure 5.10 whose colour gradient reflect interaction

<table>
<thead>
<tr>
<th>Table 5.3: Configurational Properties of interactions (A1 vs B1)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average Visual Mean Depth of interactions</strong></td>
<td>A1</td>
</tr>
<tr>
<td></td>
<td>4.55</td>
</tr>
<tr>
<td><strong>Standard deviation of visual Mean Depth of interactions</strong></td>
<td>0.43</td>
</tr>
</tbody>
</table>

![Figure 5.10 The Degree of Accessibility and Frequency of Interactions Across Different Times of the Day](image-url)
frequencies at each value of accessibility across time (the darker the higher). During lunch breaks, when movements are free in A1, student interactions are denser in the shallow end of the accessibility spectrum and decrease gradually towards the deeper end of the spectrum. A1 interactions follow the natural movement routes which maximise the affordances (possibilities) for student co-presence and encounters along shallow spaces. Students move, meet, mix and interact at the central platform, the stepped amphitheatre, the outdoor gym and upper-floor open studios, all being highly accessible and connect student occupiers to other passers-by (figure 5.11). Interactions also spread along the circulation network within the outdoor routes (level 1 and 2) or the internal corridors on level 4 and 5. These spaces accommodate frequent student movements as recorded in the counts of gates\textsuperscript{8} Aq1 (48), Az1 (48) Bz1 (55) and Cy4 (48) on figure 5.13.

\textsuperscript{8} Gate counts are fully presented and explained in methodology section 3.3.4. Their values are comparable since both schools have similar total population and similar dual schedules of two breaks, separating upper and lower secondary students.
In B1, student interactions are more associated to spatial functions than configurational accessibility, being defined by the management which constrains the affordances (possibilities) of interactions to certain spaces assigned for socialisation during breaks, such as the dining space, the courtyard benches and the social spaces around pitches. Those spaces have diverse configurational accessibility which justifies the randomised frequencies of interactions across the accessibility spectrum during lunch breaks, unlike A1’s interactions gradient along the accessibility spectrum (earlier figure 5.10). Apart from socialisation within assigned space, B1’s possibilities of spontaneous encounters (which yield interactions) are not derived from free movements but relate to destinations (i.e. attractors), as students move towards or from the dining spaces, the library or the classroom wings (figure 5.11). Those routes have the highest movement counts, especially the wing corridors on level 1 (Ax2=154
and $A_{z1}=169$; towards the dining space) or level 2 ($BX_2=106$ and $Bz_2=112$; towards the library). Still, the school management warns against using the corridors for loitering or any long-period occupancies of self-directed activities. In general, B1 students have less spaces to interact (compared to A1’s diversified locations), and the school management puts extra restriction on interactions in level-1 wing corridors and all upper-floor spaces. Circulation spaces are further examined for their affordances for learning practices in chapter 6.
Since interactions are regarded as collaborative activities, it is important to examine the student groupings and their dispersal (figure 5.13) which is re-visited when studying individual informal spaces, such as school libraries (chapter 7.2.3), dining spaces (chapter 8.2.3) and play areas (chapter 9.2.3). In school A1, free movements render minor variations of accessibility among different group populations which are similarly shallow (figure 5.14). Since A1

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9 Gate-counts are presented for the average of five minutes which is the equivalent of the circulation duration between classes, as justified in the research methodology (chapter 3.3.4.2).
Grouping possibilities are unconstrained, students create small, medium and large groups freely according to their preferences, such that bigger groups are mostly outdoors during breaks. In fact, students sometimes socialise in large, stacked groups along the shallow bridge benches on level 2, and the management allows those formations. Contrarily, B1 regulations limit group interactions to formations of five students which are recognised in this research as small groups and spread all over the school (figure 5.13). Yet, medium and large groups are restricted (by regulations). This explains the increase in visual mean depth of groups beyond the threshold of five students (figure 5.14), where students seek segregation to create bigger groups. Interactions of medium-size groups (6-9 students) always spread in corridors, where supervision is not strict as long as the group is moving; or in the courtyard, where teachers occasionally ignore the group size and permit possibilities for medium groups. However, large group interactions (10-11 students standing or sitting) target the segregated social space next the pitches, knowing that teachers will not allow it (if seen). Other larger group interactions (12-15 students), which are shallower, actually happen due to lack of supervision and are shortly dismantled by teachers once spotted.
Figure 5.13: Student Group Formations Categorized by Group Size (A1 vs B1)
There is another form of interactions that is not student-to-student but student-to-teacher, referring to incidences of knowledge exchange in the form of quick tutorials. Student-to-teacher interactions occur mostly during breaks and are more abundant in school A1 than B1. They spread along A1’s shallow internal corridors and concentrate more in open studios (figure 5.16). These interactions are primarily driven by the high accessibility of those spaces, conditional to mixing of spatial formalities through allocating teacher spaces among open studios on the same level, as expected when studying the design potentiality chapter 4. Open studios are used for student self-directed activities during breaks, while teachers (from their offices) supervise and move towards the students to initiate interactions; or in other cases, students approach teachers in the corridors. In B1, similar patterns (student-to-teacher) happen in the wing corridors (or closed classrooms) but are mostly of corrective nature, where teachers inform students not to stay in corridors (or classrooms). Finally, there are further student-to-teacher interactions which concentrate in both school libraries (A1 and B1). These are not impacted by configuration nor mixing formalities but rather the spatial function of the library as an attractor for those interactions.
5.2.2 The Relation Between the Spatial Design and Self-directed Activities

Beyond interactions, further variations of student self-directed activities are compared and discussed for their spatial distributions in the school buildings. For that, the research uses the average accessibility, measured through visual mean depth (the higher the values the more segregated the activity; figure 5.16) and the standard deviation that reflects the variation of the accessibility from the mean value for each activity (table 5.4). Self-directed activities are displayed on figure 5.17 while excluding the previously discussed interactions that dominate the plans, hence, to clarify the activity diversity.
Figure 5.16: Average Accessibility of Each Activity Category (A1 vs B1)

Table 5.4: Standard Deviation of Accessibility for Each Activity (A1 vs B1)

<table>
<thead>
<tr>
<th>Activity</th>
<th>Standard Deviation of Visual Men Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A1</td>
</tr>
<tr>
<td>Relaxations/Chill</td>
<td>0.27</td>
</tr>
<tr>
<td>Clean Challenges</td>
<td>0.56</td>
</tr>
<tr>
<td>Eating</td>
<td>0.28</td>
</tr>
<tr>
<td>Games</td>
<td>0.82</td>
</tr>
<tr>
<td>Intellectual</td>
<td>0.54</td>
</tr>
<tr>
<td>Misbehaviour</td>
<td>0.58</td>
</tr>
<tr>
<td>Performance</td>
<td>0.47</td>
</tr>
<tr>
<td>Physical Challenges</td>
<td>0.54</td>
</tr>
<tr>
<td>Solitude</td>
<td>0.51</td>
</tr>
<tr>
<td>Spiritual</td>
<td>0.17</td>
</tr>
<tr>
<td>Sports</td>
<td>0.46</td>
</tr>
<tr>
<td>Store/retrieve</td>
<td>N/A (activity not in school)</td>
</tr>
<tr>
<td>Waiting</td>
<td>0.69</td>
</tr>
<tr>
<td>Watch</td>
<td>0.45</td>
</tr>
</tbody>
</table>
Intellectual activities (olive green dots; figure 5.17) are permitted by the management to spread freely in A1, whereas they are supposedly bound to a specific spatial function in B1, i.e. the library space, following regulations. The allowed free dispersal of intellectual activities in A1 lead to occurring patterns along a stretched accessibility gradient from shallow (vibrant) to deep (quiet) spaces according to student preferences. They spread in the highly accessible area under the bridge (playground), in the mid-range accessible dining spaces and denser patterns in the open studios on the upper levels (when unused for classes during breaks).
They also spread in segregated terraces and closed classrooms at lower concentrations. These patterns yield an average accessibility (5.31) in the mid-range along the spectrum and a low standard deviation (0.54) compared to B1’s.

Contrarily, intellectual activities in B1 are the deepest student self-directed activity in the school (5.77). In fact, they are more segregated than A1’s, although A1 building is more segregated than B1. This results from dense patterns in the library and fewer patterns in two classrooms, where those destinations are highly segregated on level 2. Still, the average accessibility of intellectual activities (VMD=5.77) is not indicative of the library visual mean depth (6.18) nor the more segregated classrooms (VMD=6.33), but the value is lowered, relative to patterns in the shallow dining space. While regulations supposedly dictate activity locations in B1, the management does not stop student intellectual activities blended with eating activities in dining areas during breaks. They are overlooked by teachers on supervision duty, despite being against the dining regulations (further elaborated in chapter 8.2.2). This configurational variation (between upper-floor and dining-space patterns) yields a high standard deviation (0.83; highest in both schools).

For A1 and B1, the recorded intellectual activities patterns are compared to the student spatial preferences for intellectual activities, collected from their questionnaires (appendix 13.7.5). A1’s diversified intellectual patterns, which freely disperse in the aforesaid locations, relate to the student questionnaire answers. They prefer the library (53%), open studios (17%) and dining spaces and classrooms (equally 8%). In other words, less rules and more student freedom allow preferences to develop into actual patterns, embraced by the design potentiality. However, while the library is highlighted (by students) as the most popular destination for intellectual activities in the questionnaire answers, actual patterns indicate more intellectual activities inside open studios. This possibly portrays how the student mind associates the library to studying, but the design and configuration trigger more intellectual activities to happen within open studios. In B1, the student preferences for intellectual activities (library=62%, dining area=10% and classrooms=9%) also matches the recorded patterns. Nevertheless, it is a different scenario than A1, since B1 student preferences actually override the management rules which are ignored by students and overlooked by teachers to satisfy the student needs. Finally, the more interest in the library space for B1 student than A1 (62%>53%) is due to B1’s limited destinations which increases B1 student attachment to the library. More elaboration of the library spaces and their activities is presented in chapter 7.

Student individual or group relaxations are only found in A1 (turquoise blue dots; figure 5.17), occurring within accessible locations (VMD=4.57) but not the shallowest spaces. Students seek a degree of privacy and quietness which is not fulfilled along shallow movement routes (where vibrant interactions dominate) but afforded at cornered spaces in the playground (elaborated in chapter 9.2.2.1). Contrarily, student relaxations are missing from B1 due to the lack of spaces with similar configurational properties or furniture setup. Moreover, B1 environment is highly busy indoors and restrictive to specific activity locations outdoors which both inhibit relaxations.
In contrast to relaxations, other activities intentionally segregate in space, like student misbehaviours (A1 VMD=5.43; B1=5.45). They concentrate within A1’s playground backside (level 1) and toilet corridor (level 4); or B1’s segregated far south-west corner of the outdoor social space (black dots; figure 5.17) which all reflect the student tendency to hide. Nevertheless, spatial configuration is not the only factor that impact the location of activities that are undesired by the school. This is illustrated through clean challenges (A1 VMD=4.62; B1=5.25) and physical challenges (A1 VMD=4.76; B1=4.44) which are less segregated than misbehaviours. The latter (physical type), despite being more intense, is even less segregated than the former, specifically in B1. In those case, activities are more relative to the teacher supervision. Clean and physical challenges grow as natural by-products of group activities during breaks (e.g. within play areas), when students feel they are not supervised. Still, the spatial configuration is the prime contributor to provide possibilities for these patterns through rendering certain spaces invisible (segregated) to teachers on patrol-duties.

Doing sports (orange dots; figure 5.17) is primarily shaped by function allocation with a degree of impact from the spatial configuration. Many students (of both schools) target the pitches, regardless of their configuration, because they are prepared with relevant equipment. This is recorded in the counts of students accessing those pitches in A1 (Aq2=33; Aq3=30) and B1 (Av2=69), as shown on the earlier figure 5.12. However, the spatial configuration still impacts A1’s distribution of sports outside the pitches, as students target the segregated playground backside to play ‘unwatched’ football which is elaborated in chapter 9.2.2.1. This distribution reflects on the standard deviation of sports accessibility which is higher for A1 (0.46) than B1 (0.38). Although the pitches of B1 have higher variation in accessibility than A1’s equally shallow pitches, students (from A1) further stretch the range of accessibility for their sports (into segregated areas), following their preferences.

Again, the impact of spatial functions on activities is highlighted through the dining spaces being attractors for eating activities (red dots; figure 5.17), illustrated in their high gate counts in respect to each school (A1: Ax1=60 Aq1=33; B1: Ay2=139). Students eat inside the dining space as assigned in the school design and embraced by the management, such that the average accessibility of eating patterns (A1=4.86; B1=4.04) is just a reflection of the accessibility of the dining units as allocated by the design team (A1=4.89; B1=4.04). That is why the standard deviation of eating is slightly higher for A1 (0.28) than B1 (0.25), since the design distributed five dining units in different locations of different accessibilities, whereas B1 portrays less diverse accessibility for the single dining space. While the dining spaces (of A1 and B1) are attractors for eating, still, B1 dining spaces are more vibrant and richer in activities than A1 which is thoroughly explained in chapter 8.

Nevertheless, the spatial configuration still impacts the incidents of eating outside the dining spaces in A1. This is proven in the student questionnaire where preferences for eating lunch is not limited to the dining spaces. Although it is against the rules, almost equal percentages of A1 students prefer eating in the playground (29%) as much as the dining spaces (31%), beside the terraces (15%) and open studios (7%). Accordingly, A1 students choose segregated locations such as the backside of the playground and the far corners of the pitches or the highly segregated upper-floor terraces to hide while eating, relying on limited supervision in deep spaces. Students want to eat while socialising with their friends which is further explained in chapter 8.2.2 when discussing the dining space popularity. Segregated incidents
of eating further diversifies the range of accessibility and increases the standard deviation of eating patterns in A1.

Student performances (e.g. acting, rehearsing, singing, dancing, etc) and spiritual activities (praying or meditating) are very few patterns than other activities. Their distribution is not tied to certain configurational properties nor bound to certain spatial functions, since the theatre only functions for planned performances (e.g. school play) but not the spontaneous student performances during breaks. However, student performances in A1 are actually related to the spatial area. Being granted the freedom of choice, A1 students were observed as they decided the location of group performances (e.g. the playground central platform) relative to group size, while individuals (doing spiritual activities) seek the smallest spaces (classroom). Contrarily, B1 student performances (singing and clapping) are not decided by size (area) of space but rather as by-products of eating and interacting in the dining space which is the only indoor space that allows loud socialisation.

5.2.3 Summary of the Spatial Affordances for Learning Practices

Both schools (A1 and B1) have illustrated examples of how the spatial design (of functions and configuration) offers possibilities (affordances) for learning practices inside the school building, examined through student interactions and self-directed activities. The spatial configuration creates patterns of accessibility which trigger movements and offer possibilities of encounters, yielding student interactions. Moreover, student self-directed activities diversify, relative to their locations being shallow, vibrant and seen to everyone or segregated, quiet and hiding from other students or teachers. The relationship between the spatial configuration and activities is proven through a significant variance in accessibility of each activity in both schools (p-value <0.0001). This variance indicates that activities are not configurationally randomised but match certain accessibility properties. Activity patterns follow the configurational potentiality for certain learning practices in space as supported by the student preferences; or they are relative to the distinct configurational properties of each spatial function as assigned by the team of architects in the design.

Alongside the spatial configuration, there is a major role of functionalities (assigned during the design process) in shaping activity distribution. Spatial functions render certain spaces as attractor for activities and shape the student movement routes around those spaces. This is portrayed through the significant correlation (p-value <0.0001) between the two categorical variables: student self-directed activities and the spatial function where activities happen. Nevertheless, the impact of the spatial design is further shaped by the school management, implementing regulations on what activities to occur and where in the school building. Stricter rules (like B1) limits activities to their assigned spatial functions as allocated by the original design. Rules also drive students to seek autonomy away from supervision. Contrarily, less rules (like A1) promote student freedom to choose their activities (distribution and variation) following their spatial preferences, thus, bringing back the role of spatial configuration and patterns of accessibility (or segregation) to influence activity distribution and types (quiet vs vibrant).

Acknowledging the spatial configuration, functions and further input from the management and student preferences, learning practices diversify in the school plan. In a free environment,
interactions are primarily morphed according to accessibility patterns, following shallow spaces (e.g. A1 amphitheatre) and vibrant movement routes (e.g. A1 Bridge) which both match the configurational potentiality of how school buildings trigger learning practices. Yet, interactions are bound to spatial functions when the management (of B1) allocates areas for socialisation, reducing spontaneous student mixing and promoting spatial attractors which in some cases are shallow (e.g. B1 courtyard) or relatively deeper (e.g. B1 social space west to pitches) with less student occupancies and more misbehaviours (away from supervision). Still, spontaneous interactions resume existing along the student movement routes, especially their daily journeys to and from the dining space, playground and classrooms. While high accessibility promotes interactions, less vibrant cornered spaces, which are private but connect to main circulation, accommodate quieter student relaxations (e.g. A1 gym space).

Some self-directed activities exhibit wide accessibility spectrums (e.g. quiet vs vibrant intellectual activities), while other activities are more specific to particular configurations, like shallow accessibility (e.g. vibrant interactions), mid-range accessibility (e.g. relaxation) or segregated locations (e.g. misbehaviours). Activities also diversify across different functions (e.g. interactions) or are bound to specific spatial function (e.g. eating in dining spaces). The same applies to spatial areas where some activities require large spaces (e.g. performances) while others are bound to small spaces (praying). The degree of abiding to the spatial function is relative to the strictness of school rules and supervision. Accordingly, activities hide without the management consent (e.g. eating in A1 playground); or they are overlooked by the management that expands the allocated space for activities (e.g. allowing football outside A1 pitches or intellectual activities in B1 dining areas during breaks). Some teachers allow certain activities during their supervision duty, while others terminate them, for instance, permitting or stopping ball games in the central amphitheatre and under the bridge of school A1. There are other occasions when one supervisor alternates their decision according to student identity and their behaviour history, for example, allowing a group of A1 students (but not another) to stay in upper floor open studios to study during lunch breaks.

5.3 Summary of Studying the School Building Actuality

This chapter studies the actual operation of the school building in terms of student learning practices, and how they are impacted by the spatial design which prescribes the design potentiality. The school building is a rich environment of diverse learning practices, relative to possibilities in space. Following the perception of learning as a social process, the research focuses on student interactions which are incidents of knowledge exchange; and self-directed learning activities that include intellectual activities, student physical activities, chilled relaxations, performances, spiritual activities and eating activities. These are all recognised as learning practices which are recorded to have various concentrations across the school floor plans. They also happen inside the school as multiple diverse incidents of high variations. For instance, intellectual activities subdivide into studying, revising, writing, reading, colouring, drawing, etc. Accordingly, the research creates activity categories where similar actions are clustered together, hence, different categories are significant when compared in space. Not only do activities vary in their concentrations and types across the school spaces, but they alternate across the time of the day following the schedule implemented by the management that also imposes regulations on what and where activities take place.
The variations of activity concentrations and types (across the school building) are the main intriguing reasons to investigate the impact of the spatial design on learning practices, portrayed in the student interactions and self-directed learning activities. However, this research infers the impact of the management regulations, daily schedules and student preferences on the occurrence of activities. Hence, the research derived the affordances of the school building for learning practices, primarily founded on the spatial configuration and function allocation (as main parameters of the spatial design) and further mediated through management input and student preferences.

The spatial configuration has the prime impact on the dispersal of student interactions and the diversity of student self-directed activities. This is proven through the significant variance in the accessibility of each student activity in both schools. The degree of accessibility triggers certain types of activities, relative to configurational properties and student preferences, if the management grants a free environment with less rules. Highly accessible spaces trigger movements and promote students encounters yielding a vibrant interactive environment where students (occupying a space) mix with passers-by. A slight decrease in accessibility renders a different environment which is accessible but more private and attracts students to relax and have quieter conversations, relative to the lower degree of vibrancy while still connecting to main circulation and passers-by. The types of activities keep changing along the accessibility spectrum, reaching certain activities that seek segregation (e.g. misbehaviours). Still, one activity category possibly repeats across various configurations. For example, students (following their preferences) seek a vibrant atmosphere for interactive group studying or a quieter location for more focused individual studying. The aforementioned diversity of activities is conditional to freedom of movements and group formations during break times.

Acknowledging that the spatial configuration is not the only contributor that shapes student activities, there are implications of the spatial functions (assigned during the design process) on the distribution of activities in the school building. Certain functions are attractors for student activities (e.g. dining spaces for eating and pitches for sports). This is proven through the significant correlation between two categorical variables of the spatial function and student self-directed activities in both schools. Moreover, it is argued that the higher diversity of spatial functions and mixing of formalities (within one zone) yield higher variations and dispersals of activities across the floorplans. This is portrayed in school A1. It has more spatial functions than B1, providing diversified closed and open learning spaces and a rich landscape of its playground, beside mixing the formal spaces with informal terraces. Hence, the school has more variations of activities. School B1 is the opposite scenario with less diverse spatial functions and more regulations, i.e. controlling locations of student activities.

While school managements (and the team of architects during the design process) associate one activity to a spatial function (e.g. eating in dining spaces), the spatial function is rarely an incubator of a single activity but accommodates multiple ones, relative to possibilities in space. Similarly, the relationship between configuration and activity is multi-layered, where one degree of accessibility triggers diversified activities. For example, A1’s highly accessible outdoor platform (level 1) is a vibrant meeting space for student seated interactions, performances (dancing and acting) and some ball-games if supervision allows. All that happens while students mix with passers-by (in and out of the dining spaces); or mix with
others heading to the back side of the playground. Similarly, A1’s segregated upper-floor terraces attract students for quiet conversations and intellectual activities, while other students play games, have physical challenges or misbehave. Diverse activities are not always happening at the same time, since first comers set the theme of space (e.g. quiet studying or playing games). Still, the space affords possibilities for both activity types. This diversity is accepted by the management, unlike the situation of B1 which promotes a stricter environment with more rules while already having less variation in its landscape and spatial functions.

The spatial configuration contributes to the dispersal and diversity of activities relative to different accessibilities, i.e. different vibrant or quieter atmospheres. The spatial function mainly impacts the concentrations of certain activities to particular spatial attractors. The spatial dimension of an activity, composed through its configurational and functional properties, varies according to the upper hand taking the decision. It is either decided by the team of architects and embraced by the management (e.g. B1 strict rules; limiting football to pitches); chosen by the students within options offered by the management (e.g. A1 less rules; play football anywhere in the playground); or decided by the students against the rules (e.g. eat outside dining space in A1). While regulations exist, their implementation is relative to teachers (on supervision duty) who stop activities (e.g. ball games in A1 platform) or allow them (studying in B1 dining space), even if opposing the rules. If not overridden by management rules, activities are relative to the student preferences, following their free will. This scenario is limited to certain activities, for example, A1 students studying wherever they prefer.

While spatial regulations override student preferences, students still fulfil their preferences with assistance from the spatial configuration that support possibilities in space. Spatial regulations yield a unique relation between the spatial configuration and students who develop configurational knowledge and identify locations suitable for their activity preferences, even when rules disallow. This develops over many days spent in the school (mastered by some students over others). It is expressed in their segregated destinations to misbehave, sneak a sandwich in the food-free playground (A1), or form large groups (against the rules) in the segregated social space next to pitches (B1). Student configurational awareness is also portrayed in student destinations for quiet discrete conversations and focused studying; or, on the contrary, destinations to be visible, meet and mix with other students (or teachers) in an interactive atmosphere.

In the end, this chapter has presented the building actuality of occurring student interactions and self-directed activities while focusing on outlining the affordances of the school building for the aforementioned learning practices, primarily shaped through the spatial design of configuration and functions. The design of the school building has been discussed as a whole, thus, perceived as a holistic approach to understands the spatial affordances. This is prior to decomposing the school building into its main informal spaces, each being explored at a zoomed-in level. The in-depth study of each space further reveals the interior design of space and furniture types and layout, thus, introducing the furniture setup as an extra parameter that shapes the affordances for learning practices. This is conducted for corridors (chapter 6), the school library (chapter 7), dining spaces (chapter 8) and the playground and terraces (chapter 9), as seen in the upcoming chapters.
6 School Circulation Networks

This chapter, being focused on circulation spaces, is the first in a series of zoom-ins (chapters 6-9) that elaborate on informal learning spaces inside the school building, including circulation spaces, libraries, dining spaces and play areas; and their spatial affordances for multiple learning practices. Circulation spaces are perceived not solely as movement routes but are investigated for their potentiality to trigger and accommodate student interactions and self-directed activities. The school design potentiality (of the spatial configuration and functions) has been discussed in chapter 4, while the building actuality of diverse learning practices was presented in chapter 5, both providing a holistic perspective and highlighting the translation of possibilities, created through the design potentiality, into actual learning practices. While using data from those chapters (4 and 5), this chapter further examines the design of corridors and staircases from a closer view which reveals the role of corridor typologies to maximise (or inhibit) the circulation potentiality for learning practices. The chapter also introduces the furniture setup as a contributor to the spatial potentiality; and elaborates on the relation between corridors and their surrounding spaces (either open or cellular spaces); which are both unexplored when studying the school building holistically. All those parameters influence the student learning practices; however, the actuality of the circulation operation, in terms of the occurring interactions and self-directed activities, diverts from the design potentiality. This is a result of the management input in terms of regulations and alterations in the building configuration, while the students have their spatial preferences of where to go and what to do.

The chapter discusses the aforementioned parameters. It begins with studying the design of circulation spaces through size (area) and configurational properties while exploring the corridor typology which all maximise (or inhibit) the circulation potentiality (section 6.1). The chapter proceeds to explore how the circulation actuality of occurring student learning practices, based on building operation, diverts from the original design potentiality (section 6.2). This is expressed for the student interactions and self-directed activities around vertical cores (6.2.1); along the corridor networks during circulation periods between classes (6.2.2); or the corridor long-period occupancies during breaks which define the corridor popularity (6.2.3). Finally, the chapter concludes the circulation affordances as possibilities for interactions and self-directed learning shaped through the design potentiality that offer possibilities in space; and input from managements, teachers and students (section 6.3). The chapter summary is section 6.4.

6.1 The Design and Potentiality of Circulation Spaces

Alongside multiple allocated vertical cores, corridors stretch and branch into a network that reaches every space in the school. Corridors follow the modern design of horizontal circulation which collects and separates movement traffic from other functionalities with minimal room-to-room inclusive circulation, as described by Sailer (2018) on the work of Evans (1997). In other words, movement is spatially isolated (for efficiency purposes) from other functions while its social dimension, i.e. potential for interactions or activities, is undermined. Even the three architects (of the studied school buildings with which interviews where held) expressed the purpose of circulation spaces to solely accommodate movements with no intended functionality as activity spaces. This matches some perceptions from
literature (section 2.6.2.3) where school corridors were only evaluated for their ability to facilitate movements.

In this research, the spatial characteristics of circulation spaces are determined through the area properties, spatial configuration and corridor typology. These are the main contributors for the potentiality of circulation spaces for student learning practices of interactions and self-directed activities. Firstly, the stretching and branching of corridors yield relatively large areas of the total school area. Through the examined circulation spaces of the eleven secondary school buildings, designed by three different architecture firms (chapter 4), there is a significant strong variance in the area of each spatial function (P-value<0.0001), portrayed for all schools. Circulation spaces have the third largest average area as a singular space in the school. Furthermore, their aggregate area (in each school) composes 13% - 20% of the total school area, such that corridors have an average of 13.2% and staircases have an average of 2.9%. The relatively large area of circulation spaces is the first spatial property that potentially satisfies the student large groupings for interactions or further self-directed activities.

Beside the area of circulation, the design yields distinguished configurational properties for corridors and staircases, established through the relationship between spatial functions and accessibility. There is a significant variance in the accessibility of each spatial function (P-value<0.0001), portrayed for all eleven school buildings (chapter 4.14). Circulation functions (corridors and staircases) are among the shallow or mid-range spaces in respective to each school accessibility spectrum (figure 6.1), due to their multiple connections to other surrounding spaces. Highly accessible corridors invite student movements, co-presence and encounters, thus, increasing the possibilities for interactions which are accommodated within the large-enough circulation spaces (13% - 20% of total school area). Nevertheless, this potentiality is conditional to operational factors of social rules, e.g. teacher supervision, to grant the students freedom of moving in corridors. On upper floors, movements are initiated at the staircases (shallowest spaces), being the threshold of accessibility and then distribute along the corridor network, such that the intersections between vertical cores and horizontal routes are expected to be vibrant with high potentiality for student interactions. In summary, regardless of being intended or not by the architect, the design of circulation spaces yields configurational shallowness and large size (area) which both maximise the circulation potentiality for student interactions and self-directed activities.
Alongside high accessibility, the organisation of corridors (figure 6.2) defines the building typology (chapter 4.12) which further maximises or restricts the potentiality for interactions and self-directed activities, relative to the relationship between each corridor and its surrounding spaces. For instance, compact urban blocks, like schools A1, A2, B2, C1, C3 and C4 are always associated to small sites which renders the importance of efficient double-loaded corridors to serve multiple compact spaces. In some cases (e.g. A2), school spaces are cellular of closed boundaries towards the corridors (figure 6.2), yielding highly defined, narrow corridors which do not trigger student interactions despite their relatively high accessibility (earlier figure 6.1) and expected high movement streams. Contrarily, in other schools (e.g. A1), shallow corridors are still narrow yet connecting to similarly shallow open spaces which allow student movements to develop into interactions along corridors and propagate towards the open spaces, where interactions further develop into student self-directed activities. In other schools, the corridor changes its width to wider sections, creating in-between classroom pockets (e.g. C4) or bigger piazzas along the corridor (e.g. B2 and C1) which all have high potentiality for interactions and self-directed activities within the wider sections, especially if proximate to the formal classrooms.
Moreover, schools of centralised resources with wings (e.g. B1) or clusters (e.g. B3) vary in their circulation potentiality from the global to the local spaces. The global circulation corridors are typically shallow and wide, serving the whole population around the centralised resources (e.g. dining spaces), thus, accommodating high movements towards the student attractors which have open-plan layouts, blended with the corridors (figure 6.2). This scenario allows movements to develop into interactions and self-directed activities, closer to open-plan destinations. Nevertheless, on the local scale of the wing or cluster (away from the centralised spaces), movements are relatively less intense. Locally, the school wing has a narrower corridor serving mono-functional spaces, such as closed classrooms and studios (e.g. B1 wings) which inhibit possibilities for interactions or self-directed activities. This scenario is reversed for the cluster design (e.g. B3), where the corridor blends into a small courtyard as the locus of the classrooms; therefore, reviving the local cluster movements (although of less intensities) and yielding possibilities for interactions; and higher possibilities for self-directed activities especially within the local courtyard.

10 The floorplans are not presented in the same scale in figure 6.2, since the focus is on presenting (fitting) all the circulation networks in one figure.
Campus environments, like schools A3 and C2, have undefined circulation between their building blocks (figure 6.2) which allow free student movements. The highly accessible in-between spaces are expected to become busy movement routes, especially when they pour into a shallow central courtyard destination (also a student attractor). This configuration maximises the possibilities of vibrant interactions as students (along their movement routes) cross-path other occupiers of the courtyard. This is different from a multi-grade campus (e.g. school A4), where buildings have different functions (beyond the secondary school). In that case, cross movements between blocks are expected to be low, hence, low interactions and activities within the in-between spaces. For all campus environments, the potentiality of the circulation inside the single building block is relative to the corridor configuration which mimics one of the scenarios of the compact buildings. For example, the narrow corridor of the classrooms-block (A3) has low potential for interactions and activities, similar to the wing structure of B1, whereas the wider circulation of A4 that opens to the stepped seating is similar to B2’s social piazzas with expected high interactions and activities.

In summary, the circulation potentiality for various learning practices of student interactions and self-directed activities (as presented above and drawn from the functional and syntactic analysis) is primarily influenced by the high configurational accessibility of corridors and staircases. They have the potentiality to generate movements, mix students and induce interactions, being accommodated by the large areas of circulation (13%-20% of school spaces). Whilst the circulation high accessibility facilitates movements which lead to interactions and subsequent self-directed activities, this potentiality is further maximised (or inhibited) through the corridor typology. In compact buildings, double-loaded corridors blend into large open spaces or exhibit changes in their width (creating piazzas and break-out pockets). Those scenarios collect movements, induce interactions and facilitate collaborative self-directed activities within the corridor and the open space. The same applies globally in the outdoor spaces between buildings of a campus environment (within undefined shallow routes); or inside the school around common resources, served through wide corridors. High potentiality also applies locally within a single cluster inside its open circulation and local courtyard. This potentiality is minimised for narrow defined corridors within compact urban blocks or within an isolated wing structure. Table 6.1 summaries all the circulation potentiality scenarios.

<table>
<thead>
<tr>
<th>Building Typology</th>
<th>School Example</th>
<th>Corridor Average Width (m)</th>
<th>Corridor Design</th>
<th>Surrounding spaces</th>
<th>Potential for Interactions</th>
<th>Potential for Self-directed Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compact Urban Block</td>
<td>A1</td>
<td>1.68</td>
<td>Narrow Defined width</td>
<td>Open studios</td>
<td>High</td>
<td>Closer to open studios</td>
</tr>
<tr>
<td></td>
<td>A2</td>
<td>2.76</td>
<td>Narrow Defined Width</td>
<td>Cellular closed spaces</td>
<td>Low</td>
<td>Very low</td>
</tr>
<tr>
<td></td>
<td>B2</td>
<td>3.69</td>
<td>Wide with central piazzas</td>
<td>Open spaces</td>
<td>High</td>
<td>High in corridors, piazzas and open spaces</td>
</tr>
<tr>
<td></td>
<td>C1</td>
<td>3.06</td>
<td>Narrow with central piazzas</td>
<td>Open and closed spaces</td>
<td>High</td>
<td>High in piazzas and open spaces</td>
</tr>
</tbody>
</table>

*Table 6.1: Circulation Potentiality for Interactions and Self-directed Learning*
6.2 School Circulation Actuality vs Design Potentiality

The actuality of the circulation networks (corridors or staircases) in terms of the occurring student interactions and self-directed activities diverts from the potentiality of the original design (previous section), as portrayed in the two cases studies A1 and B1 where fieldwork observations were conducted. The operation of the circulation changes due to the mismatch between what the possibilities offer (in the original design) and what the management aims to achieve, relative to their vision and their role of promoting (or inhibiting) circulation as interactive spaces for collaborative (or individual) self-directed activities. Operational changes also happen due to the increasing student population over years.

Attempting to improve the school performance, both school managements implement two schedules for upper and lower secondary students (introduced in chapter 5.1.2), for facilities to withstand dense occupancies during breaks and for teachers to maintain control over students. Alongside the separate schedules, both managements (A1 and B1) alter the building configuration and circulation routes. They believe the new scheme secures quieter learning environments (for other students not on break), improves supervision and reduces congestions along circulation. Configurational alterations include permanent termination of circulation spaces throughout the school day; temporary termination of circulation in specific break-times, circulation periods or class-times; and changing the direction (or hierarchy) of circulation. While the studied buildings and their circulation network operate, the new configuration re-defines the student movements, social relations and encounters, bringing in the notion of ‘syntactic resilience’ (Koch & Carranza, 2013), defined as the degree of change.
in practices upon configurational changes. In this research, whether for circulation spaces (this chapter) or other informal spaces (chapter 7-9), the investigation focuses on the operational influence on student interactions and self-directed activities, as discussed in the following sections.

6.2.1 Student Mixing and Encounters at Staircases

Student mixing and encounters at staircases are common activities, considering the regular and frequent student movements between classes and during breaks. They are short-period encounters and interactions, as the social learning dimension inside the school. Yet, there is a general theme where managements are against those interactions. The studied examples (A1 and B1) express two different scenarios. For A1, the staircase design, in relation to the corridors and other open studios, offers possibilities for interactions around the vertical cores. The building operation does not support those possibilities to develop into actuality, as the school management implements permanent configurational alterations to inhibit those interactions, perceived as distractions to classes. In another case, B1 design already does not promote interactions at the staircases. Yet, the management interventions (through circulation regulations) target antisocial concerns of student frictions, resulting from unanticipated congestions and opposite movement streams. Both scenarios demonstrate the mismatch between the original design and the actuality of the building operation, as elaborated below.

![Figure 6.3: Proximity of Each Staircase to One Open-plan Studio (A1)](image)

In A1, the management inhibits the short-period incidents of student interactions at vertical cores, despite the architect original design which maximises the potentiality for student mixing, co-presence and encounters. A1 design divides the school into five households (groups of students), each served through a cluster of spaces. The architect created one
staircase for each house, thus, maintaining proximity between the house base (level 1 or 2), the adjacent staircase and the upper-level open studio (figure 6.3). Three (of five) staircases open into the highly accessible internal corridors and open studios. This configuration maximises student mixing patterns around those staircases, being locations where movers along the vertical core meet others in the corridor and open studios, thus, yielding instant interactions as quick incidents between classes. Nevertheless, the management alters the building configuration by permanently terminating these three staircases and consolidating vertical circulation through the remaining two staircases which are more separated from the open studios (figure 6.4). The management aims to minimise distractions around open studios and control student dispersal.

The management alterations, of permanently closing three staircases, inhibit student interactions around staircases on upper floors. Firstly, it almost eliminates movements at the three staircase portals that pours into the open studios as shown through gate-counts (figure 6.4) on Level 4 (Cx2=2, Cy2=2 and Cz2=1) and level 5 (Dx2=0, Dy2=2 and Dz2=0), compared to the operable gates (other two staircases). This hinders the student meetings, mixing and interactions around these staircases. Simultaneously, movements are condensed at the two operable cores, putting extra load on them, especially on the busy level 4 (Cy4=48 and Cz4=123) and relatively less dense level 5 (Dy4=27 and Dz4=59). Still, movements do not lead to interactions around those staircases, due to high congested movements which automatically prevent students from stopping and talking. This is beside the limited area for students to stand, unlike the space provided through open studios at the other staircases. Additionally, there is a significant role played by supervisors who urge students to keep moving and not to block the way. This example portrays how the spatial configuration is not

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11 Gate-counts are presented for the average of five minutes which is the equivalent of the circulation duration between classes, as justified in the research methodology (chapter 3.3.4.2).
the only factor shaping the student mixing patterns, but there are other managerial factors that impact the operation of the school.

In school B1, the spatial and operational situation is different, since the original design does not promote student momentary interactions around staircases due to the isolated wing structure, closed staircases and connection to narrow corridors, while the whole system (staircases and corridors) is highly congested during operation. Still, the staircase operation diverts from the architect design. The school alterations are not intended to inhibit interactions but directed towards regulating the student vertical movements to avoid antisocial behaviours of student frictions along the staircases. Frictions result from dense movement streams and confrontations in opposite directions, amplified due to the increasing school population. This is acted upon through implementing one-direction staircases, either supporting up or down movements within each wing and keeping one dual-direction staircase (figure 6.5).

Implications of the one-way staircases do not impact student interactions (already inhibited by design) but resolve confrontation problems on level 1 and 3, while problems persist on level 2. On level 1, students travel up in one staircase and arrive from upper floors (to level 1) in another staircase. On level 3, the inverse applies, where students travel down in one
staircase and arrive from lower levels (to level 3) in another staircase. The system is regulated through signages on staircases to inform the travel direction (figure 6.6) which is respected by students as seen on level 1 at gates Ax3 (90,2) and Az3 (0,57), where almost all students (90+57=147) are coming down from level 2; or at gates Az2 (1,86), where almost all students (86) are going up to level 2 (figure 6.7). Similarly, on level 3 which has less movements due to fewer number of classrooms, students are moving down from gate Cx3 (1,50) and Cz3 (51,1) or arriving from level 2 at gate Cz2 (27,0). On level 1 and 3, there are few exceptions of five students (2+1+1+1) going against the flow, which is expected, because the closest staircase (to the student) does not always match their direction. In other words, it is against natural movement (in some cases) to follow the one-way staircase system. Hence, students might skip the rules instead of travelling further to use the correct staircase. The few cases do not cause problems, especially as students inspect first to see if the staircase is empty or not.
Problems of confrontations and frictions exist at the middle floor (level 2), where opposite flow-directions are un-avoided even through one-direction staircases. While students respect the rules on level 2, still, students who get into the stairwell to travel down towards level 1 are confronted by other students exiting the stairwell after arriving from the upper level (also travelled down). This is portrayed in the high counts in opposite directions at the gate portal Bz3 (109, 34) in the south wing (figure 6.7). Hence, one-direction staircases succeed to minimise frictions along vertical routes inside the stairwell (where supervision is hindered); nevertheless, the system does not eliminate confrontations but delays their occurrence to access gateways at the staircase landing, specifically on level 2. The existence of one access door of each stairwell (to enter and exit) is the key challenge and the primary proof that B1 staircases were not originally designed (by the architect) to handle one-direction circulation.

In summary, staircases contribute to student movements and distribution which influence encounters and interactions, not along the stair-flight but mainly around landings and the frontage corridors. If the design anticipated movement loads and allocated staircases

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12 The student count of each gate is not displayed only as a total (red number) but also as the count in each direction (yellow brackets), to highlight the impact of regulations on movement directions. The first number represents movements towards north or east direction, and the second number is south or western movements. For example, (90,2) means 90 students moving north and two students heading south.
accordingly, there is an equal distribution of student concentrations, therefore, high potentiality for interactions around the staircases, conditional to the presence of adjacent open spaces (case of A1). Nevertheless, the school management, which controls the building operation, terminates three staircases to inhibit movements and interactions, perceived as distractions to open studios. In a different design, the potential for interactions is minimal due to isolated wing structures with closed staircases pouring into narrow corridors (case of B1). Still, the major problem is un-anticipated movement streams which yield antisocial frictions, due to student confrontations inside the stairwell, where supervision is hindered. The school management intervenes through implementing one-direction staircases. They succeed to minimise frictions, but problems persist on level-2 stair-portals whose single-gated entrances (and exits) are not originally designed to anticipate one-direction circulation.

6.2.2 Student Mixing and Encounters in Corridors

Alongside interactions around vertical cores, more short-period interaction possibilities are exhibited along the whole corridor networks. They are also shaped through management alterations to the building configuration. Nevertheless, the management changes to corridor circulation are temporary, i.e. time-bound to circulation periods between classes, unlike the earlier alterations to staircases which are permanent throughout the school day in both schools. This section focuses on those circulation period alterations to explore the instant encounters among students between classes. Regulations during circulation periods are relatively strict, as both schools A1 and B1 aim for fast and efficient student movements while prohibiting interactions or further self-directed activities within corridors. Still, there are few interactions emerging in A1 corridors between classes (relatively more than B1), as elaborated below.

School A1 has two corridor networks: internal and external. The management attempts to minimises upper-floor interactions along the shallower internal corridors which are proximate to the open studios, thus, exhibiting a high potentiality for student mixing and encounters as quick incidents between classes. Movements within internal corridors, which yield interactions and are perceived as distractions, result from the following scenario. The growing student population prevented the management from allocating each student household (group) to receive their sessions in one open studio, as intended in the original design which dedicated five staircases specifically for that purpose (each staircase for house). Consequently, students (of one house) do not only target the open studio adjacent to their house staircase, but they also distribute (through corridors) among different classrooms. Moreover, A1 management already closed three staircases (at the open studios; previous section 6.2.1) which further prevents some students from connecting directly to their open studios. These factors render the necessity that students travel horizontally along internal corridors which creates a vibrant interactive atmosphere in corridors and adjacent open studios; not easily controlled by teachers.
A1 management succeeded to minimise internal corridor interactions through minimising internal movements. They declared the external corridors (originally designed as an assisting back network facing the closed side of the classrooms) to become the main circulation route for students to access all destinations (except open studios). Teachers stand at the portals (marked with a check on figure 6.8) to filter which students to pass into the internal corridors, conditional to their destination to be an open studio, while other students are directed to external corridors. This contributes to higher movement counts in external corridors (level 4: Cz5=68, Cy5=53 and Cy6=52) than internal corridors (level 4: Cx1=35, Cy1=51, Cy3=35 and Cz3=41), as seen on figure 6.9, such that reduced internal movements lead to less encounters and interactions.

The external corridors, being unsupervised and dense with movements, become noisier with communications which are overlooked by teachers, because noises do not propagate into closed classrooms, unlike the internal corridors being blended into open studios which need
teachers to prevent student interactions. Being unsupervised, students travel through external corridors at a slower pace than internal corridors, illustrated through their coverage of 95 metres in 2.5 minutes (0.65 meters/sec), unlike their faster internal pace of 105 metres in 1.5 minutes (1.17 metres/sec). Moreover, students stop several times along the external routes to procrastinate before going to class (e.g. chat, organise their bags, etc.) which rarely happens along their consistent internal movement (being supervised). There are few cases of students hiding at the beginnings of class-time in the far-east end (terrace) of level 4. In general, student interactions in external corridors are higher than internal corridor but perceived negatively, being aimed to waste time or hide from classes. There are no patterns of self-directed activities which are not only dependent on high movements, but they also correspond to the furniture in space and the existence of supervision as portrayed in internal corridors and open studios during breaks (the next section 6.2.3).

While school regulations yield more movements along external corridors (than internal corridors), the main difference between both networks is the direction of flow rather than movement frequencies. Students travel in loops from the operable staircases, following a clockwise or counter-clockwise direction towards classrooms (through external corridors) or open studios (through internal corridors), as seen in the earlier figure 6.9. These movements are not natural nor fluid due to the direct connection between the staircases and the easier-to-access but less-travelled internal network, whereas the external network (declared as the main route) is further away, visually and distance-wise. This is indicated through the step depth analysis plotted from the central-left staircase on level 4 (figure 6.10). The internal network is one step away from the staircases, while the external network is two steps away (and some parts are three steps). Moreover, the internal corridor network is slightly more accessible than the external network as portrayed in the average visual mean depth (5.05<5.28). These spatial properties support the internal corridors as the closer and shallower natural movement route (as originally designed by the architect), unlike the travel scheme implemented by the management to restrain student interactions.

![Figure 6.10: Step Depth from Main Circulation Staircase towards Internal or External Corridors (A1)](image)

The imposed circulation routes (by the management) are against the natural movement which impact the student attitude. During circulation between classes, being forced to use the farther external network, students attempt to escape into the internal corridors, taking the shorter route to reach their classroom. They either succeed; or are opposed by a supervisor who turns them around to walk back and use the external corridor, even if they...
already reached their destination classroom. This is a redundant situation, recorded multiple times during observations. Additionally, there are few cases of students getting confused about which corridor to use, being unsure about the correct route to their destination. They are assisted by the corridor supervisor. Eventually, when the gateways are mechanically closed, few minutes after the circulation period is over (to isolate the running classes), some students (still on their way to classes) become frustrated and try to break through the door to reach the internal network. While letting the student through the natural routes might not be the best scenario (due to the expected distraction to classes in operation), the main issue is the initial design decision that rendered those corridors as natural student routes. The whole situation reflects the mismatch between the original design (which facilitates students taking the shortcut) and the management operations which do not want students circulating around other students in classes.

In B1, the situation is different, since upper-floor corridors do not accommodate student interactions, being already minimised by the isolated wing design, narrow corridors and cellular closed classrooms. Additionally, high congestions automatically inhibit interactions. Congestions result from two global circulation scenarios (i.e. across wings and across floors). Firstly, on level 2, the corridor shortcut crossing the theatre is permanently closed to minimise distractions, thus, forcing students to travel around the whole loop (figure 6.11). Secondly, and more importantly, on level 3, the original design disconnected the circulation of the two wings, since the design brief required two separate departments. In real life, students are not bound to classrooms of one department and still travel between the two wings. Students travel down the staircase one floor then move horizontally within the connected corridors of level 2, before climbing the staircase again to reach the opposite wing. These scenarios, especially the latter, multiply the distance travelled globally by students and more importantly add extra movement loads on corridors.

Figure 6.11: Circulation Closure Through the Theatre and Disconnection of Level-three Wings (B1)
The management interventions to regulate corridor movements are limited to asking students to walk on the left side to avoid frictions. There are no circulation changes, unlike A1 which had two corridor networks, hence, the opportunity to activate the external one. High congestions in B1 persist along student routes of level 2 and 3, especially in the south wings. These are more obvious on heatmaps of student concentration clouds (figure 6.12) which highlight congestions on level 2 and 3 but not level 1. Although level-1 movements (gates Ax2=154 and Az1=169) are denser than upper-level movements (level 2: Bx2=106 and Bz1=49; level 3: Cx1=34 and Cz2=27), the former movements (of level 1) signify minimal confrontation problems, due to the relatively wider corridors. Contrarily, Level-2 and level-3 corridors have sections of reduced width as a result of the floor vents implemented in the architect design to provide natural air and light into the double-loaded corridors. These contribute to the congestion challenges as described below.
Congestions inside wing corridors are natural inhibitors for any student interactions, while producing undesirable anti-social behaviours. They are explained through describing one incident of circulation between classes on level 2 (figure 6.13). Firstly, the school regulations require students to queue in front of their classroom at the session beginning which reduces the corridor width available for other circulating students. The corridor width is further reduced at certain segments due to floor vents, while student queues sometimes stretch around them. The design seems unaware of the queuing policy in operation, and the school does not shape their operation to fit the corridor design, thus, yielding a mismatch between the expected corridor function (easy circulation) and its actual operation (congested movements). Congestions are further amplified since circulating students (on level 2) are not only heading to local level 2 destinations. This links back to the global movements between
the disconnected level-three wings which forces students to travel down, circulate across level-2 wings, before travelling up again. Finally, the implementation of one-direction staircases (to avoid stairwell frictions; section 6.2.1) also adds extra load on the horizontal circulations. Students do not use the closest staircase but travel farther (locally within the wing) to reach the staircase whose direction suits their destination (up or down), thus, defying the design of two staircases per wing, originally intending to reduce travel distances.

In summary, in both schools (A1 and B1) short-period student interactions during circulation periods between classes are highly unfavoured by managements, whether facilitated (or not) by the original design. Building A1 offers possibilities for those interactions yet being inhibited by the management. They perceive interactions as distractions and alter the circulation hierarchy, where external corridors are declared as main student routes, thus, shifting dense movements away from internal corridors and open studios. Teacher supervision (at internal corridor portals) regulates this circulation diversion, filtering students (only targeting open studios) into the internal corridors; and ensuring that students move fast with minimal communications. Contrarily, external corridors are unsupervised, yielding higher and noisier communications. They are not perceived as positive interactions but mainly associated with procrastinations and hidings before reaching classrooms. The new circulation system is not fluid and defies the natural movement route, because external corridors are configurationally and distantly farther than the internal ones from the staircases, as the starting point of upper-floors circulation. This is expressed in student frustrations, attempting to escape into internal corridors, i.e. revert to the natural shorter route.

In B1, the upper-level corridor design does not promote interactions due to the isolated wing structure, closed staircases and narrow corridors. The school has other challenges regarding corridor congestions which are natural inhibitors of interactions and yield student frictions, especially on level 2. The corridor design amplifies congestions through floor-vents that reduce corridor width; beside the disconnection of level-3 wings which increases global horizontal travel distances within level 2 (being crossed by students on their journey to reach opposite wing on level 3). The management also adds to corridor congestions through closing corridor segments (at the theatre) and implementing one-way staircases which increase
corridor travel distances, alongside rules that require students to queue in corridors before sessions, minimising the net circulation width.

6.2.3 Popularity of Corridors for Student Self-directed Activities

Apart from the scarce short-period interactions as students circulate between class-times, corridors are popular student destination during breaks. Corridor popularity is not measured through quick student encounters between sessions but through the corridor capacity to accommodate long-period occupancies of student interactions and self-directed activities during breaks, i.e. the time and freedom for students to use corridors. Both cases (A1 and B1) are different. The former school (A1) provides more freedom to students to stay in corridors through lenient rules and less implementation of regulation by teachers. Accordingly, corridors are popular with patterns of student interactions and self-directed activities that emerge relative to the corridor design potentiality. Contrarily, the latter school (B1) closes most of its circulation routes and implements strict corridor regulations during breaks, yielding less activities, i.e. less popularity. Both scenarios are presented in the following discussion.

Figure 6.14: Closure of Internal Corridors During Break-times (A1)

In A1, the popularity of upper-level corridors is expressed through patterns of student interactions and self-directed activities, embraced by the student freedom to stay indoors (granted by the management), as long as they do not disturb classes nor misbehave. During breaks, circulation alterations are limited to mechanically locking segments of the internal corridors, only if there are sessions within the open studios (figure 6.14). This is a temporary termination of circulation, intended to reduce noises from movements and interactions, generated by students on break, while other students have classes due to the dual schedule (implemented to control students upon their growing population). Following the freedom granted to students, the spatial configuration of corridors and staircases plays a major role for the initiation of student movements and encounters within corridors, therefore, growing into interactions and further self-directed activities especially around empty open studios.

The role of the spatial configuration, to promote student interactions and self-directed activities, is not solely determined by the shallowness of upper-level corridors but the whole network. In fact, the sequence of events starts earlier on level 1 and 2 at the two operable staircases. They are very shallow in the school accessibility spectrum (VMD=4.32; lowest average in the school); and are located adjacent to dining units, i.e. house-bases of each student group. During breaks, students move easily from the dining units to the two staircases
(having open access granted by the management) and travel up to reach the highly accessible upper-floor internal corridors. In zones where open studios are empty, students (on break) stay in the corridors, the adjacent open studios and fewer incidents inside closed classrooms. These spaces are supervised by teachers from their opposite offices or other teachers working in open studios. This spatial scenario links back to high design potentiality for student interactions and self-directed activities (with one zone) in response to mixing functionalities of different types of learning spaces; and mixing formalities, where open studios function as informal learning spaces, while teacher spaces are allocated among student spaces for supervision and to yield student-to-teacher interactions (potentiality presented in chapter 4.15).

Alongside the high accessibility of the circulation network which drives students to upper corridors, the open studios are popular student destinations (attractors) which maximise the operation of the whole floor during breaks, as expressed in student questionnaires (appendix 13.7.5). 17% of A1 students favour open studios for intellectual activities; 16% appreciate the space for social interactions; 9% for quiet conversations; 16% to relax individually; and 7% want to eat there, despite being against regulations. In general, students understand the design potentiality of the open studios and their blended-in corridors which translate into appreciating the possibilities for interactions and self-directed activities, thus, yielding a popular space. This popularity possibly links to the teacher role who trains students to collaboratively use the open studios during formal classes. There are incidents where students do not leave to the playground after their class and spend most of their break-time in open studios.

The high accessibility of corridors and open studios, beside their popularity among students, contribute to high student occupancies of different activities. Although student interactions and self-directed activities spread on upper floors beyond the corridors, they are discussed as circulation activities. Their possibilities depend on and emerge from the network itself. Excluding terraces activities (presented in chapter 9), there are 13 variations of activities which classify into eleven categories (figure 6.15) according to the clustering of similar activities in one set (explained in chapter 5.1.2). Interactions are the most frequent activity category (37%), followed by intellectual activities (revision 14% and studying 9%) and spending alone time (11%). There are less percentages of performances (1% dancing) and praying (1%), alongside other activities disapproved by teachers, such as misbehaviours (using mobile phones 3%; spraying water 1%), fighting (1%) or indoor playing with a ball (1%).
The dispersal of interactions and variation in self-directed activity types (in corridors and adjacent spaces) is dependent on the furniture setup and spatial configuration, after getting permission from a teacher. Firstly, self-directed activities correspond to the furniture setup (tables, chairs and steeped seating in studios; sofas in corridors) which renders certain spaces as student attractors, hence, the main reason behind denser student occupancies in internal corridors than external ones (apart from terraces which are also attractors described in chapter 9). Moreover, students decide their locations according to the spatial configuration (shallow or deep) which matches their preferences of the desired level of vibrancy or quietness, relative to the activity type. The research has already established the significant variance (p-value<0.001) in the configurational accessibility of each type of activity in school A1 (chapter 5.2). The average accessibility of each activity (in corridors and surrounding upper-level spaces) is compared in figure 6.16, where the visual mean depth is plotted on the Y-axis, displaying the full accessibility range for each activity; and the colour gradient represents the frequency of activity occurrence at each accessibility value. The following discussion elaborates on all activities.
Interactions (grey dots; figure 6.17) are very popular within internal and external corridors and open studios (37% of total activities; earlier figure 6.15) which explains their widest range of accessibility (4.6 - 6.4; figure 6.16) among all activities. Students do not intend to hide as reflected through their high accessibility average (second lowest VMD; 5.32) and the darker colour gradient towards the shallower end of spectrum (figure 6.16). Possibilities for interactions, through the design potentiality, translate into actuality of social groups in front of the staircases, at the linkage between internal and external corridors (highlighted in red frames on figure 6.17) which have certain characteristics that attract students. Those spaces are highly accessible within each floor (VMD=4.76) which facilitates student encounters with passers-by (in corridors or coming from staircases), thus, to further grow the social group. Moreover, these areas are intermediate spaces, not fully indoor where noise resonates to reach teachers nor fully outdoor without a covered roofing which is inconvenient on cold, windy or rainy days. Furthermore, the spaces are confined which provide a degree of privacy to the students. They are not visible to teachers who stay indoors, but once seen by a walking supervisor, students start moving towards the external corridors (where their presence is permitted at any time).
As for student intellectual activities (orange dots; figure 6.17), they similarly exhibit a wide range of accessibility, especially revision groups (VMD 5.0 - 6.6), relative to the student preferred level of quietness and the intended degree of mixing with other students while studying. For instance, students occupy the shallow open studios for collaborative group work which is entangled with socialisations within the study-group or with other passers-by in corridors (figure 6.17). Different students use the deeper closed classrooms for quieter focused studying (in groups or individuals), and few students stay to revise in the corridor itself (far west-end of level 4). Similar to quiet studying, students seek isolation typically inside classrooms, as agreed by the teacher, to play chess (yellow dots on figure 6.17; VMD=5.78; 4th most segregated activity), pray (turquoise dots on figure 6.17; VMD=5.80; 3rd most segregated) or dance (pink dots on figure 6.17; VMD=5.87; 2nd most segregated). All these activities match the design potentiality suggested in chapter 4.1.4 for A1 and summarised in this chapter (6.1) which proves how the design triggers certain possibilities, when free movements and occupancies are granted to student.

Whilst the aforementioned self-directed activities (whether shallow or deep) have approvals and supervision from teachers (occupying offices, open studios or corridors), other antisocial activities emerge, as students seek disappearance, either through configurational isolation or through occupying locations with no supervision. For example, the most segregated activity (VMD=6.1) is an incident of students screaming and spraying water at the toilet corridor.
Students were caught by one teacher who didn’t see them but actually heard their noises. Furthermore, students used their phones when teachers are not around or started physical challenges in the unsupervised external corridors. There are other activities considered as misbehaviours, since they occur inside the building (not the playground), for instance, playing with a ball in a hidden corner of the open studio.

Alongside activity variation, student distribution across open studios and their frontage corridors has different concentrations within the same level, although the three open studios (per floor) look similar in furniture. Even for the same activity, student behaviours change across the open studios as observed during fieldwork, despite similarities in their accessibility (VMD eastern studio=5.51, central studio=5.18 and wester studio=5.30). The main difference is due to the design of the stepped seating in the middle of each open studio, defined by the school as the forum space. The back support of the stepped seating in the western studio (figure 6.18) is low in height which maintains visual connection between the external side, having the corridors, teacher offices and classrooms, towards the inner seating. Contrarily, the back support of the furniture piece in the eastern and central open studios is high enough to block visibility towards the inner side, as illustrated through the teacher isovists from corridors (figure 6.19).

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13 Isovists are drawn from teacher standing locations with a visibility angle of 170 degrees, mimicking their field of vision.
While accessibility is even for the three studios, variation of furniture types impacts visual fields as revealed in the visibility analysis of level 4 (figure 6.20). The western forum space (with low-back furniture) is highly visible (lowest VMD; 2.67) in comparison to the central forum (3.40) or the eastern one (3.89) which both have high-back supports. The differences in visibility impact the teacher supervision either from the corridor or the opposite teacher office. There are certain pocket spaces (hiding spots) for students which are blind spots for teachers, for example, various spots behind the whiteboard panels and more importantly the stepped seating forum space of the central open studio on level 4 (figure 6.19). Accordingly, teachers minimise student presence in this forum space, even if it has no classes. This explains its low student occupancies and consequently lower occupancies in its frontage corridor. Teachers occasionally allow some students in the eastern forum while accompanying them for tutorials.

In general, students appreciate the favour granted by the school, allowing them indoors (not in the playground) during breaks, except for scarce student misbehaviours (5%). The overall upper-level atmosphere (levels 4 and 5) is quiet. Students avoid making loud noises which
yield teacher interventions and demanding them to leave to the playground. This is reflected on the student group formations within the internal corridors and open studios which is more inclined towards smaller groups (e.g. a study group of five students) or individuals, unlike larger groups that occupy the external corridors. This is illustrated in figure 6.21 which portrays the frequency of each group population in different areas of level 4 and 5; the darker the gradient the higher the frequency of that group size (logged graphed to highlight all variations). At the same time, the nature of group activities (especially in the open studios) is mostly quiet, such as intellectual activities or discrete private interactions (blue frames on figure 6.22).

![Group Population vs. Location in Level 4 and 5 (School A1)](image)

*Figure 6.21: Frequencies of Group Population on Upper Floors Spaces (A1)*
After exploring A1, circulation corridors of B1 are presented which exhibit less popularity as student destinations during breaks (than A1). This corresponds to their lower design potentiality due to the isolated wing structure, narrow corridors and cellular classrooms, while the management regulations strictly inhibit corridor occupancies, hence, embracing the design. Consequently, student self-directed activities are completely eliminated from corridors and adjacent spaces (during breaks). Nevertheless, interaction patterns, which are less than A1, persist to occur around the centralised resources (dining spaces) and fewer cases inside the corridor wings, as described below.
To inhibit possible corridor interactions during breaks, the management locks level-1 accesses to wing corridors and all subsequent destinations including the staircases. They attempt to secure a quiet environment for classes taking place according to the dual schedule. The only open vertical core is the dual-direction staircase (marked yellow on figure 6.23), accessed from outside the north wing. It is kept open to connect to level-2 library (elaborated in chapter 7). Wing closures are achieved through staff supervision at the entrance of each corridor gateway. Accordingly, the school minimises movements during breaks as illustrated in the low student-counts (during break-times) at gateways Ax2=6 and Ax3=3 of the north wing and Az1=5 and Az3=1 of the south wing (figure 6.24), compared to other gates leading to operable spaces (e.g. towards the playground; Av1=32, Ay3=20 and Ay4=36). The counts of passers into wing corridors do not reach zero (aggregate 15 student), because students, after taking permission, enter both wings to use their lockers which are situated along the corridor walls (adjacent to classrooms). During these incidents, few interactions emerge between students, characterised as discrete conversations. They reflect the student eagerness to stay in the quiet private space, unlike the busy and loud dining area or library.
Apart from scarce interactions inside the closed wing corridors, more frequent and longer-induration interactions happen along the highly accessible corridors around level-1 dining spaces (highlighted in yellow; figure 6.25). These corridors are kept open by the management to serve the dining area. The popularity of these corridors matches their high potentiality for mixing students, resulting from the building typology of wing structure that bring students into centralised resources, as previously elaborated in section 6.1 (and introduced in chapter 4.15). These corridors connect the flow from both wings towards the dining area, as a centralised resource, i.e. an attractor to all students. Nevertheless, interactions, although being of long durations, do not grow into self-directed activities within these corridors because of supervision. Teachers ask students not to stay there; either sit in the dining, start queuing to the kitchen or go to the playground. Self-directed activities actually take place inside the dining spaces itself, being overlooked by teachers (although against school rules) as discussed in chapter 8.
The eastern corridor segment 1 (green frame; figure 6.25) runs north-to-south, dissecting the space into an open-plan dining area and a closed dining unit. It collects students who come from both wings and others who transversely cross-pass the open dining area to the closed unit (or vice-versa), hence, mixing students within a wide-enough corridor and yielding interactions. Students (passers-by or standing in the corridor) communicate together or with others sitting in the open dining. Moreover, the queuing segment 2 of the corridor (black frame; figure 6.25) is highly packed (highest student concentration recorded in the school), with students standing in lines to be served at the kitchen. Interactions are portrayed as noisy student communications, while teachers attempt to organise the process. The other corridor segments (3 and 4; red frame on figure 6.25) are the return way from the kitchen, having less student interactions and faster moving pace (while carrying a tray) towards an empty table. Dining spaces are thoroughly discussed in chapter 8.
On level 2, another shallow corridor loop has similar potentiality to mix students who are attracted towards another common resource, i.e., the library. Students meet along the vibrant eastern segment which is the route between both wings (highlighted in yellow; figure 6.26). The opposite western segment (highlighted in grey; figure 6.26) is almost empty, being away from busy wings and avoided by students for its proximity to teacher offices, mainly the principal room. Within the eastern corridor segment, students interact in small groups while travelling to the library. The potentiality for interactions and self-directed activities is further maximised through the break-out space, designed by the architect as a seating corner off the corridor segment (pictured in figured 6.27; blue framed on figure 6.26). However, following regulations, students are restricted from using the break-out space. It is supervised by the librarian who sees the space from inside the low-partitioned library. The amount of signage and strict penalties (figure 6.27) reflect the management eagerness to inhibit its popularity and change the student behaviours from using this space. The management is eventually successful considering the zero recorded occupancies in the break-out space.
Whilst the break-out space is empty, interactions propagate towards the south-end of the same eastern segment, where students socialise in small groups around the lockers (purple frame on figure 6.26), similar to level-1 wing lockers but more frequently and relatively less discrete. Loitering at the locker space (next to the closed south wing) is popular for two reasons, despite being against the rules. Firstly, it is hidden from the librarian supervision who cannot see the lockers from the library. This is unlike the break-out space (with no interactions) or the bag storage area at the library entrance (with less interactions), where both spaces are visible from the low-partitioned library, hence, supervised by the librarian. Secondly, students have a stronger alibi at the locker space. They pretend to use their lockers (although they are just chatting), thus, escaping the loitering penalty if seen by a teacher. This scenario does not apply at the break-out space which provides no reason for the student presence; nor at the bag storage which, despite having high occupancies, is very close to the librarian. The student eagerness for corridor interactions, although being a risky situation, signifies their interest to stay in corridors and the slight degree of corridor popularity (still lower than A1). This is expressed in the student questionnaires, where 5% favour group interactions in corridors, and 35% appreciate corridors for quiet conversations with a friend.

In summary, the corridor popularity (during breaks) is expressed as recorded patterns of interactions (in A1 and B1) and self-directed activities (only in A1), while the student appreciation of corridors is illustrated through their questionnaire answers on their favourite interaction locations. Corridors are the quiet indoor destination away from A1’s overly crowded playground or B1’s congested dining area and library. Student occupancies in A1 corridors is permitted by the management during breaks which yield interactions, densified within the internal corridors (than external ones). Interactions disperse along corridor intersections with staircases, growing into collaborative intellectual activities towards the shallow open studios. Focused studying happens inside closed classrooms; the same for performances and spiritual activities which also seek isolated locations. Self-directed activities vary in their types according to the spatial configuration, furniture setup and student
preferences. All activities have consent from teachers, except for misbehaviours which seek segregated locations while hiding from supervision.

In B1, the only permitted form of corridor interactions happen within the configurationally shallow circulation loop around the centralised resources, i.e. level-1 dining spaces or level-2 library, which both attract students and trigger their encounters, mixing and interactions. However, B1 regulations inhibit interactions within wing corridors which are closed during breaks, as student occupancies are prohibited (to avoid distracting the running classes). Still, the corridor popularity as a quiet destination (although being lowered) leads to patterns of interactions at the lockers. Interactions are fewer within the supervised wing corridors (level-1 lockers) and slightly denser in the unsupervised corridors (level-2 lockers). Student interactions in those locations depend on securing an alibi (using the locker), in case students are seen by a teacher. Still, interactions, being discrete and hiding from supervision, do not grow into collaborative intellectual self-directed activities. Despite the high potentiality for activities in certain locations, such as the break-out space along the corridor between level-2 wings, the management restricts its student occupancies, being monitored by the librarian.

In the end, both schools have signified a degree of corridor popularity (varying from A1 to B1) for student interactions and self-directed activities. This brings in the concept of affordances to summarise how the spatial design affords possibilities for activities within the school circulation spaces, as presented in the next section.

6.3 Affordances of Circulation Spaces

The affordances of circulation spaces are the product of the circulation design potentiality and operational factors, both yielding an actuality of occurring student learning practices. Circulation affordances are possibilities for student interactions and self-directed activities in corridors and at staircases. They are derived from the architect’s original design; yet, affordances only translate to actuality, conditional to the operation schemes of circulation regulations, management configurational alterations to circulation routes, teacher supervision and student preferences.

Considering the school design, configurational accessibility of corridors and staircases is the prime contributor to the student learning practices in circulation spaces. Movements are triggered along highly accessible routes, bringing students together and increasing their possibilities to mix, interact and do other self-directed activities. Simultaneously, spatial functions (e.g. dining spaces and libraries) are student attractors, thus, activating certain routes (regardless of their configuration) towards those attractors. Contrarily, configurational segregation reduces the possibilities for encounters and subsequent interactions or activities. Eventually, corridors are mostly the incubators of interactions and self-directed activities, while staircases contribute to initiating those patterns or accommodating fewer patterns inside the stairwell (for open-plan staircase; not the vertical core of A1 nor B1).

The aforementioned spatial properties define the holistic understanding of the circulation affordances (through configurations and functions). Nevertheless, further analyses provide deeper insights on how corridor networks and vertical cores trigger or restrict, i.e. afford, student interactions and self-directed activities. While interactions grow as a consequent of
movements, linked to shallow circulation spaces or vibrant routes towards attractors; yet, movements do not automatically guarantee interactions nor self-directed activities. Their occurrence is a multi-faceted process, influenced by multiple parameters, such as the width of corridors; the allocation of staircases; the configuration (and function) of the destinations around circulation spaces; and the furniture of the corridor interior design and furniture. These parameters are discussed below.

For instance, the corridor width and the allocation of vertical cores determine the movement threshold as the first condition for interactions to emerge. Optimal student distributions are initiated from multiple staircases towards wide-enough corridors that are not narrowed by physical obstructions (e.g. B1 floor vents) nor student static queues. Keeping movements below the threshold affords a vibrant yet safe environment, where students (if allowed by the management) meet and mix as they move (or stop moving). However, exceeding the movement threshold produce undesirable congestions which are natural inhibitors of interactions due the spread of student antisocial confrontations and frictions. This forces the management to intervene to regulate movements which is commonly accompanied by restricting interactions (e.g. B1 corridors). Even if antisocial behaviours were avoided, still, excessive movements are noisy and are recognised by school managements as distractions, hence, inducing interventions to prohibit interactions (e.g. A1 internal corridors).

Whilst keeping movements below the threshold is required as an initial step, the spread of student interactions equally depends on the configuration of spaces around circulation. Long narrow corridors, connected to a low count of closed spaces (e.g. A1 external corridor) or a high count (e.g. level-1 wing corridors in B1), have optimal movement loads (not exceeding the threshold) which secures a safe uncongested environment with no student frictions. However, those corridors do not afford positive student interactions which are limited to procrastinations and hiding away from classes (in A1) or non-existent (in B1). Contrarily, open spaces that blend into corridors provide an informal environment (mainly during breaks), where interactions develop among passers-by in the shallow corridors or mixing those passers-by with other students occupying the open spaces, mostly for short incidents between classes or during breaks. This is portrayed in A1 internal corridors and open studios which receive student streams from the staircases. It is also portrayed in B1 boundary-less dining corridor and the library corridor with a break-out space, although the latter space is closed by the school management.

The aforementioned spatial requirements afford the initiation of student interactions. Still possibilities for longer student occupancies of self-directed activities, i.e. corridor popularity, is related to the available furniture within the break-out spaces or within the open studies that connect to corridors. Similar to certain spatial functions being attractors for student activities (e.g. eat in dining spaces), the furniture setup is perceived as micro attractors, corresponding to the type of student activity. The furniture setup is possibly of the whole interior space (e.g. the large stepped seating in A1’s open studios) or down to the scale of single chairs or tables (also in A1’s open studios or B1’s break-out space). This explains the spread of self-directed learning (especially intellectual activities) in A1 popular open studios, following interactions initiated from internal corridors. The spaces comprise different types of furniture, affording different seating postures and various group formations (or individual
studying and relaxation). The same potential exists for B1’s smaller break out spaces with built in benches and small tables (although being closed by the school).

While spatial parameters define the circulation potentiality, it only translates to actual interactions or further activities in response to management regulations and alterations of the circulation configurations. Regulations render a controlled environment with less interactions; or diverts existing patterns from the original design potentiality. It is achieved through strictly terminating vertical cores (e.g. A1 three staircases; during the whole day) and closing down horizontal routes (e.g. B1 wing corridors; during breaks). It is also achieved through less drastic changes, like changing the hierarchy of circulation routes (e.g. promoting A1 external corridors over internal ones) and imposing directions to movement streams (e.g. B1 one-way staircases). Nevertheless, when regulations stand against natural movements derived from configuration (e.g. both management asking students to take the farther or deeper route), they are prone to be disregarded, unless supported by strict supervision (e.g. A1 internal corridors) or penalties (e.g. B1 break-out space). Yet, with less supervision, students struggle to follow imposed circulation regulations, because the natural routes are shorter or more accessible. The design reverts to its natural operation, as A1 student prefer the internal access to classrooms (instead of the imposed external route); or B1 students use the closest staircase regardless of its travel direction.

Alongside the role of management, student preferences contribute to circulation affordances. The corridor design offers possibilities for movements, interactions and self-directed activities which, even if allowed by the management, only happen according to student decisions following their preferences. In a free movement environment, students choose their travel routes, their final destination and their self-directed activities which by definition provide a degree of student autonomy (unlike teacher-driven activities). In a simple example, not all of A1 population use the shallow internal corridors and open studios for interactions and self-directed activities, but students also occupy other spaces according to different preferences, for example, the library, dining spaces and the playground as seen in next chapters. Moreover, student preferences are clearly distinguished in scenarios where students unfollow rules to pursue their desired interactions, as portrayed in B1 students reaching for the closed corridors with an alibi to use the locks while aiming for quiet conversations.

In summary, affordances of circulation spaces for student interactions and self-directed activities are impacted by the design potentiality and managerial schemes. Affordances are primarily shaped through the spatial configuration and functions which activate certain spaces as vibrant circulation, either through configurational shallowness or routes towards functional attractors. Affordances are further moderated through the management which alters the building configuration and movement routes; or the students whose preferences decide where they go and what they do. Accordingly, the actuality of the school operation diverts from the potentiality offered through the spatial design. Whilst configuration is the prime contributor, the translation of movements into interactions corresponds to further design factors. Firstly, the corridor clear width and staircase allocations determine the movement threshold. Exceeding this threshold produces congestions which inhibit student interactions and yield antisocial frictions. Nevertheless, maintaining a vibrant environment with no congestions nor frictions is yet to be complemented by the configuration of the surrounding space that complete the spatial requirements for corridors to afford interactions.
Open spaces around corridors allow students to mix, form groups and interact under teacher supervision. Otherwise, unsupervised corridors (serving closed spaces) yield undesired procrastinations and students hiding from classes. Finally, the existing furniture guarantees the transition from just instant interactions into long-period self-directed activities, i.e. popular corridors.

6.4 Summary of Studying School Circulation Spaces

Circulation design comprises the allocated staircases and the stretching corridor network which compose 13%-20% of the school area. The relatively high percentage is the first indication of the circulation potentiality to accommodate student interactions. This potentiality is maximised, since circulation spaces have significant configurational properties, being highly accessible, thus, possibly promoting student movements, mixing patterns and encounters which are the seeds that trigger student interactions and self-directed activities. Circulation potentiality is further maximised (or inhibited) according to building typologies. Compact buildings either comprise closed staircases, narrow corridors and closed spaces which inhibit mixing; or corridors blended into open spaces which maximise mixing and interactions. Centralised resources (with wing structures or clusters) attract students around common resources (e.g. dining areas), accommodated through wide vibrant corridors, hence, high potentiality for global student mixing during breaks. Local wings are more isolated with less movements, unlike the cluster design that attracts students in the local courtyard, reviving local departmental mixing, interactions and possible self-directed activities. Finally, campus environments trigger in-between building circulation along shallow routes with high potentiality for student interactions and self-directed activities.

The actuality of circulation spaces to accommodate movements and interactions diverts from the aforementioned potentiality scenarios. Managements perceive corridors as routes and interactions as distractions. Accordingly, they alter the building configuration to inhibit interactions (e.g. divert student routes). The new system yields no interactions, conditional to strict supervision. Still, some regulation, being against the natural movement routes, are occasionally unfollowed by students, while the lack of supervision in some new routes produce negative interactions of procrastinations. Moreover, interactions are automatically inhibited due to congestions, resulting from the original design (e.g. disconnected corridors and floor vents that reduce corridor width); management regulations (e.g. changes in routes and queuing policy at classes); or simply the overgrowing school population. Congestions cause antisocial confrontations which influence managements to regulate movements through further regulations (e.g. one-way circulations) to minimise frictions. Concerns remain in certain spaces where confrontations are un-avoided (e.g. staircase portals).

The popularity of corridors during breaks (as a student destination) for self-directed activities is either minimised due to strict regulations (e.g. locking down corridors and loitering penalties); or maximised in response to natural movements along shallow corridors. In the former scenario, regulations do not fully inhibit corridor activities, as students persist to socialise in corridors away from supervision, especially at spaces that provide an alibi to stay in corridors (e.g. lockers). In the latter scenario, when students are granted freedom, they distribute within shallow corridors, where short and long-period interactions densify, and longer occupancies of self-directed activities grow towards open studios. Activities diversify
according to the student preferences and the spatial configuration. Collaborative intellectual activities spread within accessible vibrant spaces, while quieter focused studying occurs in deeper classrooms which also accommodate students who seek isolation to perform or pray. While those activities emerge with teacher consents, misbehaviours seek segregation away from supervision.

In the end, multiple parameters shape circulation affordances for student interactions and self-directed activities. The spatial configuration renders shallow vibrant routes, bringing students together to mix, similarly achieved through functional attractors. Then, corridor typologies further maximise or inhibit movements. While interactions happen where movements exist in space, interactions are not only shaped by movements. Accessibility shapes movements but does not dictate interactions, because co-presence does not lead automatically into mixing patterns unless certain criteria are fulfilled. There is a movement threshold, shaped through corridor width and staircase allocation. When it is un-anticipated, dense movements yield congestions and antisocial frictions. Movements, if lacking supervision, yield negatively perceived procrastinations. Co-presence only leads to learning interactions when movements resonate from staircases into corridors and open spaces, all providing a suitable environment for student mixing, socialising and interacting. Then, it is the role of furniture setup to nurture interactions into self-directed activities. Still, not all spatial possibilities translate into actuality of occurring learning practices; being conditional to management alterations that control movements and inhibit interactions; or student preferences to pursue self-directed activities.
7 School Library Spaces

Acknowledging learning as a social process beyond formal teaching events, school libraries have an important role to accommodate student self-directed activities, especially intellectual ones, such as reading, studying, revising, drawing beside interactions. In this research, school libraries are studied for their potentiality and actuality of promoting student learning practices during break-times. Nevertheless, similar to other informal spaces, the operation of school libraries diverts from the original design based on multiple factors, such as changes in the student routes, supervision patterns and library regulations which all redefine the actual student practices of interactions and self-directed learning in the library.

While other informal spaces, such corridors, dining areas and the playground, are main components in every school building, the library is only allocated in some secondary schools and missing from others. The school library is perceived as a school ‘luxury’, as described by a staff member during one management interview (appendix 13.5.4), since it is not a constant component in every school in the UK. Out of the eleven cases studies in this research, only seven schools have an allocated library space.

This chapter begins with analysing the design of school libraries based on the seven libraries (from eleven cases) in order to define the library potentiality for learning practices based on the library configuration, allocation and area (section 7.1). The chapter proceeds to present the library actuality due to changes in building operation which diverts from the original design (section 7.2), thus, impacting the patterns of student mixing and encounters at the library (section 7.2.1); impacting the popularity of the library for long-period occupancies of diverse self-directed activities (section 7.2.2); and impacting the student group formations inside the library (section 7.2.3). After presenting the library potentiality and actuality, the research defines the library affordance for student interactions and self-directed activities (section 7.3). The chapter summary is section 7.4.

7.1 The Design and Potentiality of School Libraries

The school library is designed as a learning hub that attracts students, as described by the architects and teachers (interviews; appendix 13.1.5/13.6.4). The seven schools which have a dedicated library space (of eleven cases studies; from architect A, B and C projects), signify the library prominence in terms of its spatial configuration, size and relationship to the surrounding corridors. These parameters shape the potentiality of the school library for student interactions and self-directed activities, as discussed below.
Figure 7.1: Accessibility of Library Spaces, Compared to Other Functions

The school design yields the configurational properties of the library which impact the student movement patterns, hence, the potentiality for encounters and interactions at the library space. There is a significant variance in the accessibility of each spatial function (P-value<0.001; for all the case studies), such that libraries are mostly within the mid-range of each school accessibility spectrum (marked red; figure 7.1). Libraries are deeper than other informal spaces (e.g. the playground and dining areas), yet, shallower than all formal classes and studios. This configuration, i.e. not being among the shallowest spaces, is heavily impacted by the library allocation on upper levels, except library C2 which is relatively shallow on level 1. While libraries are not highly accessible, the three architects ensured positioning the library along one of the main student routes on the upper floors, except for library A1 which is of a branching corridor (figure 7.2). Students cross by the library along their daily circulation, even if it is not the shallowest route, thus, maximising the potential co-presence at the library space. Then, it is the role of the library design, being large and porous as discussed below, to attract students inside, thus, increasing their interactions, while the library interior design influences their activities.
The school library has high potentiality for student interactions and self-directed activities. Firstly, it is an attractor for a group of students who target the library for their activities during breaks regardless of its design. At the same time, the library is a porous space which invites students (passers-by) inside. High porosity facilitates the transition of student streams from the main corridor into the library, therefore, maximising possible interactions and subsequent self-directed activities. This is achieved through an open-plan layout, where the library blends with the main circulation corridor (e.g. B1, B2 and B3; figure 7.2). Porosity is also maximised through a closed-plan library with multiple gateways (e.g. A1); a glass frontage that exposes the inner activities (e.g. A2 and C2); or both features combined (e.g. C1). Moreover, the library has a large area to accommodate for the co-presence of a large portion of the school population at the same time during breaks (if compared to typical classrooms). In fact, it is averaged as the fifth largest functionality (as a singular space) in the school, deduced from the significant variance (P-value<0.001) in the areas of different functions in all the studied schools (chapter 4.14).

In summary, the spatial design of the school library defines its potentiality for student interactions and self-directed learning. Although the library configuration is not highly accessible (mid-range accessibility; yielding less natural movement), its positioning along one of the main student routes maximises movements and encounters proximate to the library which guarantees higher mixing patterns and student interactions around the library. Movements also happen towards the library as an attractor for some students (regardless of configuration). Then, the library porosity (through an open-plan layout or multiple access-gateways) invites students inward and allows mixing between passers-by and occupiers.
Finally, the size area of the library, as a large area, facilitate the accommodation of large numbers of students at the same time during breaks.

7.2 School Library Actuality vs Design Potentiality

School libraries are designed as interactive spaces for individual and collaborative student activities. Their spatial potentiality varies depending on the aforementioned spatial parameters (section 7.1). Yet, potentiality is also defined through the furniture setup whose impact is only revealed through zoomed-in studies of the library interior design (upcoming for A1 and B1). Nevertheless, the library potentiality is altered through school operational schemes of supervision, regulations and student preferences which filter out (and in fewer cases increase) possibilities for learning practices, to yield the actuality of student interactions and self-directed activities. Firstly, the design and regulations impact the short-period student encounters (and possible interactions) around the library space (section 7.2.1). This is different from the library popularity among students which is evaluated through their long-period occupancies of self-directed activities (beyond instant encounters), being impacted by the interior design and the librarian supervision (section 7.2.2). The library furniture and the degree of student freedom (vs the librarian control) also impact the student grouping and sitting patterns inside the library (section 7.2.3). These are all presented in the following discussion for library A1 and B1.

7.2.1 Student Mixing and Encounters at School Libraries

The design potentiality to induce instant encounters and mixing patterns at the library (which yield subsequent student interactions) is different in school A1 than B1 due to variations in movement patterns which are primarily shaped through the building configuration but further altered according to the management regulations. The former library (A1) has lower student mixing patterns than the latter (B1) as discussed below.

Figure 7.3: Library Location, Movement alterations and Gate-counts (A1)
In A1 library, the possibilities for student encounters are reduced due to its spatial isolation, while the management diverts student routes from the library. Firstly, although being in the mid-range accessibility (VMD=5.02), the library is configured as a cornered space off a secondary branch from the main student route (figure 7.3). It is hidden with no corridor frontage, since the main entrance is recessed between a staircase and an elevator. Consequently, A1 library is isolated as reflected on the low student movements at its main gate (Bx1=24), compared to B1 library (count=62)\(^{14}\). Moreover, the management further reduces possibilities for student mixing by diverting movements away from the library. They close level-2 internal corridor (pink route; figure 7.3) for student-access, by terminating the south-east staircase (highlighted red on figure 7.3; discussed in circulation chapter 6.2.1). They also close the surrounding gateways, including the second library entrance (Bx2). These changes are intended to inhibit the student circulation within the space adjacent to the library to provide teachers with privacy, upon assigning the room as their office (due to shortage of their spaces; teacher interviews appendix 13.6.4). This internal route and the second library entrance originally compensated for the library isolation, through possible cross-library movement streams that maximise student encounters inside the library. In operation, they are terminated as reflected in gate-counts (Bx2=1). The single incident of student crossing was with a written teacher permission.

As for B1, the design has higher potentiality to induce student encounters around the library. Although B1 library is relatively segregated (VMD=6.18; highest of all libraries), the design centralised the space with frontage over three main corridors of which one route is highly important, connecting both wings on level 2 (navy route; figure 7.4). This configuration brings students (passers-by) around the library space which maximises their encounters (and

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\(^{14}\)Comparing A1 and B1 gate-counts is possible since both schools have similar total population, and both schools implement dual schedules of two breaks, separating upper and lower secondary students. Hence, the student population of each school in one break is similar to the other.
possible interactions). There is a student habit of walking by the library and stopping to see if their friends are inside. Passers-by see the library interior from two corridors, courtesy of the semi-open library plan (highlighted orange on figure 7.4). The side along the main corridor (north-to-south wing) and the side of the library entrance, both, visually connect to the library interior and its occupiers through short partitions or bookshelves (figure 7.5).

B1 management regulation, although being strict, works in the favour of the library operation to facilitate student mixing around the library. Wing corridors and staircases are locked shortly after students leave their classrooms to start their breaks (chapter 6.2.3), except for one staircase (marked green; figure 7.4) that connects students between level-1 dining area and the upper-level library. These alterations reduce the available corridors (and standing locations) to areas around the library which is vibrant with encounters. Students have a quick conversation around the bag storage area opposite the library entrance (marked brown; figure 7.4) which is busy as illustrated in gate-counts (By2=62 on figure 7.4; higher than A1’s entrance count of 24). Students then shortly move into the library (if notified by the librarian); or leave to the dining area and come back later to pick up their bags. The management also closes the break-out space adjacent to the library (marked grey on figure 7.4; elaborated in chapter 6.2.3) which pushes students towards the library frontage to avoid loitering penalties. The corridor between both wings (left picture of figure 7.5) accommodates student movements and encounters (By3=37), less than the main library entrance (By2=62; pictured right of figure 7.5) but still higher than A1 library gates (count=24). These patterns reflect how the atmosphere around B1 library is more vibrant with mixing and encounters than A1’s.

In summary, A1 has lower student encounters and subsequent interactions around the library than B1. While both libraries are of mid-range accessibility on level 2, A1 is relatively isolated away from the student main route, whereas B1 is allocated along the busiest route between wings which maximises encounters and interactions outside the library space. Additionally, different building operational schemes further impact student interactions around the library.
Management A1 alters the student routes by terminating the library as a through-movement route along the school’s internal corridor. This amplifies the library segregation, decreases its porosity and diminishes possible encounters between passers-by and occupiers. A1 library is rendered as a quiet space. The scenario is reversed in B1, where the management maximises student encounters around the library. They close wing corridors and consolidate movements towards the library, while the library’s open-plan layout connects passers-by and occupiers. Hence, the library is activated as a prime destination with a vibrant surrounding atmosphere with maximum student interactions.

7.2.2 Popularity of the Library for Student Self-directed Activities

The library popularity is expressed through long-period student occupancies for various learning practices. The potentiality and actual operation of the library to promote instant student encounters (discussed in the previous section 7.2.1) contribute to bringing students into the library. Nevertheless, the degree of popularity is determined through the design potentiality to accommodate student self-directed activities beside their interaction patterns for long durations, beyond instant encounters. These learning practices are impacted by the library furniture types and the interior layout which define the interior spatial configuration. Still, the actuality of self-directed activities diverts from the library potentiality, being shaped through the librarian input on activities, their supervision patterns and regulations. The spatial and operational parameters of A1 and B1 libraries are elaborated below.

![Figure 7.6 Aggregated Student Occupancies in the Library (A1 vs B1)](image)

Library B1 is more popular among students than A1. It is illustrated through higher B1 occupancies during break-times, yielding a vibrant atmosphere compared to A1’s quieter library with less occupancies (figure 7.6). The maximum recorded count of students at once in A1 library is 30 students, yielding a density of 0.27 student/m² (one student in 3.7 metres). This is lower than B1’s record of 88 students at once\(^\text{15}\) which yields a density of 0.62 student/m² (one student in 1.61 metres). Higher B1 library occupancies (and densities) result from the space being the only indoor destination open to students during breaks beside the dining space which is more crowded (chapter 8). Contrarily, lower occupancies in A1 library

\(^{15}\) The maximum occupancy is the highest count of students in the library at any time during one lunch session, not the aggregate of the two consecutive lunch breaks.
result from the student dispersal over multiple indoor destinations, such as the upper-floor internal corridors and open studios which are highly favoured by students (chapter 6.2.3) beside the dining units. In A1, the library occupancy is mainly represented through a group of loyal library students who visit the space for similar activity patterns every lunch break. This group also exists in B1 but is diluted among higher frequencies of changeable students who visit the library to stay with friends, socialise or do different activities according to the librarian input (as elaborated later).

The higher popularity of B1 library (than A1) is also illustrated through student preferences obtained from their questionnaires (appendix 13.7.5). Only 4% of A1 students\(^{16}\) prefer the library as a vibrant social space; 12% for quiet conversations (between two friends) and 31% to stay alone and relax. The percentage increases as the type of activity becomes private, reflecting the overall quiet atmosphere. Yet, all A1 percentages are less than records from B1 questionnaires (10% social interactions; 21% quiet conversations and 55% staying alone), portraying a higher B1 student interest in the library space. B1 students are also keener on doing intellectual activities (e.g. read, write, study) in the library than A1 student (62%>53%). Finally, students input their weekly library visits and the duration spent there\(^{17}\). Compiled data suggests that a single A1 student spends 38 minutes/week (on average) in the library, compared to the higher average of 62 minutes/week for B1 students, although B1 lunch break (30 minutes) is shorter than A1’s (50 minutes). In other words, it is calculated that one A1 student spends 15% of their weekly lunch time in the library, unlike one B1 student who spends more time (41% of their weekly lunch time).

The less popularity of A1 library yields a quieter environment which is embraced through the interior design of the library, whereas B1 library layout matches its vibrant atmosphere as a highly popular destination. The interior of each library is studied through visibility analysis. The visibility model is defined through boundaries, such as partitions or bookshelves that block visibility, in contrast to furniture (below the eye level) which allows visual connections (figure 7.7). In library A1, bookshelves are positioned perpendicular to the outer walls, thus, creating a divided space of smaller pockets which are visually isolated and quieter (framed in mauve on figure 7.7). Contrarily, B1 library is not compartmentalised, as bookshelves are aligned parallel to the outer curved boundary, creating a unified and equally visible space, where desks are arranged in rows. There is only one pocket, partially segregated behind the protruding wall partition.

\(^{16}\)Questionnaires (appendix 13.8.5) in A1 are filled by 10% of the total student population. The small sample size renders the questionnaire only as a supportive tool to prove the already established observation (through occupancies) that library A1 is not as popular as B1.

\(^{17}\)The online questionnaire allowed students to input a number of library visits per week and an average duration spent per day. Both figures are used to calculate the student average library-time/week (duration*number of visits) and calculate the percentage time spent in the library out of the weekly lunch break time over five days (duration*number of visits/break duration*5 days).
Library A1 interior configuration is more diversified with quiet segregated pockets serving individuals (or pairs) and the highly visible large middle table or side sofas serving collaborative activities, whereas B1 interior exhibits equal configurational visibility. However, B1 library accommodates more self-directed activity types, especially intellectual activities (figure 7.8). This is because the interior design is not the only factor contributing to the library popularity and subsequent activity diversity. There are other previously discussed spatial parameters which maximise the library potentiality as a popular destination, such as configurational accessibility, library porosity, movement streams into the space and the availability of other indoor destinations. Then, the operational scheme of each library, according to the management vision and the librarian input, are very important in shaping the student learning practices, where B1 library is rendered more popular with more activity variations than A1. The following discussion explains how and why student self-directed activities vary between both libraries.

Figure 7.8: Activity Variations in the School Library; Coloured by Activity Categories (A1 vs B1)
The high variation in B1 library activities is a product of the high diversity (and frequencies) of intellectual activities, composing 89% of total activities and formed of ten different types (cyan bars; figure 7.8). These patterns links to the huge efforts of B1 librarian to encourage student intellectual activities, while the school provides laptops, computers and assorted stationeries (papers, colouring books and pencils, etc). In contrast, A1 library provides a free environment for students to choose their activities with no influence from the librarian and minimal school stationery, thus, yielding a lower percentage of intellectual activities (68%) of only three types. These are mostly loyal A1 library visitors (mentioned previously) who spend their lunch breaks reading (39%), being facilitated by the quiet library atmosphere, unlike B1’s vibrant space which does not encourage reading (only 12%). Further intellectual activities in A1 library include studying (11%) and revising (18%) which are pursued by changeable students according to their needs (not the regular library visitors). A1 free environment allows more student interactions (29%), with no teacher interventions as long as students are not noisy. Contrarily, B1’s stricter librarian inhibits most of interactions (only 5%) in favour of intellectual activities, and because the library space is already noisy due to high occupancies and porosity to corridors.

Prior to exploring the activity distribution, it is important to understand supervision techniques in A1 and B1 which impact the student self-directed activities. Library A1 provides more student freedom (than B1), for them to choose activities and distribute in different locations. A1 librarian supervises the library from their desk, only intervening if the environment gets noisy. Students occupy locations not seen by the librarian as revealed through the librarian isovist (grey area-fill; figure 7.9), i.e. hidden pockets between shelves, demonstrating low visibility (previous visibility analysis; figure 7.7). Accordingly, A1 librarian does not choose what activities students do or where they sit. Contrarily, library B1 has stricter supervision, especially due to higher occupancies and the louder atmosphere, being open towards busy corridors. B1 librarian moves around (unlike A1’s static supervision) to check on students, tell them what activities to do, restrict their movement in the library and...
observe the outer corridor especially the closed break-out space (discussed in chapter 6.2.3). B2 library is exposed from the librarian desk except for the round table behind their desk and the top-right pocket. The librarian prevents students from using this hidden pocket unless they are attending tutorials (accompanied by teachers). The former space (behind their desk) is proximate to the librarian, i.e. under their control and is normally occupied by students who study in groups.

Acknowledging the freedom granted to A1 students to move and choose activities, the interior configuration and furniture highly influence A1’s activity distribution, whereas B1 activities are more influenced by the librarian. Verbal interactions in A1, such as talking, discussing, gossiping happen on the two opposite sofas, if being less discrete but still not noisy (mauve dots; figure 7.9). More private conversations densify at the peripheral pockets between bookshelves as students sit on bean bags or low chairs. These locations also accommodate some misbehaviours of students using their mobiles, knowing they are not visible to the librarian (red dots; figure 7.9). Patterns of student chilling, i.e. laying down individually or in groups (orange dots; figure 7.9), mimic the same locations of interactions, depending on the degree of privacy desired by students. Contrarily, the quiet and relaxed environment of A1 is replaced with a vibrant active space in library B1. According to the librarian, to stay in the library, B1 students have to perform some activities. Interactions only densify outside the library (opposite corridor) then disintegrate beyond the library entrance by the impact of the librarian who also prevents students from interacting or even laying down and chilling.

Intellectual activities (cyan dots; figure 7.9) have different patterns in library A1 than B1, more related to student preferences in A1 but more related to the librarian input in B1. Some of A1 students have the freedom (granted by the librarian) to isolate themselves in pockets to read silently while laying down on bean bags, if those spaces are not occupied by interacting students. Most of student independent reading (individually) coexists alongside revising and studying at the middle table or among small groups of friends (collaboratively) at the cornered round tables which are also shared with teachers. The choice of formal upright sitting at the middle and corner tables is preferred by teachers for short student tutorials and by students for focused studying, unlike the relaxed sitting preferred by students on sofas and bean bags. In B1, intellectual activities are organised by the librarian. For example, they put colouring stationery on one table, thus, attracting students to colour or draw at that location. They also assign a table for students to revise (behind the librarian desk). The central desks (arranged in row) are mostly occupied by students who sit individually with laptops (provided by the school). Sometimes, students sit in pairs or small groups (3-4 students) to work together on one laptop which is often dismantled by the librarian, if being noisy. Reading has no specific location (unlike A1’s middle table) but spreads all over the library, slightly concentrating towards the side tables (away from the loud centre).

In summary, the popularity of the school library is its capacity to accommodate long-period student occupancies to perform various self-directed activities and interactions, beyond instant encounters around the library. B1 library is more popular with higher student densities and diverse activity types than A1, resulting from B1’s limited indoor destinations, while A1 students spread over multiple spaces. These differences impact the student preferences, where questionnaires inferred that B1 students are more interested in using the library than
A1 students. Accordingly, B1 library is dense with diverse activities, whereas A1 library portrays the quiet relaxed environment, accentuated through the interior design of multiple silent and segregated pockets. Nevertheless, not all activities benefit from the busy atmosphere. Intellectual activities in library A1 are more genuine, longer in duration and chosen by students (e.g. independent reading by regular visitors), unlike B1’s activities which sometimes are alibis to stay in the library to socialise. A1 Students have the freedom to choose their activities, even if it is to interact (quietly) or sit in their favourite spots. B1 library, being dense in all activities, is highly controlled by the librarian who influences what activities occur, where students sit and also prevents interactions.

7.2.3 Student Group Formations and Seating Arrangements in School Libraries

In the school library, student group formations (or individuals) and their seating arrangements are impacted by the furniture typologies and layout which in return impact the student collaborative activities, either social interactions (mostly in A1) or intellectual activities (mostly in B1). Both schools have diverse library furniture (e.g. round tables, individual desks, sofas) which affords diverse sitting postures and group formations. However, supervision patterns and library regulations (moderating the actuality of operation) influence the potentiality of furniture. A1 students have the freedom to move some furniture pieces, unlike B1 students who are bound by fixed furniture arrangement and regulations on groupings, determined by the librarian. Therefore, each operational scheme yields different student grouping and subsequent self-directed activities and interactions.

While A1 furniture promotes grouping in the library centre around the middle table, students (by choice) reverse this scenario as the middle table accommodates more individuals, fewer pairs and minimal small groups (figure 7.10). The table is visible and proximate to librarian,
thus, providing no privacy for group or pair interactions. Eventually, it remains quiet. This setting attracts individuals who are regular visitors of the library and mostly reading. They do not mind being visible to the librarian nor using the collective space, although they sit alone (or silently in pairs). In fact, individual regular visitors avoid the peripheries which are more oriented for individual sitting yet frequently occupied with conversing students (whispering). Although being discrete, conversations disturb readers, pushing them to the quieter centre. Simultaneously, students in groups migrate away from the middle less-private table. Its large dimensions (2.5mX3.6m) obstruct communications unless students raise their voices which is not allowed. They seek privacy in corners of the hidden pockets and along the exterior boundary (their backs against the wall) to interact. Students also cluster around small tables to study. In general, A1 library, while being quiet, is an interactive space, mainly for small groups (3-5 students; 45%) and pairs (34%), more than individuals (19%).

In B1, different group formations disperse evenly across the library. While the librarian attempts to prevent grouping (except for collaborative intellectual activities), high student densities, furniture arrangement and the student eagerness to collaborate render higher percentage of small groups (3-5 students; 45%) than pairs (29%) or individuals (26%). The small desks in the library centre (capacity of two students each) are arranged continuously, forming long rows with no separation between students (figure 7.11), unless a student sits individually with no one in the adjacent seats (fewer scenario in the dense library). The same applies to the front desk with computers, where students stay in small groups around each single seat of one PC. In fact, the library turns from a space where individual sitting is desired (by the librarian) into a space where students hardly sit individually, even if they want to. Individual sitting is further reduced due to the policy of fixed-in-place furniture (even if its movable) which prevents students from customising their seating locations away from other students. Finally, the librarian puts efforts to maintain a disciplined environment by preventing students from laying down (even on sofas) and dismantling groups which are significantly loud or just interacting with no activity pursued.
The furniture arrangements in each library influence the student choices of seating locations, such that A1 library provides more student freedom to move furniture, unlike B1 students who are controlled by the librarian but still try to maximise their privacy. The study of the student common sitting spots through isovist analysis (figure 7.12) reflect these seating arrangements and the degree of control in each library which subsequently impact the student grouping and their activities pursued.

Figure 7.12: Librarian Isovists from their Desk and Student Isovists from Common Sitting Locations (A1 vs B1)

Isovists\(^{18}\) from A1 student favourite spots (figure 7.12) portray the advantages of the hidden pockets and the area along the outer boundary between shelves. Alongside being private for individual relaxations as students stretch on bean bags, students in pairs or small groups have strong visual connection to other areas that expose them. If the librarian moves towards those spaces, they have enough time to react accordingly, i.e. lower their voice, change their activity or stop misbehaving. The visual advantage of these pockets, as experienced by the researcher during observations, is beyond the explanation of isovists. Pockets (e.g. seat 2 on figure 7.12) are close to the bookshelves. Students see the librarian through the slits between books and ensure the librarian is not paying attention to them. From the other side, the librarian is seated far away from the shelves and does not see what is happening behind. It is like having a one-way visual window. These advantages explain the student patterns of moving bean bags and low chairs into those locations, seeking privacy while sitting collectively, in pairs (most frequent) or individually. The opposite scenario of moving furniture towards the centre of the library was never recorded in observations.

Whilst B1 library accommodates diverse group formations, it portrays the controlled environment due to the librarian restrictions on group sitting, activity locations and moving furniture (even if it is easily moveable). The librarian shapes the student grouping, by deciding

\(^{18}\) Isovists are drawn from seating locations with a visibility angle of 170 degrees, mimicking the field of vision of a student (or the librarian from their desk).
which students cannot to sit together; which students can work collaboratively; and which groups are split in two or completely dismantled. The librarian also guides students to specific locations, for example, revising at the round table (next to librarian) or using laptops at the middle desks, where students sit face-to-face with the librarian. All activities are monitored, and the only hidden space from the librarian is closed (top-right corner behind the protruding wall; figure 7.12). In response to that, students seek more privacy through occupying back seats (e.g. seat 2 on figure 7.12), away from the librarian desk. Although each desk allows sitting from both directions, students mostly sit with their backs against the wall. They preserve their privacy from wanderers (other students) and most importantly keep an eye on the librarian. This pattern is sometimes reflected on the order of desks occupancies during breaks, where back seats are occupied firstly and more frequently by groups to socialise more than to use their laptops (as noticed from observations). The other side desk (seat 1 on figure 7.12) is popular for individual or small group intellectual activities (actual work not pretending).

In summary, student grouping, which influences the patterns of interactions and self-directed activities, is primarily shaped by the library furniture (typology and layout) and further shaped through the librarian degree of control over the space. In library A1, students (in groups or individually) customise their seating layout and move furniture towards the hidden pockets to increase their privacy and stay away from the supervised central space, while other students who prefer the quiet atmosphere stay around the middle table to read and study. In B1, the library furniture is fixed-in-place. Students are prevented from sitting where supervision is hindered. Their maximum privacy is to occupy back seats away from the librarian front-desk. Students are also restricted from grouping (unless studying collectively with the librarian consent); yet, this is hardly achieved due to the overcrowded library, where individual sitting is less likely, as furniture is closely arranged.

7.3 Affordances of School Libraries

The affordances of school libraries constitute the possibilities for student interactions and self-directed activities to emerge, relative to multiple spatial and operational parameters. They are shaped through the design potentiality that results from the library configurations, size (area) and furniture setup. Yet, affordances, as possibilities, translate into actuality through the management operation schemes, regulations, the librarian role and the student preferences which filter out possibilities (more plausible scenario) or maximise affordances (less cases) for learning practices.

Affordances are primarily shaped through the spatial design. The building configuration either segregates the library away from the student routes, thus, yielding less possibilities of student encounters; or positions the library along busy routes, thus, triggering movement patterns around the library whose surrounding affords student encounters, mixing patterns and interactions. Then, the library degree of porosity (open-plan layout vs limited access-points) contributes to the propagation of movements and interactions patterns into the library. The interior design and shelf-layout create a compartmented space, affording quiet and private activities; or render a unified space where activities are equally visible and vibrant within a collaborative environment. Furniture typologies influence the student attitude through affording relaxed postures (e.g. bean bags) or the formal upright sitting (e.g. desk-chair
combination). The furniture layout also shapes group formations which contributes to collaborative activities. The aforementioned parameters constitute the library affordances which shape possibilities for student short-period encounters or long-period occupancies, and the latter (long-period occupancies) renders the library as a popular destination.

While the spatial design outlines possibilities for student learning practices, the management operation schemes, supported by the librarian local input, maximise or reduce the affordances for student interactions and self-directed activities. For example, diversions in student routes minimise student encounters around and inside the library which render a quiet library atmosphere (case of A1); whereas closures of corridors and break-time destinations consolidate movements towards the library and maximise student mixing, thus, affording more interactions (case of B1). Moreover, the librarian either allows student to sit freely, i.e. in different postures, group sizes and locations (even hidden pockets); or restricts interactions from hidden spaces, controls student sitting patterns while influencing their activity choices (through guidance or providing stationery). Finally, the less controlled library environment allows student preferences to surface which impacts their interactions and self-directed activities. This applies to students who target the library on regular bases; or mostly other students who have changeable needs, i.e. different activities, to fulfil during breaks. All those operation parameters shape affordances, as possibilities, in space, thus, contributing to the degree of library popularity.

In summary, the library affordances for student interactions and self-directed activities comprise the set of possibilities for instant encounters and interactions around the library; beside and the set of possibilities for the library to grow popular while promoting long-period occupancies. During those occupancies, the library space affords various individual or collaborative self-directed activities, especially the intellectual ones, while interactions emerge parallel to those activities. All learning practices are derived from possibilities that eventually translate in space according to the library operation.

7.4 Summary of Studying School Libraries

The school library is an important student attractor for self-directed activities and interaction patterns during breaks. The library allocation, spatial configuration and relationship to student routes outline its potentiality to maximise (or reduce) encounters and subsequent student interactions around the library, while the spatial porosity influences the student flows into the library. The interior design, furniture typology and furniture layout contribute to the library popularity for long-period occupancies and variations in group formations. This potentiality only translates into actual patterns of interactions and self-directed activities in correspondence to the management operational schemes (altered movement routes) and more importantly the local input from librarians, their control and supervision techniques. Finally, student preferences impact the occurring activities, if a less-controlled environment is granted by the librarian.

While movement densities, encounters, occupancies and the degree of popularity varies between the two studied libraries (A1 and B1), both spaces afford student learning practices, whether within a relaxed quiet atmosphere which has more discrete student interactions than self-directed learning (A1); or a vibrant activity-driven atmosphere with more diverse
intellectual activities and less interactions. Nevertheless, not all activities benefit from the vibrant environment, such that A1 (the quieter example) accommodates personalised experiences for regular visitors who target the library for focused intellectual activities, mainly independent reading. These examples are fewer in B1, diluted among the busier occupancies of students arriving at the library with their friends and pursuing less-focused activities to be able to stay in the library.

Both libraries (A1 and B1) have supervision from their librarians but in different ways. The library either provides freedom for students to choose their activities and location of sitting (A1); or influences the activity choices, through providing stationery, laptops and PCs, and restricts locations of sitting (B1). The operation scheme of A1 is a relaxed environment for students to sit everywhere (including hidden spots), move furniture and interact or do other activities, as long as they are quiet. The operation scheme of B1 comes with a price, where the librarian is more engaged and ensures a disciplined environment, by restricting interactions and controlling what activities emerge, where students sit and their groupings. There is a balanced social-spatial system in both libraries. When the overall design and configuration render an isolated library (A1), the rules and furniture provide more freedom in the quiet environment. Contrarily, when the overall design yields a porous, highly connected space along busy routes, regulations and the librarian’s input counter act to control the busy atmosphere and maintain discipline on the student distribution and use of furniture. Table 7.5 provides a summary of both library spaces.
### Table 7.1: Summary of Library A1 vs B1

<table>
<thead>
<tr>
<th>Spatial Design</th>
<th>Library A1</th>
<th>Library B1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Configuration</td>
<td>Mid-range Accessibility</td>
<td>Mid-range Accessibility</td>
</tr>
<tr>
<td>Entrance</td>
<td>From secondary corridor</td>
<td>Along busy route</td>
</tr>
<tr>
<td>Porosity</td>
<td>Visibly isolated from exterior</td>
<td>Highly porous open-plan layout</td>
</tr>
<tr>
<td>Interior Design</td>
<td>Shelf layout creates hidden quiet pockets occupied by students</td>
<td>Unified highly visible space with one pocket closed to students</td>
</tr>
<tr>
<td>Furniture</td>
<td>Seating variation: low chairs, bean bags, sofas, tables.</td>
<td>Typical chair-desk combination, round tables, one sofa</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Student Input</th>
<th>Library A1</th>
<th>Library B1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Student preferences for the library</td>
<td>Less favoured among other favoured destinations to choose from</td>
<td>Highly favoured with limited destination to choose from</td>
</tr>
<tr>
<td>Average time spent in library (one student)</td>
<td>38 minutes per week</td>
<td>62 minutes per week</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Operational Scheme</th>
<th>Library A1</th>
<th>Library B1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tools</td>
<td>Only books, no laptops, limited stationery</td>
<td>Books, laptops, PCs, and various stationery, all provided by school</td>
</tr>
<tr>
<td>Regulations</td>
<td>Less rules, free environment for seating postures and groupings</td>
<td>Stricter rules, controlled environment on grouping and postures.</td>
</tr>
<tr>
<td>Supervision</td>
<td>Static</td>
<td>Moves around</td>
</tr>
<tr>
<td>Librarian control</td>
<td>Allows freedom to students if they remain quiet</td>
<td>Encourages intellectual activities and prohibits interactions. Closes hidden areas for student use</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Overall environment</th>
<th>Library A1</th>
<th>Library B1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiet, relaxed and less popular.</td>
<td>Vibrant, activity dense and more popular</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity Patterns</th>
<th>Library A1</th>
<th>Library B1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quiet interactions or focused reading</td>
<td>Diverse intellectual activities but less focused (background to desired interactions)</td>
<td></td>
</tr>
</tbody>
</table>
8 School Dining Spaces

Dining spaces are important school building components to accommodate the daily lunch breaks assigned in the student schedules. Students either bring their own food, buy food from the school kitchen or receive free meals, if being entitled for the governmental programme of ‘Free School Meal’. In the latter two scenarios (which are the most common), students are served through the school kitchen, and in all scenarios, they are seated in the dining space. Accordingly, there are high occupancy loads on the dining area at one period of time (lunch break) which sometimes influences the management to separate upper and lower secondary students into two consecutive lunch breaks within a dual schedule (introduced in chapter 5.1.2).

Acknowledging the social dimension of learning (chapter 2.6.2), the importance of dining spaces grows beyond accommodating the student eating activities during lunch breaks. The dining area is rendered as an interactive space with individual and collaborative self-directed activities and socialisations, parallel to eating activities. Accordingly, it is recognised as an important informal space for student learning practices. The design of the dining space has the potentiality to maximise the possibilities of those learning practices during breaks, while the school operation (in terms of the management and student input) further shapes the actuality of the dining space, i.e. the occurring patterns of encounters, interactions and self-directed activities.

This chapter begins with discussing the design and potentiality of dining spaces to accommodate student interactions and self-directed activities, beyond their original functionality as eating venues (section 8.1). The chapter proceeds to describe how the actuality of operation diverts from the spatial potentiality (section 8.2) which leads to changes in the patterns of student mixing and encounters (8.2.1); and has an impact on the popularity of dining spaces for student long-period occupancy to perform self-directed activities (8.2.2); beside the impact on social group formations (8.2.3). Based on the discussed design potentiality and actual operation, this chapter defines the affordances of dining spaces for student interactions and self-directed activities (section 8.3). The chapter summary is section 8.4.

8.1 The Design and Potentiality of School Dining Spaces

The design of dining spaces is examined through eleven schools of which ten cases have dining spaces, except for school C4 whose dining space is in a different building (outside the research scope). The spatial characteristics of dining spaces are determined through their functional allocation, spatial configuration and size (area) which all shape the potentiality of dining spaces for student interactions and self-directed activities as discussed below.
The architect assigns the dining functionality to certain spaces, rendering those destinations as attractors for students during lunch breaks, regardless of their configurational shallowness or depth. Students distribute across dining spaces which in return shape their potential co-presence, encounters and interactions. The student distribution is relative to two designs of dining spaces, portrayed in the ten schools (of eleven case studies). The first design is a ‘unified’ dining area for the whole school (figure 8.1). The term ‘unified’ is introduced in this research to refer to the spatial layout as a single, large, allocated dining area with a unified service zone. The term also refers to the social dimension, as the dining area brings (unifies) the school population to one space, where students mix, interact, perform self-directed activities alongside eating activities. The unified dining area possibly locates on the lower ground of a compact building (e.g. A2, B2 and C3), within a campus environment to serve different blocks (e.g. A3 and A4) or as a centralised resource to serve the school wings (e.g. B1) or clusters (e.g. B3). The second dining design describes the design and allocation of multiple dining units within one school. These units possibly distribute across different levels of a compact building (e.g. A1 and C1) or distribute across different buildings in a campus.
environment (e.g. C2). Consequently, the student dispersal is higher, and the potential student mixing patterns are constrained by the local unit which belongs to one household (e.g. A1 local dining for each house-group) or one department (e.g. C1 local dining space for each department), as described by the architects in their interviews (appendix 13.1.5).

The definition of dining venues as a unified space or multiple units is not associated to the presence or absence of internal partitions in the dining space; but rather by the allocation of one service zone (for the unified space) or multiple service zones for multiple dining units. One form of a unified dining space is a large open space for students to sit together, served through a single kitchen and a single cluster of toilets (e.g. A2, A3, B2, B3 and C3). Nevertheless, another form of a unified dining space has different zones, as seen in A4 with an internal wall partition inside the space; or in B1 whose dining space is dissected by a corridor between the open space and the closed extension unit (figure 8.1). Still, each of those cases has a unified service unit (one kitchen, one serving till and one queuing area) for the whole dining area. Accordingly, the student mixing is expected to happen along circulation, along queuing and during the utilisation of services, even if mixing is relatively minimised due to partitioning inside their seating area. Contrarily, the second design (of multiple dining spaces) has multiple clusters of services. Each unit has its separate entrances, different serving till, multiple queuing space and toilets, and this design divides students into local groups in terms routing (to reach the dining spaces), being served and sitting locations.

The size of dining spaces contributes to the spread of interactions and self-directed activities during breaks. A singular dining space varies in size according to the dining design, i.e. large area (for a unified space) or a smaller area (among multiple units). Still, each singular space (even the smallest) is large-enough to host big gatherings of students at once during lunch breaks, thus, facilitating group interactions or collaborative activities. This is portrayed in the significant variance (p-value<0.001) in the size (area) of school functions (chapter 4.12.1), such that a singular dining space is the fourth largest area (on average) in the school. The dining design solution (unified or multiple units) does not impact each school’s aggregate area of dining spaces (as a percentage of the school area), since it is primarily dependent on the total student population. The aggregate area of dining spaces in each school (table 8.1) is averaged at 2.5% and ranges between 2% and 4%, in exception of school B3 whose dining area is relatively small (1%), but the roofed courtyard (centre of each local cluster) is expected to function as a local dining space.

<table>
<thead>
<tr>
<th>School</th>
<th>Dining Design</th>
<th>Area % of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1</td>
<td>Multiple Units</td>
<td>4%</td>
</tr>
<tr>
<td>A2</td>
<td>Unified Space</td>
<td>2%</td>
</tr>
<tr>
<td>A3</td>
<td>Unified Space</td>
<td>3%</td>
</tr>
<tr>
<td>A4</td>
<td>Unified Space</td>
<td>4%</td>
</tr>
<tr>
<td>B1</td>
<td>Unified Space</td>
<td>3%</td>
</tr>
<tr>
<td>B2</td>
<td>Unified Space</td>
<td>2%</td>
</tr>
<tr>
<td>B3</td>
<td>Unified Space</td>
<td>1%</td>
</tr>
<tr>
<td>C1</td>
<td>Multiple Units</td>
<td>2%</td>
</tr>
<tr>
<td>C2</td>
<td>Multiple Units</td>
<td>2%</td>
</tr>
<tr>
<td>C3</td>
<td>Unified Space</td>
<td>3%</td>
</tr>
</tbody>
</table>
 Alongside functioning as student attractors, the configuration of dining spaces in the school building impacts the student movement patterns, therefore, encounters and interactions. Acknowledging the significant variance (p-value<0.001) of configurational properties for each spatial function in all case studies (chapter 4.14), dining spaces are among the shallow or mid-range spaces in respective to each school accessibility spectrum (figure 8.2). This results from the dining design as large, highly porous and central spaces in the form of open-plan layouts or partitioned spaces with multiple entrances; beside the dining allocation on the shallower lower levels (except for C1 whose local dining units extend to level-3 department). High accessibility translates to high potentiality of bringing students together. Regardless of being (or not) the final student destination, dining spaces are along the student shallow (natural) movement routes. Students even travel through dining spaces as circulation shortcuts. This configuration triggers students (passers-by) to mix and interact among themselves or with occupiers of the dining area; in addition to the development of further self-directed activities, especially as the dining spaces are furnished and equipped (for eating) which also potentially serve individual or collaborative activities.

In summary, dining spaces are student destination (functional properties) allocated within shallow areas of the school (configurational properties). Both factors prescribe the design potentiality for student learning practices. The former (functionality) attracts student into a unified space, where mixing and interactions are maximised for the whole student population; or into multiple units that only allow mixing in local groups. Moreover, the area of the dining functionality, even the singular space among multiple units, provide a large enough space that satisfies the simultaneous large-group occupancies during breaks.
Moreover, the configurational accessibility of the dining space renders dining areas (especially of open layouts) as vibrant and shallow routes for student natural movements, even if students are not targeting the space as a final destination. Students meet, mix, interact and perform further self-directed activities accommodated by the furniture available for eating activities.

8.2 School Dining Spaces Actuality vs Design Potentiality

The potentiality of the dining spaces for learning practices (as presented in the previous section) does not fully translate into actuality, in response to changes in the actual operation of dining spaces mainly by the management. This influences the student encounters and mixing patterns (as short incidents) and the popularity of dining spaces (long-period occupancies), thus, impacting patterns of student interactions and self-directed learning, as described below for school A1 and B1.

8.2.1 Student Mixing and Encounters in Dining Spaces

In A1, student encounters within (and around) dining units, as the initial seed of interactions, divert from the expected patterns that are prescribed by the original design. Architect A allocated five dining spaces: three units on level 1 (eastern, central and western) and two units on level 2 (far-east and far-west). Their potentiality for student mixing is minimised in the original design, following the separation of students into five households (group of students), each assigned for one dining unit which is accessed through its own staircase (figure 8.3). This scenario reduces encounters (and subsequent interactions) to members of the same house. However, the actual building operation yields higher mixing patterns than expected, since the management terminates three staircases and consolidates the movements of all students into two staircases to minimise distractions (discussed in circulation chapter 6.2.1). This is explained through the observations of three dining units (out of five): the western and central units on level 1 and the far-east unit on level 2.

The new configuration allows students to mix and interact along their travel routes and more importantly inside one dining space (the western unit), being used as a circulation shortcut, as portrayed in the recorded movements (figure 8.4). While all dining units have equal
occupancies (as assigned by the school), the western unit (on level 1) has the highest movements \((Ax1=60\) and \(AX2=59)\), because students use its operable staircase from upper floors to access all spaces of level 1 (and vice-versa). Along this route, students cross the western units (west-to-east) towards the central unit whose staircase is terminated by the management. Consequently, the central unit has relatively less movements, and its side gate (receiving students from the west unit) is more active \((Ay2=42)\) than its front gate \((Ay1=33)\). Moreover, movements (and subsequent mixing and encounters) are significantly lowered for level 2 units (than level 1) as recorded for the far-east unit \((By1=7\) and \(By2=24)\). This is also due to terminating the unit’s staircase; and more importantly relative to its segregation away from the busy centre of the playground. Hence, movements are only conditional to the dining functionality as a student attractor (a destination to eat).

In general, level 1 units are more vibrant than level 2 units, due to higher movements, beside their higher accessibility. Movements also radiate towards circulation corridors around level-1 dining units which show high counts \((Aq1=48\) and \(Av1=36)\). High movement streams within and at the frontage corridor of the western unit yield high co-presence and encounters which lead to high student interactions. Consequently, some students get their food from their assigned dining unit (following the house distribution; according to regulations) then travel to eat in the western dining unit with their friends. This is a situation of functional dislocation as the operation diverts from the original architect design, due to configurational alterations undertaken by the management to achieve a certain scheme, i.e. a quiet environment on upper levels upon the closure of staircases (elaborated previously in chapter 6.2.1).
In school B1, student mixing and encounters at the dining area also divert from the expected patterns of the original design. It is not due to circulation alterations (like A1) but results from changing the student distribution (by the management) inside the dining area. The original design allocates one large dining area, served through a single kitchen and composed of an open-plan layout with a partitioned side to the east (figure 8.5; left plan), where all students are expected to sit freely during one lunch break session. The whole space is a centralised resource which attracts students for the dining functionality. Additionally, the dining area is highly accessible and located along the shallow route between both wings or between the north wing and the playground; or vice-versa. Thus, B1 dining space, as a destination or an intersection to the shallow movement routes, yields high potentiality for student encounters and interactions.

However, the actual operation of the dining area minimises encounters across student year-groups through separating them in different zones by year-group (figure 8.5; right). This scheme intends to control student dispersal, organise student sitting layout and reduce empty seats, considering the overloaded dining occupancies, even after implementing two separate breaks for upper and lower secondary students. Year-8 students (or year-11 in the next break session) are served in the open-plan area; year 9 are served in the enclosed eastern unit; and the management expands the dining space towards the entrance foyer for year-7 (or year 10 in the next break). Since the foyer is required to be empty of furniture (obstacles), to safely distributes morning and end-of-day movements into the student wings, the school utilises movable and foldable benches (figure 8.6), unpacked after morning arrivals and repacked (folded and stacked against the wall) after lunch breaks to unblock circulation for the departure time.
The school succeeds to separate students in different zones which reduces their mixing and encounters. While movement streams are dense from both wings (Ax1=80, Ax2=154, Az1=196 and Az2=87), movements decline within each zone of the dining space, whether the extension dining in the foyer (Ay1=42) or the less busy eastern enclosure (Ay5=24), as illustrated on figure 8.7. The dining open-plan zone remains dense with movements (Ay2=139), since it accommodates the busy queuing area for all year groups to access one kitchen (figure 8.7). In other words, although the school attempts to separate student groups, the original design (of a unified dining space with a single serving till within one kitchen) brings students together as they collect their meals, thus, portraying an example of the mismatch between the architect design (potentiality) and the school preferred operation (actuality). Interactions are minimal in the queuing space due to congestions (natural inhibitors to interactions) and due to efforts from supervisors to formalise the student queue, i.e. arrange their lines and keep consistent flow towards the kitchen while preventing social interactions. Still, encounters lead to student interactions along the circulation loop in the outer boundary of the dining space as previously discussed in chapter 6.2.3.
In summary, student mixing and encounters around and within the dining spaces (of A1 and B1) are decided according to dining allocation and the configuration of student routes towards their dining spaces. The former parameter (allocation) renders dining spaces as student attractors by default, such that student mixing patterns are relative to the allocation of multiple dining units that separate the student-groups (A1); or the allocation of a single space that mixes all students (B1). The management operation either embraces the original design and assign student-groups over the multiple units (case of A1); or they alter the design by actually splitting the dining space into subzones for different year-groups (case of B1). Still, student mixing occur, despite the management splitting zones, as students mix while using the unified services or along their routes towards the dining space. This brings in the important role of the student routes that lead into the dining areas. They highly impact the student short-period mixing, encounters and interactions, especially if the management alters movement routes, thus, rendering one dining unit as a vibrant shortcut towards other destinations (portrayed in A1).

8.2.2 Popularity of Dining Spaces for Student Self-directed Activities

While the previous section discussed the potentiality and actuality of dining spaces for instant student mixing and encounters which are seeds for interactions, this section explains the popularity of dining spaces among students for long-period occupancies, i.e. for students to
stay, socialise and perform self-directed activities while eating, beyond quick encounters. This is described below for the dining spaces of A1 and B1.

B1 dining is more popular than A1 as inferred from the recorded occupancies and student questionnaires. Occupancies of the dining spaces are lower in A1 than B1 (Figure 8.8). A1 students spread more into the playground than inside the closed dining units which is reversed for B1, as students concentrate indoors in the dining area more than the playground. This is illustrated through the average one-day count of students within dining spaces during two consecutive lunch breaks. For A1, the average occupancy is 71 students per dining unit which aggregates to approximately 355 students but distributed among five units, whereas the average count in B1 dining area is 433 students, i.e. busier than A1 and all condensed in one area. These occupancies yield a density of 0.78 student/m$^2$ (one student in 1.3 m$^2$) in A1, compared to the higher density of 1.01 student/m$^2$ in B1 (one student in 0.99 m$^2$). The popularity of B1 dining area is further illustrated through student questionnaires (appendix 13.7.5), where 54% of B1 students prefer the dining area for lunch, in comparison to A1’s less percentage (30%). Additionally, B1 dining space is highly favoured for social interactions (46%), in comparison to only 12% in A1.

![Figure 8.8: Student Occupancies in Dining Spaces (A1 vs B1)](image)

The higher popularity of B1 dining area than A1 (as deduced from occupancies and questionnaires) corresponds to the design potentiality to promote student long-period

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19 Observations in A1 dining units are performed by the researcher who can only cover one unit at a time. The total occupancy of the five units was compiled as an average from repeated observations of different units over different days.
occupancies with high contribution from the actual operational scheme by the school management. A1 dining units are less popular among students, because the design separates students into five cellular dining spaces. Even though the actual circulation operation (consolidating movements in two staircases) maximises instant student movements and encounters within the western dining unit (level 1), still, the management restricts food to be served to students within their assigned house. Accordingly, students recognise dining units only as destinations to get food. They eat and leave towards other destinations to meet their social group of friends who are probably distributed among different house-groups, thus, eating in different dining units. Meeting the social group outside the dining unit is facilitated through high variation of informal spaces, like internal corridors and open studios (chapter 6) and terraces (chapter 9) which are missing from B1, alongside the library (chapter 7) and the playground (chapter 9). Those spaces (being more of social hubs) attract students (as grouped friends) away from their assigned dining unit which restricts grouping to students of the same house, thus, reduces the dining space popularity. This phenomenon explains incidents of students eating (within a social group) outside the dining unit in the playground which is against regulations (elaborated in chapter 9).

Contrarily, B1 design renders the dining area as a highly accessible open-plan layout, centred between the two wings which promotes the dining popularity among students as a circulation route and destination. The dining popularity is additionally maximised due to the low variation of other informal spaces: library, playground and corridors (compared to A1’s more diversity). The management further reduces the available student destinations during breaks by locking down corridors. They also impose strict regulations on the playground in terms of social group-sizes (maximum 6 students) and pitch occupancies (20 students). These regulations push students away from the playground, whereas their bigger social groups are permitted by teachers in the dining area to save space in the overloaded dining space. Eventually, B1 dining area grows more popular as students stay within social groups (of friends) which is possible, since each year-group dines in one zone, and friends are mostly of the same year group, unlike A1 houses which distribute one year-group across different dining units (A1 houses are not defined by year-group).

Moreover, the operational logistics of the lunch break in B1 keep students within the dining area, unlike A1, where students leave shortly. A1 lunch break is long (50 minutes). The average time of getting food is 6 minutes (based on durations of queuing, being served, finding seats and starting to eat). Students have enough time to eat and leave for other attractors (mentioned above) which are more appealing according to questionnaires. Contrarily, B1 lunch break is shorter (30 minutes), explained by the school to keep student engaged and avoid free time that causes misbehaviours (teacher interview; appendix 13.6.4). Students spend approximately 11 minutes to get food due to the long queue and busy kitchen serving all students, thus, having less remaining time for eating or other activities. Some students end up spending the whole break in the dining area where they socialise or perform further self-directed activities during and after eating. Even if students eat quickly, there are no indoor destinations except the library which is similarly crowded and has stricter rules on group interactions (discussed earlier in chapter 7).

The popularity of the dining space, which varies from A1 to B1 as explained through the previous parameters, yields diversified student interactions and self-directed activities during
lunch breaks (figure 8.9). Those activities are parallel to the act of eating which only composes approximately half the total dining space activities (A1=56% and B1=52%), despite being the original functionality of the space (according to the architect). B1 dining area, being more popular among the students, has more activity variations (20 types) than A1 (10 types). It functions as the vibrant centre of the school, bringing students from both wings into the shallow central open space, further expanded into the similarly shallow and porous entrance foyer. In contrast, A1 dining units are separate cellular spaces, more segregated (especially level-2 units) and oriented to satisfy the spatial functionality (serve food to students) before students leave to socialise in other spaces. This explains why eating percentage (of total dining activities) is slightly higher in A1 than B1 (56%>51%; yellow bars on figure 8.9). Student interactions are the second most activity in both schools (A1=16% and B1=21%; mauve bars on figure 8.9). Further self-directed activities take place as a by-product of the student long-period occupation, such as intellectual activities (A1=13% and B1=5%), beside games and performances. The spatial distribution of all activities is described in the next discussion.

The dispersal of student interactions and self-directed activities in each dining space reflects the vibrant atmosphere of B1 dining, unlike the relatively quieter atmosphere of A1 (figure 8.10). Student interactions, being denser in B1 than A1 (21%>16%), distribute all over B1 dining area and last for longer durations, even after students finish eating (as observed during fieldwork). This corresponds to the higher potentiality for mixing students in a unified space, compared to multiple confined units of A1. Denser interactions of B1 also relate to the higher popularity of B1 dining for diverse reasons explained before, especially being the only indoor social space where interactions are allowed and the formation of social groups of friends,
seated by year-groups. B1 queuing area (having green dots; figure 8.10) is the most congested location (among all observed spaces), while A1 service is faster and more efficient with no queuing congestions due to the student division among five units. B1 dining space accommodates performances of singing and clapping (orange dots; figure 8.10) which emerge spontaneously at different tables, while students are seated to socialise or eat. There are also other games (e.g. cards or chess; pink dots on figure 8.10) concentrated at the smaller tables (south end of B1 dining area). These examples further support how B1 dining space is popular and is perceived by the students as an activity space, beyond an eating destination.

Figure 8.10: Student Interactions and Self-directed Activities and Teacher Supervision in Dining Spaces (A1 vs B1)

B1’s higher popularity yields louder, vibrant and more spreading student activities which drives the school to seek control through stricter and more alert supervision (than A1). B1 teachers distribute between benches and circulate around (pink triangles; figure 8.10), especially at the queuing area to organise students, stop or open the flow into the kitchen and prevent misbehaviours (e.g. pushing) due to high congestions. Teachers also dismantle student groups in the dining circulation routes, especially the link between the two wings which is always vibrant with interactions that block movements (previously discussed in chapter 6.2.3). Contrarily, A1 supervision is mostly static from the glass room inside each dining unit, since the overall atmosphere is not very busy. A1’s less supervised dining units yields some misbehaviours, as illustrated in the far-east unit on level 2. Students use their phones or have physical challenges, especially within the space adjacent to the supervision room but separated by an opaque partition, i.e. a blind spot. Dining supervision (in both schools) mimics techniques of library supervision (chapter 7) which reflects the general scheme of each school, where B1 is stricter than A1.
Student intellectual activities are more diverse in B1 than A1, as clarified from other activities on figure 8.11 (red dots). B1 students use the dining area to study, paint, read, do homeworks and organise portfolios. These activities disperse across all zones yet concentrate around the smaller tables in the southern end of the dining area, especially when students write or draw. This side is quieter and has less movements. It provides more student privacy, less interference from others and better collaborative seating arrangement, since the tables have smaller capacities (4 students sitting around), compared to long benches (10-12 students; noisy and sitting side-by-side). As for A1, intellectual activities are mainly student revisions which concentrate in the far-east dining unit (level 2). The management is credited for establishing this dining units as a revision hub (teacher interview; appendix 13.6.4) which matches its potential as being quieter and more segregated. Accordingly, students are subconsciously trained to go there to revise during the breaks (when they need to). In short, A1 far-east dining unit is an attractor for student intellectual activities, whereas B1 patterns emerge as by-products of long-period occupancies of the dining area which is popular among the students.

In summary, the dining popularity is defined through its operation for long-period occupancies, beyond the instant encounters, i.e. students to stay, mix, socialise and perform further self-directed activities. Popularity and long-period occupancies are not solely impacted by the dining functionality as a student attractor, since sometimes students get their food and leave shortly with no further interactions nor self-directed activities due to the lack of social grouping (case of A1). Additionally, the dining popularity is not fully dependent on the spatial configuration, since high accessibility does not guarantee long-period occupancies but only secures the short encounter and subsequent interaction between students (e.g. west dining unit in A1). However, popularity is maximised if the dining space is
the optimal destination to perform self-directed activities during breaks, due to the lack of other informal indoor spaces for socialisation (case of B1). This is opposite to A1 design which provides diverse indoor destinations that satisfy the student needs for social activities, hence, decreasing the popularity of its dining units. Popularity is also shaped through the management operational scheme. They ease regulations, allowing students to stay in large groups, perform intellectual activities throughout the break-time (even if not allowed in the dining area by regulations), thus, maximising the popularity (B1). Contrarily, another management restrict student distribution to their assigned dining space, thus, rendering the dining space solely as an eating destination, before students target other more popular destinations with their social group (A1).

8.2.3 Student Group Formations and Seating Arrangements in Dining Spaces

In dining spaces, student group formations to interact and do self-directed activities are shaped through furniture, being a contributor to the spatial potential and only revealed through zoomed-in analysis of each dining space. Furniture and its layout decide the group seating arrangements and the student circulation (between furniture pieces) within the dining space. Still, the input from the school management, as usual, impacts the actual student grouping patterns, as explained for A1 and B1.

The furniture of A1 dining units provides higher flexibility (than B1) to accommodate different group formations. A1 furniture (figure 8.12) promotes small groups at round tables (capacity of 4 to 5 students) and medium groups at benches on the sides of rectangular tables (capacity of 6 to 7 students). Larger groups (13 students) grow as students stack themselves on one bench or move two benches together (level 2; far-east unit). In general, these group variations
reflect on the student collaborative activities and socialisations, while being themselves a projection of the student preferences. Contrarily, B1 dining area accommodates less group variations, being guided through unified bench type of standard capacity (10 or 12 students). Moreover, sometimes groupings do not reflect the student social groups as teachers arrange students to fill all seats (to save space in the already crowded lunch break). Therefore, some students are possibly not seated among their social group. Still, most of B1 students are eager to arrive quickly (during lunch time) to the dining space, get food and sit within their social group, as one long table is split into two smaller groups (5 or 6 students). This is the most common group arrangement beside two groups plus a pair (seated across; towards the table aisle seats).

A1 dining furniture also accommodated individual sitting which is missing from B1 whose individual population are students queuing to get their food (not eating alone). A1 dining units (on level 1) comprises highchairs at a counter that extends along the peripheries which serves quick individual eating (blue dots; figure 8.12). This links back to A1 dining functionality as eating venues. Students, not perceiving dining units as social spaces, eat and leave to meet their friends (of other households, therefore, eating in different units) at other destinations. B1 dining area does not have individual sitting, because the furniture (only benches) does not provide the required isolation for individual students; beside the dining being a vibrant collaborative atmosphere where most students engage in group interactions and collaborative self-directed activities (related to dining area popularity). The maximum privacy exists at the smaller tables (four-student capacity) where students write, paint or play cards while seeking less interference from others (as discussed in the previous section).
Alongside the potentiality of furniture types to diversify group formations, A1 students have a degree of freedom (guaranteed by the teachers) to move furniture around the dining unit, unlike B1 dining furniture which is rigidly allocated by the management. Even B1 foldable furniture (in the dining extension) is unpacked by staff in fixed locations. A1 students (especially on level 1 dining units) customise their seating layout towards or away from other groups. They easily move the lightweight benches and tables towards the deep far-end of the dining unit (green zone; figure 8.13), to be adjacent to the supervisor room. This location is away from the lateral circulation (east-to-west) and the busy front entrance; and more importantly away from the supervisor field of vision (being blocked by the opaque partition). Consequently, A1 circulation within the dining unit becomes labyrinthic and squeezed between randomly scattered furniture pieces which is favoured by students and overlooked by the management. This scenario is not afforded in B1 as the dining space is highly overloaded and furniture has to account for fixed circulation routes to facilitate movement streams which is also why teachers prevent standing groups from blocking the circulations.

In summary, the dining furniture type and layout influence the diversity of student group formations or possibilities for solitude. Accordingly, furniture shapes the student socialisation patterns or the collaborative self-directed activities which both happen parallel to eating activities. Moreover, the management operation has an important role to decide on the degree of freedom for students to sit in groups or move furniture. One management scheme allows student to create their groups and move benches to their preferred locations (A1). Another scheme (B1) is restrictive to fixed-in-place furniture to maintain clear student routes. They also interfere in the student seating arrangement to fit students into empty seats, due to the high occupancies of the dining space, while students attempt to sit in their social group through early arrivals (during lunch break) into the dining space.

### 8.3 Affordances of Dining spaces

In this research, the affordances of the dining space are studied as the possibilities for student interactions and self-directed activities which are offered by the dining space design. Spatial parameters prescribe the potentiality of dining spaces as movement routes and final destinations, i.e. possibilities for instant student mixing and further long-period activities. Affordances translate into actual learning practices, being moderated by the management regulations and student preferences. In other words, possibilities (potentiality) are enriched or filtered out during the building operation (actuality), while the latter scenario (filtering out possibilities) is more common due to regulations.

Dining affordances are shaped through the functional allocation, size (area) of the dining space, its spatial configuration and the furniture setup. The architect allocates dining functionalities which, by default, are attractors for students. The chosen dining solution either divides students among multiple units, thus, reducing encounters; or creates one large, unified area that affords higher student encounters. Then, the dining floor-area, being the 4th largest singular space, affords the growth of co-presence into interactions with minimal congestions, as students sit to eat. Moreover, the spatial configuration amplifies or reduces student mixing. Highly accessible dining spaces are natural movement routes, thus, offering the opportunity for passers-by to mix with occupiers of the dining space (case of B1). In contrast, segregated dining spaces isolate occupiers from passers-by, thus, minimising
encounters (case of A1 units on level 2); alongside the initial isolation of the dining occupiers (from other students) upon dividing multiple dining units as different student destinations. Finally, the furniture setup maximises (or limits) possibilities of group formations to affords student collaborative self-directed activities (parallel to eating activities).

Nevertheless, not all possibilities (affordances) translate into occurring learning practices in the dining spaces. The translation from the design potentiality into actual incidents of short-period mixing and interactions or long-period occupancies (with socialisation and self-directed activities) is relative to the management operation and student preferences which all shape the dining space popularity. For example, A1 design, which potentially minimises student encounters due to separation of dining units, operates to brings students together upon the management consolidating movement routes which activates certain dining units as movement shortcuts. Hence, the operation maximised student mixing and instant interactions, despite not being afforded in the original design. However, further management regulations separate students again (after initially mixing them) by limiting their food serving to assigned dining units. This minimises the student long-period occupancies of socialisation or self-directed activities, hence lowering the dining popularity, as students favour other destinations that allow them to mix with friends.

Another design (B1) has higher potentiality to mix students in a unified dining area, but the school management seeks control over the growing student population through organising the student seating and allocating different zones to year-groups which minimises student relationships across year-groups. Yet, further rules work in the favour of the dining area, as other destinations are closed (e.g. corridors), have stricter regulations on social grouping (e.g. the playground) beside the logistics of a short break (less time available; all break spent in the dining area). Consequently, the dining area grows into a popular student social hub with various self-directed activities, games and performances, beyond eating activities (case of B1). Finally, supervision, either being strict in the latter vibrant atmosphere (B1) or lenient in the former quieter dining units (A1), influences the spatial affordance for learning practices. For example, A1 teachers allow students to customise their seating plan through moving furniture, thus, impacting socialisation patterns. B1 teachers dismantle standing group interactions (in-between seating areas) but permit bigger seated social groups; and overlook intellectual activities on dining tables (although being against the rules).

In the end, the affordances of dining spaces for student interactions and self-directed activities is a reflection of the possibilities for student encounters and mixing patterns. It also relates to the popularity of the dining space to afford long-period student occupancies as a social interactive hub. Students perform various collaborative self-directed activities, especially the intellectual ones, while interacting throughout their daily eating routines.

8.4 Summary of Studying School Dining Spaces

Dining spaces are key functionalities in the school building, fulfilling the requirement of accommodating students for their daily lunch-meals during the school day. Nevertheless, the importance of dining spaces extends beyond eating activities to grow as a social interactive space for students to mix, socialise and perform individual and collaborative self-directed activities.
The affordances of dining spaces for instant student encounters, as seeds of social relations which grow into interactions and further activities, is impacted by the spatial design. Firstly, the dining design divides the student population across multiple units which reduces student encounters (case of A1); or brings students into a unified larger space which maximises student mixing and potential interactions (case of B1). Moreover, the spatial configuration contributes to the dining functionality as shallow student routes and movement shortcuts which further brings students together (B1); or yields isolated dining units that are only targeted by students to get food (A1 dining units; level 2). The school management also unintentionally maximises student co-presence in dining spaces (A1 western unit; level 1) through consolidating vertical movements (for a different cause of minimising upper-floor distractions) which eventually promotes encounters and interactions around the dining units. Other management policies minimise encounters among students, such as B1 regulations of arranging the student seating in different zones by year-groups.

Alongside instant encounters which result from movements, affordances for longer-period occupancies yield the dining popularity among students, as they socialise and perform self-directed activities, parallel to eating patterns. Less popular dining spaces are relatively quieter during operation (case of A1). They function as eating destinations with minimal social activities, since the management divides the student population to be served in different dining units. Consequently, students leave (after eating) towards more popular destinations that satisfy their social groups, i.e. to mix with students who are assigned to other houses. Exceptions happen as some students escape with their food trays (or already have food from home) and eat (and socialise) with their friends in another dining unit. In general, the quieter atmosphere helps the management to establish certain locations as revision hubs (e.g. A1 far-east dining unit; level 2). Students target this space as a destination for intellectual activities, rather than the growth of those activities through long-period occupancies while eating and socialising. Finally, the quiet dining spaces benefit students as the relaxed environment has lenient supervision, allowing students to move furniture and customise their seating arrangements.

Contrarily, the high popularity of dining spaces yields a vibrant atmosphere with diverse self-directed activities. Students study, finish homework, play games or perform around their dining tables during or after eating (case of B1). Nevertheless, the highly popular dining area is overcrowded and noisy, therefore, challenging in operation especially upon the growth of the student population. The management expands the seating layout (to satisfy more occupancies) and separate year-groups in different zones (for efficient use of seats). However, they miss the fundamental challenge that leads to the busy dining environment (apart from the growing population) which is the shorter break time and limited indoor destinations, resulting from locking corridors and imposing strict rules on outdoor play areas. Consequently, students favour the dining area, where they socialise and do further activities in the remaining time after eating. Finally, the highly popular dining area is louder and requires stricter supervision, as teachers regulate the student congested queue to the kitchen, dismantle group interactions that block circulations and prevent misbehaviours.

In the end, dining spaces have the spatial potentiality to afford multiple learning practices of student interactions and self-directed activities; alongside their functionality as eating
destinations. Whilst acknowledging the role of the design potentiality, affordances, as possibilities in space, are still influenced by the school operation schemes which maximise (or inhibit) student encounters and influence the popularity of dining spaces as student destinations. The functionality of dining spaces satisfies the default activity of serving food, and in some cases, based on the design potentiality and regulations, dining areas grow into social hubs, where student interactions and self-directed activities occur independent of eating activities.
This chapter discusses play areas as the last investigated type of informal learning spaces in the school building. Play areas are compulsory design components in every school building to accommodate the curriculum physical education and provide spaces for students to play outdoors, as described in the UK ‘Generic design Brief’ (Department of Education, 2020a). Play areas are mainly composed of the playground (in every school) and smaller terraces (in fewer schools), yielding a total area that is relative to the student population of every school\(^2\), as deduced from the ‘Area guidelines for mainstream schools’ (Department of Education, 2014). While the total area is decided by the school population, it is the architect role to decide on the allocation of play spaces across the site; and to decide on the diversity of the landscape design, such as social spaces, courtyards, pitches beside the terraces.

Play areas are used by students on daily basis (mostly during breaks) for different interactions and self-directed activities. While play areas do accommodate some intellectual activities, their functionality is more oriented towards attracting social and physical activities. The former activities (social) are mostly represented through interactions and socialisation which are integral part of the student self-directed learning activities, in recognition of social learning (chapter 2.6.2). The latter activities (physical) are equally important to intellectual activities, linking to ideas from literature on the student wellbeing (chapter 2.7.4). Hence, learning expands beyond student attainment to include the student experience and physical and mental wellbeing which all strongly relate to self-directed practices of socialisation, relaxations, performances and physical activities (sports). They all take place within play areas mostly during break-times and are studied in this research.

The chapter begins with exploring the design and potentiality of play areas, portrayed through the playground and terraces (section 9.1). The chapter proceeds to describe how the actuality of interactions and self-directed activities in play areas corresponds to the design potentiality; or being shaped through the management input and student preferences (section 9.2). The actuality vs potentiality is discussed for student mixing patterns and instant interactions (section 9.2.1), long-period occupancies that contribute to the popularity of play areas (section 9.2.2) or variations in group formations within the large playground (section 9.2.3). In reflection of those discussions, the chapter presents the affordances of play areas (section 9.3). The chapter summary is section 9.4.

9.1 The Design and Potentiality of School Play Areas

The design of play areas is studied through eleven cases studies which all have playgrounds, and six schools (of the eleven) have terraces (A1, A2, B2, B3 and C1). According to the significant variance (p-value<0.001) in the areas of school functions (chapter 4.12.1), playgrounds are the largest school function, composing 35%-49% of the total area. Being the largest space renders their importance to accommodate the whole school population or at least a large portion (if the school implements dual schedules) during break-times. Oppositely, terraces are smaller in size (1%-7% of total area), hence, providing a more private atmosphere.

\(^2\) The minimum area of play areas is calculated through the formula 1800+30N, whereas the maximum area is 2000+33.3N; such that N is the number of students (Department of Education, 2014).
for students away from the busy playground. In general, all play areas, as large spatial attractors, bring student together to mix and interact; or perform further self-directed activities.

Figure 9.1: Playground Spaces of the Eleven Case Studies

Whilst the outdoor surface area (of play areas) is proportional to the school population, the distribution of play areas is relative to the school site and the building typology which impact the student mixing patterns, interactions and subsequent activities. In this research cases studies, apart from the main pitches which are always clustered together and attract students for physical activities, other play areas are either clustered in one area or dispersed across different zones (figure 9.1). For large school sites (e.g. B2, B3 and C1), architects have mostly clustered the main playground space on one side, adjacent to the building, thus, consolidating student dispersal to one zone, where interactions and self-directed activities occur. This allocation changes for building typologies with courtyards, where the building wraps around the outdoor courtyard (e.g. A3, B1, C2 and C3); or within a campus environment, where the outdoor spaces wrap around the buildings (e.g. A3 and A4). In both latter cases, the courtyard and the in-between spaces (of a campus) operate as movement shortcuts along the student routes which trigger through-movements and maximises the potentiality for student
encounters and mixing patterns; beside already being attractors for student socialisation and other activities as students target those spaces during break-times.

In compact sites, play areas are dispersed across different zones. When the site is tight, architects come up with smart solutions to satisfy the required outdoor area through overlapping play spaces with the building footprint which also happen over multiple levels (e.g. A1). This design yields diversified outdoor landscape which attracts more student activities. Additionally, the overlap between the building footprint and outdoor areas yields possibilities of movement shortcuts (as corridors) across the playground which maximises potential student encounters and interactions. The architect also allocates upper-floor terraces to maximise outdoor areas in compact sites (e.g. A1 and A2) as clarified in architect-A interview (appendix 13.1.5). Still, terraces exist in larger school sites (e.g. B2, B3 and C1). All terraces are potentially student attractors for diverse self-directed activities and interactions, especially being proximate to upper-floor classrooms and away from the busier playground.

Alongside the role of play areas as student attractors or movement shortcuts, playgrounds and terraces have distinct configurational properties which shape their potentiality for interactions and self-directed activities. The significant variance (p-value<0.001) in configurational accessibility of spatial functions (in all eleven cases; chapter 4.14) renders playgrounds as highly accessible within the visual mean depth spectrum of each school (marked red; figure 9.2). This is an implication of creating large open spaces, highly porous with multiple entrances and connecting to indoor spaces. Accordingly, playgrounds are part of the natural movement routes in the school (shaped by accessibility), especially when students are granted the freedom of movement during breaks. This reflects on student co-presence and encounters which yield interactions, while the large area (as a property of all playgrounds) accommodates their gatherings and further possibilities for self-directed activities. Contrarily, terraces (marked green; figure 9.2) are segregated on the peripheries of

Figure 9.2: Accessibility of the Playground and Terraces, Compared to Other Spaces in Each School
upper floors, away from natural movement routes. Acknowledging that not all activities benefit from vibrant atmospheres, the segregated configuration of terraces potentially adds to the diversity of student activities, i.e. being suitable for quieter and more private activities with less control from the teachers.

Alongside the accessibility variation between the playground and terraces, the playground, being large and dispersed across different locations, exhibits configurational variations within its areas which contribute to the diversity of student self-directed activities, relative to vibrant and accessible spaces vs quieter and segregated spaces. Configurational variation is illustrated through the spectrum of accessibility for the grid units of each playground (not aggregated VGA), where the visual mean depth is plotted on the y-axis, while the colour gradient portrays the frequency of grid units along the range within a logged scale to clarify variations (figure 9.3). The darker colour indicates denser grid units, thus, a larger space in that specific range. Schools of the narrowest accessibility range (C2, C4 and A4; ordered by narrowest) have play areas clustered in one side. However, wider accessibility ranges correspond to schools of dispersed play areas across the site (e.g. A1; widest range).

In summary, playgrounds are designed as large porous outdoor spaces to accommodate large student populations at a single break period, while terraces are smaller, exhibiting a more private atmosphere. All play areas (playgrounds and terraces) are, by default, student attractors during break times for various social interactions, sports and further self-directed activities, while some playground spaces (e.g. courtyards or outdoor spaces in-between buildings) also function as shortcuts for student routes, hence, maximising their potentiality.
for encounters and interactions. Nevertheless, the main contributor to student mixing and interactions is the configurational properties of play areas. The playground high accessibility triggers student co-presence along natural (shallow) movement routes, thus, maximising the potential for interactions and further self-directed activities, easily accommodated within the available large areas. Terraces are contrastingly segregated and provide the environment for quieter activities to emerge away from the busy playground. Still, the playground itself, formed of dispersed spaces (in some schools), has the potentiality to diversify student activities in response to variations in playground accessibility.

9.2 School Play Areas Actuality vs Design Potentiality

The actuality (occurring activities) of play areas is portrayed through two forms of student self-directed practices during break-times. Firstly, there are patterns of student mixing and encounters which yield short-period communications and instant interactions along movements (section 9.2.1). Secondly, play areas are popular among students to attract them for long-period occupancies which comprise socialisation patterns and various self-directed activities (section 9.2.2). The actuality of short-period encounters or long-period occupancies diverts from the potentiality provided by the design of play areas, as presented for the two studied playgrounds (A1 and B1). This results from the management operational schemes, including (but not limited to) the duration of the breaks and the regulations during those periods (especially in B1), which impact student movements, encounters and interactions and proceed to shape their occupancies and activities.

9.2.1 Student Mixing and Encounters in Play Areas

Student mixing and encounters are incidents which bring students together for short-period interactions along their movements during break-times. Recorded movements (during field observations) happen for multiple reasons, especially within the play areas. That is why for this section, the study excludes activities that require movements by nature (e.g. sports, physical and clean challenges). Thus, the illustrated graph (figure 9.4) portrays the count of students moving, meeting and encountering each other within different school functionalities of A1 and B1. The warmer colour gradient reflects denser movements, and the graph is logged to clarify variations. While excluding physical activities, the significance of encounters in play areas is expressed through the dense playground movements in both schools. They constitute movements towards play areas (attractors) or crossings in the playground as circulation shortcuts which both bring students together and maximise encounters. There are also patterns of group walking, accompanied by various interactions. Contrarily, movements are relatively scarce in terraces (allocated in A1 building; missing from B1 design), linking to their segregation and peripheral allocation away from main routes. Therefore, they tend to function as student attractors more than movement shortcuts (discussed for their popularity in section 9.2.2).
Playground movements, which yield mixing patterns and encounters, primarily correspond to configurational accessibility, such that both playgrounds are highly accessible, as a spatial property of all playgrounds (discussed in section 9.1), therefore, yielding dense playground movements. A1 playground portrays higher movements and encounters (dark red on figure 9.4; highest among all functions) than playground B1 (orange on figure 9.4; second highest following corridors). This is opposite to the expected patterns, since playground B1 portrays higher spatial potentiality and supposedly triggers more movements, being shallower on average visual mean depth (B1=4.52 < A1=4.70), especially at its social area (north of pitches), whereas A1 playground has some isolated areas, like its backside (figure 9.5)\textsuperscript{21}. Nevertheless, A1 management provides freedom to students, while B1 imposes regulations on student movements and permanently alters the playground configuration, thus, minimising movements and controlling encounters, as elaborated below.

\textsuperscript{21} The visual mean depth of both playgrounds is illustrated using the same colour range for the visual mean depth spectrum (figure 9.5) to outline which spaces are comparably shallow (or deep). The colour range is chosen to highlight all the accessibility differences in the playgrounds. The remaining parts of the building are included in the analysis (full building accessibility; chapter 4.1; 4.5) but slightly faded away in display to focus on the playground accessibility.
In A1, the management keeps all accessways to play areas operable, while movement alterations only relate to staircase operation (chapter 6.2.1) with minimal interference on playground movements, thus, yielding free movements and encounters. Recorded movements through gateways (red numbers on figure 9.5) are similar across A1 playground, being shaped by accessibility and student preferences. The highest movements were recorded at the seating benches (Bz1=55) which is mainly accessed from the staircase of the shallow stepped amphitheatre (Az1=48). Movements are also maximised towards certain play areas, being attractors for student, despite the segregation. For example, the corridors in-between dining units (Aq1=48; Av1=36) are vibrant, since their destination, i.e. the playground backside (Av2=35), is popular among students, similar to the playground pitches (Aq2=33; Aq3=30), as elaborated in the next section 9.2.2 on playground popularity.

Contrarily, B1 management imposes regulations on student routes towards the playground which impact their movements, encounters and potential interactions. They terminate accessways from classroom wings towards the social courtyard (grey crosses; figure 9.5), to isolate running sessions within the wings from break-time distractions, considering the dual schedule (chapter 5.1.2). These closures minimise student mixing in the courtyard, unlike its original potentiality as a shortcut for movements between wings. Moreover, the management consolidates movements towards the playground, by promoting the gateways at the busy dining area (Ay4=110; Ay3=29) and discourages students from using the southern
playground access (Av1), adjacent to the south wing, to keep it quiet. This is against student natural movements, since Av1 gateway is highly accessible and serves the dense streams coming from the south wing (Az1=169). Accordingly, it remains vibrant during operation (Av1=71), against the school efforts.

Beside changing routes towards the playground, the management also alters movements within the playground spaces which further reduces student mixing. They install mesh partitions (Black zigzag; figure 9.5) to regulate movements towards the pitches, being limited to one gateway (Av2=69) through partition 1 (east-to-west). They also separate ball activities from student socialisation, using partition 2 (north-to-south). These alterations isolate the seating area (west of the pitches; figure 9.6), becoming the most segregated space in the playground which originally (un-partitioned) was equally shallow to the area north of pitches. Finally, the outdoor connecting corridor (far east link) exhibits dense movements (Av3=60), sustaining circulations between the courtyard and the southern zone of social areas and pitches. Nevertheless, movements do not lead to mixing patterns nor interactions due to its limited potentiality. It is designed as a narrow pathway (not a seated social space) with blocked access (by the management) from the south wing. These properties do not match its configurational importance as the only outdoor connection between playground spaces: the courtyard on one side and social areas and pitches on the other.

The consequences of A1’s free movements, compared to B1 controlled environment, reflect on the configurational accessibility of the movement patterns. In A1, excluding activities that require movements by nature (e.g. sports, physical and clean challenges), the student dispersal follows natural movement routes, being dense along the shallowest routes which grow vibrant with encounters, interactions and socialisation. Movements, thereafter, decrease gradually as segregation increases; yet, certain deep spaces remaining dense with movements, i.e. attractors for students, such as the playground backside. Contrarily, movements in B1 playground do not follow natural movement routes and are similar across different ranges of the accessibility spectrum. These configurational properties of movements are deduced from figure 9.7. It shows records movements from field observations22 in both

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22 The graph excludes recorded patterns of movements that result from sports, clean and physical challenges, i.e. activities that require movements by nature. Hence, it illustrates movements generated by the configurational properties of the building.
schools (X-axis) and their corresponding visual mean depth of each record (Y-axis). The darker gradient reflects denser movements at each accessibility range; values are logged to clarify differences.

![Visual Mean Depth of Movements](image)

*Figure 9.7: Visual Mean Depth of Movement Patterns (A1 vs B1)*

In summary, while terraces function as attractors, the playground has the potentiality to trigger student encounters and mixing, relative to movements patterns, i.e. walking patterns intertwined with interactions, excluding movements of sports or challenges. Those patterns (of mixing and encounters) depend on configurational accessibility and the design potentiality to activate certain play areas as movement shortcuts. Within a free-movement playground (case of A1), student movements follow the natural routes, densifying along shallow play areas which are vibrant with encounters as seeds for interactions, and movements (and subsequent encounters) decrease gradually towards segregated play areas. Still, some deeper play areas exhibit dense movements, as attractors according to student preferences (e.g. A1 backside). Contrarily, when the management interfere in student routes or alter the playground configuration through partitioning (case of B1), movements are shaped by regulations and undifferentiated between shallow or deeper spaces. Still, certain routes, despite being discouraged by teachers, are vibrant in operation, as natural student routes, i.e. highly accessible and proximate to student occupied spaces (e.g. B1 southern gateway to playground).

### 9.2.2 Popularity of Play Areas for Student Self-directed Activities
The popularity of play areas is the degree by which students are attracted to perform various individual and collaborative self-directed activities and socialisation patterns during break-times, beyond instant encounters. Play areas are not equally popular, being influenced by the design which prescribes the spatial potentiality. After that, the school operational scheme impacts the actual student occupancies and occurring activities. Hence, they influence the spatial potentiality and, accordingly, maximise or inhibit the popularity of play areas. The popularity is expressed for the vibrant playground, as the common student destination in every school (studied for A1 and B1), and terraces of A1 (missing from B1) as attractors for lower number of students, i.e. the quieter atmosphere.

9.2.2.1 The playground

The playground popularity links to its functionality as a prime student destination during break-times. Movements within the playground contribute to student mixing patterns (previous section 9.2.1) and substantially increase possibilities of socialisations, thus, influencing popularity. Nevertheless, the playground popularity is evaluated beyond movements or instant encounters to comprise the long-period occupancies of different self-directed activities which contribute to learning as a social process (literature section 2.6.2). Those learning practices of self-directed activities and interactions are shaped through multiple spatial parameters and the management operational scheme as described below for playground A1 and B1.

A1 playground is more popular among students than B1, as deduced from higher occupancies during break-times (dots on figure 9.8)\textsuperscript{23}. A1 playground has an average of 563 students per day during observations of break-times, whereas B1 playground attracts a lower average of 276 students. Cumulative occupancies (from observations) are illustrated as concentration heatmaps (clouds on figure 9.8), hence, revealing which specific zones are more occupied by students than others (darker red clouds). Variations of concentration are displayed across playground areas within the same school and compared across schools. Heatmaps do not reflect occupancies but signify the student concentration per area. That is why football pitches are not highlighted, despite their high occupancies, because students distribute over large areas.

\textsuperscript{23} Occupancies (from observations in both playground) are comparable, since the recordings presented on figure 9.8 are for equal observation duration (aggregate of five days), and both schools have similar populations. They also implement the same dual schedule that splits the student body over two lunch breaks, so the total number of students on break (at one period) is similar between both schools.
The higher popularity of A1 playground (than B1) matches its design of diversified landscape features (eleven destinations marked on figure 9.8) which also have different accessibility properties as portrayed in the average visual mean depth (VMD) of each area (figure 9.9). A1 highest student concentrations spread along the edge of the shallow bridge (No 8 on figure 9.8; VMD=4.40), where students gather around benches to socialise and watch the lower-level pitches. Moreover, high concentrations exist on the similarly shallow amphitheatre and the central platform (No 1&2 on figure 9.8; VMD=4.32), as students move benches from under the bridge to the front of dining units. This corresponds to the less popularity of dining units (chapter 8), such that students eat individually (in their assigned unit) and leave to the playground to meet friends. Lastly, high concentrations propagate towards the segregated backside (No 7 on figure 9.8, VMD=5.45), being unexposed to other play areas (more private) and popular for ball activities or social groupings as elaborated in the proceeding discussion of activity types.

Moderate student concentrations exist under the bridge on level 1 (No 5 on figure 9.8) which is a unique area in terms of configuration and relationship to the surrounding spaces. Firstly, it is the shallowest playground space (VMD=4.15), potentially attracting many students. Still, the space remains private and not exposed (unlike the central platform), since it is protected by the upper bridge and confined between two rows of columns from the east-side (basketball court) and the west-side (central platform). From this area, students expose all
level-1 spaces (except the playground backside). While most of play areas have changeable students on different days, this space is daily occupied by the same group of students who sit on wooden benches. Finally, students (of lower concentrations) are attracted to level-2 benches (No 10 on figure 9.8; VMD=4.62) and the shallow outdoor gym (No 9 on figure 9.8; VMD=4.51), for its soft flooring which allows students to sit comfortably, relax and socialise.

![Visual Mean Depth of Playground Space](image)

*Figure 9.9: Accessibility of Different Play Areas in the Playground (A1 vs B1)*

The lower popularity of B1 playground is portrayed through lower occupancies and smaller concentration clouds. This corresponds to the less-diverse landscape (five destinations on figure 9.8), while the management imposes strict regulations which further inhibit the popularity. Accordingly, the student distribution reflects this controlled environment and does not match the configurational potentiality. For example, the social area (north of pitches; No 3 on figure 9.8) is the shallowest playground area (VMD=3.92); however, supervision discourages students from standing there, unless being seated at its few benches. The management limits group formation to five students. Teachers dismantle large groups and ask students to move towards the courtyard (No 1 on figure 9.8), where they sit at the benches. The courtyard cultivates the highest concentrations, as the designated social space, although it is not the shallowest space (VMD=4.35) and already had reduced movements upon closing its wing entrances (previous section 9.2.1).

Despite the controlled environment, B1 students follow their preferences in some situations. For example, in the lack of supervision, students revert back to stand in their preferred shallow social area (north of pitches) which accommodates high concentrations (but lower than the courtyard). Student preferences also prevail as they favour-less the seating (west of
pitches) although being designated (by the management) for socialisation. It has the lowest concentrations, being the most segregated space (VMD=5.44) and accessed from a secondary entrance inside the pitches, following the playground partitioning (discussed in section 9.2.1). Still, the south end of this social seating attracts certain student groups who seek segregation and less supervision (elaborated in the discussion on activity types).

Studying A1 and B1 playground occupancies reveals the differences between the popularity of the playground (defined through long-period occupancies) and its patterns of instant encounters (shaped by movements; previous section 9.2.1). Although low movements always yield low occupancies (i.e. low popularity), such as B1’s social seating west of the pitches, contrarily, higher movements do not guarantee higher occupancies (higher popularity). For example, A1’s highest student concentration is along level-2 bridge, relative to the student preferences, high configurational accessibility and the visibility provided towards the lower pitches. Yet, these high concentrations do not match the lower movement streams along the bridge (Bz2=27; section 9.2.1), especially when compared to the higher movements on the opposite eastern side (Bz1=55). Both data sets do not contradict, since high concentrations on the western bridge are based on student sitting and standing occupancies (long-period), whereas higher movements on the eastern side is associated to short-period encounters along shallower routes. The same applies to B1 courtyard which accommodates the highest student concentrations but not the highest movements (upon closing wing-accesses). In the case of B1, concentrations correspond to regulations that assign the courtyard as the main student social space.

The higher popularity of A1 playground than B1 matches the previous findings in other chapters, where B1 students prefer to occupy the indoor dining area (the busiest break-time destination; chapter 8) and the library (second busiest; chapter 7) over the playground. Contrarily, A1 students spread more within outdoor areas than their indoor occupancies in dining units or library. This variation in popularity also matches the student preferences, obtained from their questionnaires (appendix 13.7.5), where 51% of A1 students (highest percentage) are attracted to the playground for social activities, compared to 31% of B1 (ranked second after the dining space 46%). A1 students also favour the playground for quieter interactions in small groups (or pairs) more than B1 students (27%>20%); or to stay individually (9%>8%). Finally, 29% of A1 students want to eat in the playground, although it is against the rules, whereas only 19% of B1 share the same desire, despite eating being allowed by supervision in B1 playground.

In summary, the playground popularity is shaped through long-period occupancies by different social groups that yield various student concentrations, beyond instant movements or encounters. When free movements are granted (case of A1), occupancies are shaped by student preferences, being attracted to multiple play areas of diverse landscape features and diverse accessibility properties. This matches the preferences of students who favour the playground over the indoor dining units or library. Contrarily, the lower popularity of another playground (B1) matches its lower occupancies as student appreciate-less the controlled environment and are more attracted to the indoor dining area or library. Student concentrations in the playground are shaped by regulations and supervision (in B1), rather than configurational properties (case of A1). Students (in B1) sit around benches in designated areas, more than their patterns within shallower spaces. Still, student preferences prevail, as
they socialise in the shallowest spaces in the absence of supervision, and other social groups target the segregated play areas.

After discussing playground occupancies that reflect the degree of popularity, these patterns exhibit different types of activities, classified into categories described in chapter 5.1.2. Recognising learning as a social process, all self-directed activities and interactions in the playground influence the student learning experience. Social activities, relaxations and performances enhance the student mental and emotional wellbeing, while sports and other physical activities contribute to their physical wellbeing (literature 2.7.4). A1 playground, which is more popular due to its multiple play areas, diverse landscape and accessibility properties beside the freedom granted to students, yields more activity variations (35 activities across 13 categories). Contrarily, B1 playground, being less popular with a less diverse landscape within a controlled environment, portrays less activity variation (13 activities across 8 categories), as displayed in figure 9.10. In both playgrounds, the most frequent activity category (by percentage) is verbal interactions, such that A1 has more interactions than B1 (71%>58). Sports come second, being higher in B1 (33%) than A1 (12%). All activity categories are elaborated in the following discussing while referring to their configurational accessibility.

Figure 9.10: Activity Types and Categories in the Playground (A1 vs B1)

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24 Categorisation simplifies activities by clustering similar ones together. When deciding on the classification, for all functions, most categories had multiple activity types (chapter 5.1.2). Yet, for the playground, some categories have only one activity after filtering out activities missing from play areas (present in other functionalities).
Playground activities have configurational properties (figure 9.11), deduced from correlating observations to configurational data (methodology 3.7.3). The study has already established the significant variance (P-value<0.0001) in accessibility (visual mean depth) of each activity for both schools (chapter 5.2). The accessibility of certain activities, for example, basketball in A1, refers to the configuration of the play area which attracts students, i.e. the basketball court. Nevertheless, for other activities, when students are granted freedom of movement, the accessibility reflects student preferences. For example, dancing in A1 or talking in B1 are shallow activities, while climbing a post (misbehaving) in A1 or fighting (physical challenges) in B1 are segregated, all according to student preferences. Figure 9.12 presents the average accessibility and range of all activities.
Since activity variations are high in both playgrounds (especially A1), activities are not discussed simultaneously. Each category or similar categories are presented together on a separate figure according to the following themes: (1) verbal interactions; (2) sports; (3) intellectual activities, invented games and performances; (4) clean and physical challenges and misbehaviours; (5) student solitude, i.e. spending alone time; and finally (6) relaxed activities of chilling, waiting and watching.
Verbal interactions (figure 9.13) are the most frequent activity in both playgrounds, being the prime contributor to concentration clouds, i.e. the busiest locations. Interactions disperse across the play areas which is the higher percentage especially in A1 (57%) than B1 (38%); or cluster around seating benches. A1 students still have seated interactions away from benches, courtesy of the diversified landscape. They socialise on the hard flooring of the amphitheatre, the soft flooring of the outdoor gym and the grass area. In terms of accessibility, interactions (away from benches) are more segregated in A1 than B1 (VMD: 4.45>4.25) which mostly reflect student preferences. Standing and moving groups target highly segregated spaces, for example, the backside of the playground (5.45) and the far west end of the football pitches (4.99) to maintain their private social group within the busy playground and to avoid supervision. In B1, patterns away from benches are mostly students moving towards (or away from) the designated social areas, thus, being shallow, along main routes.

Interactions around benches are less in A1 (14%) than B1 (20%), although playground A1 has higher cumulative interactions (71%>58%). This corresponds to B1 controlled playground, as the management allocates benched social spaces for socialisation. Teachers discourages standing in groups (away from benches) and redirects students towards designated social spaces, where supervision is higher. While A1 students are granted free movements, some students socialise around fixed concrete benches on level 2. However, other students prefer the wooden benches on level 1 which are movable, and teachers allow students to arrange
their seating layout. A1 benches concentrate under the bridge (the shallowest space of the playground), and students move some benches towards the similarly shallow central platform to sit and mix with passers-by. This explains the shallower accessibility of bench-interactions in A1 than B1 (VMD=4.35<4.61), whereas the latter (B1) has fixed benches allocated by the architect. Bench locations are embraced by the management which prohibits moving benches, and the management already segregated one seated social space (west of pitches; with benches) by adding partitions, as discussed in section 9.2.1.

Doing sports (figure 9.14) is the second most-frequent activity in both playgrounds. Pitches and courts are attractors to students, regardless of their accessibility. Playground A1 has different court types which yield higher sports variation, comprising football in two pitches, basketball in one court, exercising in the outdoor gym and other ball activities simultaneously within those zones. B1 playground has less sports variation, limited to football in pitches or ping-pong at the tables (west of pitches). While A1 allows students to freely practice their sports, B1 management is strict about pitch occupancies (20 students). A supervisor regulates access to the pitches and controls the student play time, through substitutions between players on the pitch and others queuing. Nevertheless, B1 sports are more frequent (33%) than A1 (12%). This possibly links to the controlled social spaces of B1 which boosts the popularity of football pitches, whereas A1’s diverse landscape (with more freedom) triggers...
multiple student activities beyond sports. Moreover, sports being a limited merchandise in B1, controlled in duration, possibly attracts more students to do sports.

Sports overflow to other play areas, beyond the designated pitches, which only occurs in playground A1, being permitted (occasionally) by teachers but completely restricted in B1. The configurational accessibility of A1 sports (outside pitches) reflects student preferences. Few students choose the central platform and level-2 benches for ball activities, but many students target the backside of the playground. In the former location (platform and benches), ball activities emerge spontaneously as a result of student groupings. These activities are short in duration, as they disrupt other students (passers-by or sitting) in the vibrant, highly accessible locations, hence, being stopped by teachers. In the latter case, the playground backside turns into a sports zone with high occupancies similar to the pitches yet being denser due to the smaller area.

There are multiple factors that facilitate ball activities in the backside. Firstly, the space is confined by the building from one side and the school fence from the other, forming a pitch-like space that accommodates interesting and less rule-based ball activities (unlike the main pitches with proper football). Secondly, the space is highly segregated (VMD=5.45; highest in the playground) away from student routes which provides isolation from passers-by who disturb (or be disturbed by) ball activities. Configurational segregation also plays a bigger role to support football in the backside, rendering it suitable for students who love football but not skilled enough for the main pitches. In the backside, there are less students watching, unlike the main pitches that is visible from level-2 bridge, where many students gather to watch. Finally, there is less supervision over the backside, unlike the teachers’ regular presence in shallower spaces, where they stop ball activities.
Moreover, there is another theme of self-directed practices, including intellectual activities, performances and student invented games that emerge in A1 playground (figure 9.15). They are missing from B1 playground, being concentrated inside the popular dining area (chapter 8.2.2). Intellectual activities (in A1 playground) include group studying on benches under the bridge, recurring by the same student group who like the space for its high accessibility (shallowest in the playground; \( \text{VMD}=4.15 \)) to connect with others yet its spatial confinement (with side columns) that secures a degree of privacy. There is one case of a student reading on a level-2 bench during a less-busy day (towards exam season) which explains how the typical vibrant atmosphere inhibits certain activities, even if afforded by the design. Finally, there is a group of younger students who explore the vegetated area of the backside (trees and soil). It is an intellectual activity intended to study the plants, nurtured upon the student curiosity and possibly linked to one of their class activities.

Alongside intellectual activities, different games and performances exist in A1 playground. The activity locations reflect the student configurational knowledge and understanding of the playground landscape. For example, students play board and card games in level-2 grass area (if opened by the management) which is suitable for ground-sitting in groups on hot summer days, with no passers-by to disturb. There are more interesting games invented by the students, such as bocce but using coins. Different social groups personalise this game in terms of rules and number of players, and they target different locations away from each other.
However, this game’s locations have configurational similarities, being in the midrange accessibility (VMD=4.41). Students choose corners to secure a degree of privacy and separation from passers-by (who disturb the game), but they do not intend to hide from supervision (e.g. corner of the bride and under the bridge). Finally, situational awareness is also portrayed when students perform. Dancing students use the shallow central platform which attracts attention from every other space (theatrical effect). Nevertheless, other performers, rehearsing for the school play, choose quieter spots on level 2 to focus more on their performance.

Student challenges and misbehaviours (figure 9.16) are un-avoided in both playgrounds, although being undesirable by the managements. They emerge as by-products of the student high activity during break-times. Challenges are either clean, such as running, chasing and rolling in the grass; or more heated up challenges with physical contact (e.g. fighting). In both cases, challenges are recorded during observations\(^{25}\), and their labelling as misbehaviours (or not) is left for management decisions, relative to regulations, which alternates in different situations according to the degree of aggression. Nevertheless, further activities are clearly

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\(^{25}\) Activities observed in both schools, including all student challenges and misbehaviours, are not dangerous nor threaten the student safety. Still, the researcher reported all physical challenges, once observed, to the playground supervisor, in compliance with the ethical approval (appendix 13.4).
classified as misbehaviours against the rules, performed individually or in groups, such as climbing a post or sneaking scooters from the storage to ride during break-times in A1.

In terms of clean challenges, there are more variations in A1 playground but completely missing from B1, possibly resulting from the A1’s higher popularity, diverse landscape and the freedom granted to students, unlike the controlled environment of B1. Clean challenges compose 2% of activities in A1 playground. One popular example is students competitively running, being a shallow activity (VMD=4.30) which emerges spontaneously in the central platform among groups of friends. More vigorous chasing exists in the same location but mostly spread on the less-busy level 2 and into the segregated backside, thus, yielding a deeper configuration (VMD=4.67). Moreover, rolling in the grass (competitively) is linked only to level-2 grass area and is conditional to it being operable during certain times of the year (decided by the management). In general, students do not feel the necessity to hide, and their patterns spread spontaneously across multiple play areas.

Student physical challenges are less spontaneous in both playgrounds (unlike clean challenges). Students consider their location, its configuration and surrounding supervision, hence, evaluate the risk of getting in trouble, before starting the challenge. Accordingly, less-vigorous challenges (low risk), perceived by students as having fun, are not segregated, such as bag-swinging fights at level-2 benches in A1 (midrange accessibility; VMD=4.41), pushings along the corridors towards A1’s backside and fights with elastic bands in B1’s courtyard (VMD=4.74). Contrarily, tense fighting and pushing (high risk) are segregated and primarily avoid supervision. A1 students target the isolated backside for fights (VMD=4.60). Pushing is deeper (VMD=4.73), courtesy of incidents at the furthest end of the backside. In B1, where regulations (and penalties) are stricter, fighting is highly segregated (VMD=5.54; highest of all activities) in the furthest point from supervision in the social area (west of pitches) which is isolated upon installing partitions to regulate movements. In general, B1 fighting percentage is slightly higher than A1 (1.4%>1.25%) despite B1’s stricter supervision which questions the necessity of maintaining a controlled environment if it only shapes student movements.

Student misbehaviours also diversify in accessibility (like challenges), but they have a common condition which is the lack of supervision. While challenges are hard to inhibit, being spontaneous and driven by student high energies and eagerness to compete, misbehaviours are easier to control, being automatically inhibited in the presence of teachers. Students are aware of their surrounding and do not initiate misbehaviours except during the brief absence of teachers in the respective space, as recorded in all incidents of both playgrounds. For A1, misbehaviours happen in the backside, as a student attempts to climb a post (VMD=5.69), in the south-west end of the football pitches, as a student jumps over the fence (VMD=5.00) or inside the bicycle parking under the bridge, as some students sneak scooters to use in the playground (VMD=4.45). In B1, there is single case in the far corner of the segregated social space (west of the pitches; VMD=5.54).

Another activity, perceived as misbehaving by regulations, is eating in the playground. Management A1 is strict about preventing eating in play areas (only rule in the playground), whereas B1 allows it for food not taken from the canteen (no use of kitchen trays). Eating in playground A1 is highly dispersed across different play areas with no common configurational properties, only relative to the lack of supervision. The nature of eating outdoors, being a
quick incident, allows students, after securing their surroundings, to sneak a bite from their food and hide it again. Students do not target segregated spots, since the main purpose of eating outside dining units is to stay with friends (who are possibly assigned to another dining unit as discussed in chapter 8.2.2). Thus, eating follows social grouping, parallel to other activities, for instance, eating while socialising outside the dining units (VMD= 4.55); or eating while watching football from the western seats inside the pitches (VMD= 4.76) or from level-2 bridge (VMD=4.47).

Student solitude (figure 9.17) is significant in both playgrounds, as 6% of A1 students (4th most frequent activity) and 4% of B1 students (ranked 3rd) spend alone time. Incidents of solitude happen as students walk (wander) by themselves across play areas, which is the higher percentage; or fewer patterns of sitting alone. The act of walking alone spreads evenly across play areas, especially the main routes, such as A1’s staircases within the amphitheatre or B1’s corridors towards the playground from the dining area. Moreover, sitting alone exists in A1, following the location of benches or on the stepped amphitheatre, while being very scarce in B1. In general, patterns of walking or sitting alone are either temporary, when students walk towards friends or sit waiting for them; or for longer periods, as students intentionally isolate. The latter scenario is noticeable when individuals avoid interacting with peers. It is expressed in the student questionnaires (appendix 13.7.5), where 9% of A1 students and 8% of B1 prefer
alone time in the playground. Nevertheless, it is hard to recognise (during observations) the exact purpose behind being alone.

The last category comprises activities of a relaxed nature, either watching and waiting or chilling which compose 6% of A1 playground and 5% of B1 (figure 9.18). Firstly, the act of watching is tied to viewing areas, proximate around competitive activities. A1 students mostly watch football and basketball from level-2 bridge or from inside of the sport zones at the pitch edges or corners of the backside (which functions as a pitch-like area). Students cluster into socialising groups to watch, talk and make fun of the game (and players). B1 students mostly watch football while queuing next to pitches to take their turn in the playing team, as regulated by the supervisor who controls the duration of play and pitch occupancy. In fewer cases in both playgrounds, students watch others’ physical challenges, either in A1’s backside or B1’s segregated social space (west of the pitches).

Student individual or group relaxations happen in A1 (2%) as students laydown on the outdoor gym-floor or the grass area. Both spaces are accessible and proximate to main

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26 According to the ethical approval (appendix 13.4), the researcher does not interact or ask questions to students during observations which explains the ambiguity to understand why students stay alone, whether waiting for other or just preferring to be alone. Moreover, students did not disclose their alone locations when asked about it in the questionnaires. Many students selected ‘others’ in this particular multiple-choice question.
playground circulation routes on level 2. Nevertheless, these spaces are cornered in the plan, where students sit with their backs against the south-end wall of the school. Accordingly, students secure a degree of privacy while connecting to their friends who pass by. Furthermore, these spaces have comfortable flooring (grass or soft rubber) which students prefer especially on hot summer days, thus, portraying how the furniture setup further influences possibilities for certain student activities, even unmatching the original spatial function, i.e. gym area for relaxing but not exercising. There are less patterns of relaxations on the hard flooring of the amphitheatre. However, similar relaxations are missing from B1 playground, in respect to the strict operational scheme in the whole school including the playground.

![Diagram of School A1 and B1 playgrounds](image)

**Figure 9.19: All Playground Activities (A1 vs B1)**

In summary, both playgrounds accommodate diverse self-directed activities of various social, physical and intellectual natures which contribute to the student learning experience beside their challenges and misbehaviours; all activities aggregated on figure 9.19. The highly popular playground, of diversified landscape and configurational properties, triggers more activity variations (case of A1), unlike the controlled playground of less diverse landscape (case of B1). When granting student freedom, configurational diversity influences student preferences for activity locations, supported by their configurational awareness. Students know where to socialise in groups while connecting to passers-by (e.g. moving benches into A1’s shallow platform); where to be visible but maintain privacy for intellectual activities (e.g.
under A1’s bridge); and where to isolate to play unwatched football outside pitches or fight and misbehave (e.g. A1’s backside). Students also comprehend their playground landscape, matching certain areas for relevant activities, for instance, stretching on A1’s soft gym flooring or grass area; or watching football from A1’s bridge. Even in the controlled playground (B1), as supervision is stricter, students know where to stand to socialise while anticipating supervisors (e.g. B1’s social space; north of pitches), hence, staying on the move and pretending to be moving towards social spaces (e.g. B1’s courtyard). They understand the isolation guaranteed upon partitioning play areas, therefore, the suitability of certain spots for physical challenges away from supervision (e.g. ping-pong tables; west of pitches). In general, all self-directed activities and interactions have a spatial dimension that links to configuration, landscape diversity or functionality of spaces as student attractors.

9.2.2.2 Upper-floor Terraces

Alongside the playground as a popular student destination during break-times, some schools (six of eleven cases) have additional play areas portrayed in upper-floor terraces. The popularity of terraces among students is discussed through school A1 which has four terraces for its secondary school (missing from B1). A1 terraces attract students during breaks for long-period occupancies, as permitted by the management. They have quieter and less busy atmosphere (unlike the vibrant playground), relative to their configurational segregation and peripheral allocation. The popularity of terraces is also expressed in the student questionnaire (appendix 13.7.5), where 12% of A1 students favour the terraces for social activities; 8% appreciate alone time in terraces; and a higher percentage (19%) prefer quieter interactions there. Additionally, 15% of students want to eat in terraces (which is prohibited by school regulations).
The popularity of A1 terraces yields student occupancies (figure 9.20) as continuations to student patterns within upper-floor corridors and open studios during breaks (chapter 6.2.3). Occupancies vary across the four terraces according to multiple factors. Firstly, while terraces are similarly segregated on peripheries, some terraces are small which inhibits their popularity. This includes the easter terrace on level 4 (with zero occupancies recorded) and the science terrace on level 5 with very low occupancies. Secondly, the occupancies are impacted by the schedule and the teachers. For example, the art terrace on level 5 is large enough for student activities; however, it is adjacent to the art studio which has classes during student breaks (due to the dual schedule). The teacher asks student to leave this terrace to avoid distractions. In fact, the teacher sometimes runs their art class in the terrace itself which automatically inhibits its popularity among other students on break, who cannot stay around a running class. Considering the above conditions, level 4 plantation terrace (east side) is the busiest, being large with a central grass platform and away from running classes.
Student occupancies comprise activity variations (figure 9.21) which correspond to different characteristics of the terraces. For example, some students prefer to play in terraces over the playground, because it is less busy, i.e. less interference from other students. These play patterns compose the highest percentage (49%) and are mostly concentrated in the plantation terrace (level 4), while being scarce in the smaller science terrace (level 5). The same applies for interactions (21%; second most activity), being favoured by some students in the quieter terraces (over the playground) and also concentrated in the plantation terrace. Moreover, the quieter atmosphere attracts students for intellectual activities (8%), such as student revisions, independent reading and group learning and practicing of origami. While those patterns concentrate in the plantation terrace, the teacher (running the art studio on level 5) allows independent reading in the art terrace, knowing students will not cause distractions. This example illustrates how teachers influence the activity distribution and variation across terraces.

Student challenges and misbehaviours emerge in the terraces, consequent to the lack of supervision which applies to the whole upper-floor outdoor spaces, including the external corridors (discussed in chapter 6.2.3). Challenges and misbehaviours concentrate in the unsupervised plantation terrace (level 4). They are much fewer in the science terrace and non-existing in the art terrace (supervised by the art teacher). For example, clean challenges (3% of activities) include chases which spread in the plantation and science terraces. More intense challenges grow, such as fighting (another 3%) in the plantation terrace, and some students gather to watch, replicating the same patterns of the playground backside. Finally, in terms of misbehaviours, the percentage is higher than challenges (7%), as students recognise the lack of supervision. Their majority use their phones (which is against regulations), while less incidents of eating happen in the terraces.
In summary, terraces portray the quieter, less intense extension of the playground. Their environment is shaped through configurational segregation and peripheral allocation. Nevertheless, terraces stay active not as vibrant movement routes with encounters, but rather as attractors for small groups of students during break-times. Student occupancies in the terraces are shaped by the size of each terrace, its proximity to running classes beside the role of teachers to allow or prevent student from occupying the space. These factors render the popularity of certain terraces (e.g. Plantation terrace; level 4) over other terraces. Popularity translates into a diversified range of activities, all reflecting the quieter atmosphere of the terraces, such as play patterns away from interferences in the larger playground, quieter conversations and interactions and some intellectual activities. Yet, the quiet and segregated atmosphere, accompanied by the lack of supervision, also yields some student physical challenges and misbehaviours.

9.2.3 Student Group Formations in Play Areas

In the context of play areas, during break-times, student interactions and self-directed activities are mostly collaborative practices, i.e. group formations, which are argued to enhance the student social wellbeing (literature section 2.7.4) and widen their learning abilities, if involved in intellectual activities (literature section 2.6.2). In A1 terraces, student formations are mostly small groups, relative to the quieter atmosphere. However, the main variations in group formations are within the highly popular playground of diverse activities, ranging from individuals and pairs to small groups (3-5 students), medium groups (6-9 students) and larger clusters (more than 10 students). Both playgrounds have more frequent and larger group formations than any other school function. The variations in group formations are driven by student preferences in playground A1 but mostly controlled by regulations and teachers who distribute groups in B1, as explained in the following discussion.

Group formations correspond to student activities. In one scenario, student groupings are products of a recurring activity that brings students together, i.e. an activity type yields multiple social groups. For example, football attracts students to pitches, where clustered individuals play in teams. Shortly, a second group (not playing) start to watch, socialise and make fun of the game, from A1’s bridge or B1’s queuing side of the pitches. In another scenario, the formation of a social group yields further activities to emerge. This is more common in A1 than B1, resulting from the controlled playground environment in B1. For instance, a group of friends gather on A1’s stepped amphitheatre. The group eventually start talking and arguing. Few students start to eat secretly, and others start chasing when a couple tease each other. Activities continue to diversify, while the group formation lasts. The variations in group sizing in both playgrounds (resulting from the aforementioned scenarios) are explained in the following discussion.
In both playgrounds, individuals (blue dots on figure 9.22) are patterns of sitting or moving alone (elaborated in section 9.2.2) which compose the smallest percentage (A1=6%; B1=5%), being hard to exist in the busy playground. Individuals are only common in A1 library (chapter 7) than A1 playground, but they hardly exist in any of B1's informal spaces. Contrarily, students in pairs are more frequent in the playgrounds, and small groups (3-5 students) spread even more, composing the largest percentage (A1=36%; B1=33%). In playground A1, grouping is unrestricted (by management). Therefore, pairs and small groups (green and yellow dots on figure 9.22) distribute according to student preferences, moving all over the playground; or sitting at benches or directly on the floor (e.g. amphitheatre, grass area and the gym). In B1, pairs and small groups (sitting at few benches or mostly standing) favour the social area (north of pitches) for its less supervision, over the courtyard. The latter (courtyard) is less favoured, despite having more seats, due to its higher teacher presence. These spatial preferences are chosen by B1 students, since group-size restrictions apply for formations larger than five students. Sometimes, teachers encourage standing students to start moving into the courtyard (the more controlled space).
The distribution of medium groups (6-9 students) in playground A1 (figure 9.23) mimics the wide dispersal of small groupings. A1 students spread freely to create medium groups while socialising or studying around benches. For example, it is common to see a group of six students moving a picnic-style bench into A1’s central platform. Being in a highly visible location, they are joined by other friends to grow the group into seven or eight students. They all stack on the bench (capacity four to five). This example (of group formation) repeats in various locations away from benches, as students sit more comfortably, independent of furniture, on the stepped amphitheatre or the grass area; beside their standing groups everywhere (e.g. central platform and most of level-2 spaces).

Contrarily, medium groups in B1 are associated to benches within seating areas, assigned by the management. Although regulations restrict formations more than 5 students, teachers permit students to sit on large picnic-style benches in groups of six or seven, being accommodated by the bench capacity. Consequently, the courtyard benches attract more students in medium groups than the social area (north of pitches) which has smaller benches; thus, group-size regulations apply. This is contrary to patterns of pairs and small groups which reflected more student interest in the social space (north of pitches) than the courtyard, as illustrated earlier (figure 9.22). Still, some student groups stand north of the pitches, following their preferences, yet being shortly dismantled by teachers. Finally, there is significant
presence of medium groups in the social area (west of pitches) for students interested to be segregated and away from supervision.

Large groups (mauve dots on figure 9.23) are less dispersed in both playgrounds and are associated to specific locations. Yet, their distribution has different justifications in both playgrounds. Apart from groups who play sports in pitches or areas acting as pitches (A1’s backside), A1 students still have the freedom to choose their large-group locations, being mostly impacted by the surface area to accommodate the large formation and allow for its growth. For example, large socialising groups are accommodated in the central platform, the stepped amphitheatre and the grass area for socialisation. The largest groups (33 students) cluster on the bridge to socialise and watch football (of the lower-level pitches), and the group grows further as more students join by time. In B1, large groups are only restricted to sports in pitches. Still, students take advantage of the absence of supervision in the segregated social space (west of pitches) and cluster in large groups. The other large group, recorded in social area north of the pitches, was quickly dismantled by the teacher.

In summary, the playground exhibits the highest variation of student grouping in the school building. Group variations link to activity variation, either being a product of a specific activity (e.g. grouping to study or do sports); or the opposite scenario, where activities emerge from student clustering, i.e. friends meet first then activities follow. When students are granted freedom (A1), grouping patterns reflect student preferences, such that pairs and small groups highly disperse in the playground, and the increase in group population constrains the student locations to areas that possibly accommodate larger groups and serves the group purpose. Larger groups are also more static and grow across time, as passers-by join. On the contrary, in another playground (B1), the process of group formation is moulded by group-size limitations and control over group distribution. Still, students find their way to create large groups, by sitting away from supervision; or standing and being ready to move, before being dismantled by a passing teacher. In all cases, grouping is an expression of student social life and their collaborative activity types which positively influence the student social and emotional wellbeing.

9.3 Affordances of Play Areas

As described in literature (chapter 2.5), affordances constitute the capacity of the environment to primarily accommodate and further trigger actions or activities, in this context, by students in play areas. The affordances of play areas are shaped through multiple spatial parameters, related to the school design and configuration which layout a set of possibilities for student interactions, socialisation and self-directed activities during break-times, either in the playground or the upper-floor terraces (if available). Nevertheless, affordances are further shaped through operational factors, i.e. the management degree of control over play areas and the regulations they implement which restrict possibilities in space or allow freedom for students to act according to their preferences.

The size (area) of play spaces portray the first spatial parameter that impacts affordances. The playground is typically the largest space and the main student attractor during breaks. Therefore, it affords higher simultaneous occupancies than other spatial functions, yielding a vibrant atmosphere of co-presence, encounters and interactions, beside diverse collaborative
activities. High occupancies lead to student groupings, and the spacious playground exceptionally affords large group formations, being comfortably accommodated as the surface area allows, unlike other informal spaces (corridors, libraries or dining spaces) which afford smaller groups. These social groups and their embedded collaborative activities are important for the student mental, emotional and social wellbeing as described in literature (section 2.7.4). On the contrary, the relatively smaller areas of terraces afford less occupancies and smaller groupings. Accordingly, terraces complement the student needs with a quieter environment that affords a sense of student privacy, lacking in the playground but beneficial for the student mental wellbeing: to clear their minds and restore their energy.

Alongside their size, the allocation of play areas yields different distributions of student occupancies, therefore, affords different mixing possibilities and activity types. Certain school designs render play areas as dispersed yet connected zones which afford less global mixing but higher activity variation. Each area has its main theme (activity category) with minor activity deviations in the background. For example, A1’s platform is the socialisation locus with minor performances and chases in the background. Similarly, A1’s backside acts as a football pitch with minor watching, running and misbehaving in the background; and A1’s bridge is a watching area with minor socialisation and eating activities. Contrastingly, clustered play areas possibly exhibit more student encounters but affords less activity variation, as seen in B1’s social spaces with the adjacent pitches which form one large, continuous and single-levelled space, where activity diversity is lowered. Finally, in-between spaces, as part of play areas, afford the highest encounters, such as A1’s outdoor connecting corridors (between dining units), B1’s courtyard (between wings) and more examples from campus environments (A3 and C2; high potentiality but not observed for their actuality).

The aforementioned spatial parameters of size (area) and allocation of play areas contribute to the high configurational accessibility which affords high possibilities for interactions for two main reasons. Firstly, student streams follow the natural movement patterns along the shallowest areas of the playground which bring student together to mix, interact and create social groups, through exposing the occupiers of each play area to other passers-by. These patterns are portrayed through A1’s shallow amphitheatre and area under the bridge; or B1’s shallow social space (north of pitches). Secondly, while certain areas are less accessible, i.e. not the natural movement routes, still, their allocation around other main spaces renders their functionalities as vital movement shortcuts, hence, affording vibrant encounters and interactions, such as the connecting corridors: between A1’s front and back playground sides; or between B1’s courtyard and pitch zone. Finally, in contrast to the playground, terraces are configurationally segregated away from movement routes, thus, affording quieter interactions or specific self-directed activities (targeted by the student).

Configurational accessibility introduces natural movement routes in the playground as spaces of high encounters which afford interactions. Yet, high accessibility does not guarantee the diversification of self-directed activities. Some activities benefit from high accessibility of play areas (e.g. socialising, performing and watching), while other activities are afforded in less vibrant play areas (e.g. relaxations), in confined spaces (e.g. intellectual activities), cornered spaces of mid-range accessibility (e.g. group games) or even segregated spaces (e.g. challenges and private conversations). In that essence, affordances of play areas for diverse self-directed activities correspond to rich configurational variations that trigger different
activities to satisfy student needs and preferences. Contrarily, configurational monotony possibly affords less activity diversity. Nevertheless, whilst the spatial configuration has this significant impact on the affordances of play areas, it is considered a co-contributor beside the furniture setup which also shapes the play areas affordances, as elaborated below.

The furniture setup is considered the initial step for activities to occur, i.e. to allow play areas to afford long-period occupancies by students, hence, defining the degree of popularity. The furniture setup yields a rich landscape of affordances. The direct example is the playground benches. They afford different social groupings according to the bench type, its capacity and whether it is movable or not. Nevertheless, the definition of the furniture setup expands beyond installed furniture pieces, to include the variation in landscape, such as A1’s bridge, its area underneath and the stepped amphitheatre; or the variation in surface materials, like soft flooring for A1’s outdoor gym, harder tiles for the stepped amphitheatre and the natural grass area. All these elements afford diverse student social groups and self-directed activities.

All the aforementioned spatial parameters layout affordances as possibilities in play areas, derived from the spatial potentiality of the architect design. However, affordances are further shaped through operational factors which define the actuality of play areas. In one scenario, students are granted freedom of movement (case of A1). Accordingly, affordances are shaped by the student preferences who choose where to go and what to do. Students exhibit configurational awareness and understanding of the landscape. Hence, their decisions revert back to the potentiality of play areas through configuration and furniture setup, sustained as the major influence on interactions and self-directed activities. For example, A1 students choose to dance in the shallow platform which affords a theatrical effect, i.e. being central and visible to everyone, while other students prefer to perform in less-visible spaces to focus on their rehearsal but still be watched by fewer students. These examples reflect the configurational influence on student preferences. Moreover, students choose soft surfaces (e.g. outdoor gym or the grass area) to relax and sit on the floor; or the bridge to stand and watch football of the lower pitches. These reflect the influence of the whole spatial setup of landscape features on the student preferences.

In another scenario, the affordances of play areas are constrained by strict operation (case of B1). Consequently, certain affordances (as possibilities) for interactions are inhibited, despite being embedded in the spatial potentiality. For instance, the management closes vital gateways, although they potentially bring student together to interact (e.g. gateways from wings into the courtyard). They also promote certain routes towards the playground (e.g. entrances from the dining side), despite affording less encounters than other routes that are configurationally the shallow natural route but being less encouraged by the management (e.g. the southern gateway). Finally, the management allocates certain benched spaces for socialisation, restrains the social group-size while discouraging students from standing in specific areas (e.g. north of the pitches), despite their high accessibility, i.e. being natural for student co-presence, encounters and socialisation.
Management regulations also minimise affordances for the diversification of student self-directed activities. They divide the social areas (using meshes) to create gated entrances into the pitches which unintentionally segregates certain spaces and splits social groupings. They control the student duration in pitches and limit sports to designated areas, leaving no room for students to grow with their sport activities, even if the space affords its occurrence. Nevertheless, student preferences, afforded by configurational properties that maximise possibilities in space, override some regulations. Students create large groups (beyond the allowed population) and occupy the ping-pong tables to socialise instead of playing sports, being aware of their segregation that affords less supervision and more privacy.

In summary, play areas are rich landscapes of affordances, exemplified through the playground as the main student destination during break-times; and the terraces (if available) as a secondary student retreat for quieter interactions and self-directed activities. The spatial design, in terms of configuration, furniture setup and landscape diversity, is capable of accommodating and triggering student interactions and self-directed activities as possibilities, i.e. a rich landscape of affordances. Possibilities mostly adapt to the student preferences, when granted freedom; or are constrained by stricter operational schemes, when the management imposes regulation to controls interactions and self-directed activities.

9.4 Summary of Studying School Play Areas

Play areas are formed of the playground (in every school) and the upper-floor terraces (in fewer schools), complying with governmental regulations that determine the mandatory outdoor area, relative to the school population. Still, it is the architect role to decide on the allocation and diversity of play areas across the school site which yield high percentage (35%-49%) of total area from the studied cases. Apart from terraces, which are mostly allocated on the peripheries of upper floors, the playground allocation encompasses a clustered zone within one side of the school site, distributed yet connected spaces within different locations or completely scattered play areas on multiple floors and overlapping the building footprint. The aforementioned possibilities (due to allocation and size) determine the configurational properties of play areas. The playground as a large porous space is typically highly accessible, whereas terraces are mostly segregated.

The spatial configuration of the playground is the prime contributor to student interactions and social groupings, either as instant short-period communications or long-period socialisations. These patterns organically grow according to configurational accessibility that shapes the natural movement routes and affords patterns of through-movements and co-presence. Students, as passers-by, are encountered and mix with occupiers of shallow play areas, as students being attracted to A1’s central platform or the social area (north of pitches) in B1. In the former example, A1 regulations do not restrain student socialisations nor grouping, unlike the latter case (B1), where the management inhibits socialisation in the shallow area in favour of other spaces (e.g. the courtyard). Hence, social patterns in B1 are not organically shaped by configuration while also being controlled by group-size regulations. However, configurational accessibility, supported by student preferences, overrides
regulations, as students socialise in the shallow space (north of pitches), before being dismantled by teachers.

Beyond student interactions, self-directed activities compose a major portion of occupancies within play areas which reflects on the playground popularity among students (or the terraces less popularity). Student activities lead to concentration clouds which portray zones of high occupancies in the playground. The more popular playground (A1) yields more frequent and larger concentration clouds. It also exhibits higher variation of activities relative to the spatial configuration. The playground exhibits variations in configurational accessibility which affords diverse self-directed activities. For instance, open, shallow and vibrant play areas afford patterns of socialisation, running and chases. Further activities are afforded in confined yet shallow play areas (e.g. intellectual activities), in cornered play areas of mid-range accessibility (e.g. personalised games) or within segregated spaces (e.g. private conversations, physical challenges and misbehaviours). Contrarily, terraces, as monotonously segregated with similar activity vibes (all quiet), are mostly favoured for private interactions and self-directed activities, like intellectual studying or playing in small groups away from the busy playground.

While the spatial configuration contributes to activity diversity, the furniture setup in play areas is also important to attract students in the first place, i.e. a rich landscape of affordance. For example, benches afford social grouping and interactions when positioned in shallow space (by the architect in the original design or moved by student); or afford private conversations, if segregated in the playground. Moreover, the variation in landscape and design features impact activity diversity. For example, grass areas and soft floorings afford ground-sitting and relaxations, especially when configured along peripheries (away from student routes). A design feature, like a central platform affords stage-like activities (performances), embraced by high accessibility that renders the students (performers) visible, especially to other groups who gather on the amphitheatre to socialise and watch. Finally, the landscape features comprise the diversification of sports zones, using floor markings and equipment, into different pitches, courts beside ping-pong tables. These elements trigger student to do sports activities.

Regulations, imposed by the management, impact student decisions, activity types and dispersal. What is taken for granted in one playground and driven by student needs in particular engagements (e.g. sports outside the pitches in A1), is actually restricted for other students (playground B1). Nevertheless, in the lack of supervision, regulations are less followed, when they contradict natural movements, i.e. the natural student decisions to use the shallower gateways towards B1’s playground. High accessibility triggers certain activity choices in the playground, even if being against regulations, as seen in student eating patterns within social groups on A1’s amphitheatres or student social interactions (while standing) in B1’s shallow play areas (north of the pitches). Both examples portray the student natural choice in shallow spaces. Furthermore, regulations are completely disregarded (sometimes), if the student preferences are supported by configurational properties that facilitate activity occurrence, for example, A1 student misbehaviours in the backside or large-group formations and physical challenges at ping-pong tables in B1. In both scenarios (and other examples), student activities are embraced by configurational segregation that secures the student privacy.
In the end, it is important to highlight the high potentiality of play areas as popular student destinations for interactions and self-directed activities. Students vent their energies (through physical activities), express their personalities (through performances and personalised games), build their social networks (through socialisation and group formations) or work on their academic progress (intellectual activities). The aforementioned activities all benefit the student physical, mental, social and emotional wellbeing, while students fulfil their needs and preferences. Nevertheless, it is the management role to decide on the play areas operation, as a free environment or a controlled space by regulations and strict supervision.
10 Research Discussion: Design Implications

This research explored the school design potentiality for the student learning practices while focusing on informal learning spaces, through exploring the design decisions of three architects during the design process in addition to the design outcome, i.e. the spatial design of functions and configurations of eleven secondary school project. The research also expanded into studying the building actuality through investigating the school daily operations, management regulations, teacher guidance and supervision and student preferences which all shape the student practices of interactions and self-directed activities in two of the eleven schools. Considering the design potentiality and building actuality, the implications of the school design on the student learning practices, of interactions and self-directed activities, are presented as spatial affordances, i.e. possibilities in space, which are either translate into actions in the school environment or filtered out according to operational factors.

The research presents the main discussion which focuses on the school building affordances for learning practices. However, prior to discussing affordances, it is crucial to establish the relationship between the school design (space) and activities (learning practices), not just from literature but also through studying the building design potentiality and operation (section 10.1). This relationship is founded upon the research cases studies and their embedded spatial properties, derived from spatial analysis that define the design potentiality, beside the deduced activity patterns, obtained from observational data that prescribe the building occurring learning practices. This leads to the redefining the spatial function relative to the multi-layering of the student activities in space. After laying down the foundation of the design potentiality and school actuality, the discussion elaborates on the possibilities for various interactions and self-directed activities within informal spaces which are defined as affordances (section 10.2). This discussion proceeds to understand the school design from the perspective of boundaries and control, though applying Bernstein’s pedagogic framework of classification and framing on the school spaces (section 10.3). Based on all the aforementioned explorations, the research infers the degree of student satisfaction with the school, relative to the design potentiality and building actuality (section 10.4). The discussion summary is section 10.5.

10.1 The School Building Design Potentiality and Operation Actuality

Whilst the relationship between the school building (space) and the occurring learning practices (activities) is already established through literature, this research supports and extends the current understanding of this social-spatial relationship beyond acknowledging its existence, by demonstrating how the school design exhibits a potentiality to shape the occurring student learning activities of interactions and self-directed learning practices. The research thoroughly explores how the spatial parameters correspond to each other and to other operational parameters. Through spatial analysis, observations and surveying techniques, this research deduces the spatial properties of the school building through a holistic study of building configurations and functions, before elaborating on informal spaces, like corridors, libraries, dining spaces and play areas, and their occurring activities.
10.1.1 Design Potentiality

From the analysis of eleven case studies, it is inferred that the school design is not a spontaneous process, but there are patterns in the design decisions (by architects during the design process) which yield patterns in the final spatial functions and configuration. Firstly, there is a significant variance (ANOVA test; p-value <0.0001) in the areas of the school functionalities, illustrated for all case studies. Informal learning spaces are highlighted as large areas that dominate the school building, either on the singular grain, for example, a single dining space is always large, or considering their aggregate total area, since they compose on average 50% of the total area, courtesy of the playground. Thus, the area of informal spaces, being a design objective or just a by-product of spatial allocations and area requirement, indicate their vitality for student interactions and self-directed activities outside the classroom formal setting, since they provide the needed large spaces to accommodate those collaborative or individual learning practices.

Alongside their different areas, spatial functions have different configurational properties that distinguish each function from the other. This is established through a significant variance (ANOVA test; p-value <0.0001) in the visual mean depth of different functions, as assigned by the architect. For this relationship, informal spaces portray configurational accessibility, such that dining spaces, libraries, social spaces, corridors and staircases are relatively shallow or within the mid-range accessibility. Playgrounds and halls are always the shallowest spaces in all schools, unlike terraces which are always segregated. These configurational properties highlight the potentiality of informal learning spaces to bring students together along shallow movement routes, promote their interactions and set the baseline for further self-directed activities to emerge, according to the assigned function to space, the furniture setup and the previously established large areas of informal spaces. So, in certain scenarios, configurational shallowness contributes to busy movements with potentially vibrant interactions and further activities, as generically argued by Hillier (1996) and elaborated for school buildings by Pasalar (2003; 2007), Kishimoto and Taguchi (2014) and Sailer (2015). Nevertheless, in other scenarios, the student interactions and locations of activities are more influenced by the social rules implemented in space by the management and the teachers who supervise students in space. This matches earlier literature on how social rules and the building programme impact the social events in buildings, as argued by Hillier and Penn (1991) and Hanson (1998). This also brings in the idea of control in buildings and the role of surveillance in relation to the spatial configuration, as discussed by Markus (1993).

Alongside arguing for the previous, this research adds that configurational segregation is also desirable in the school environment to provide student privacy and promotes quieter interactions and self-directed activities. This is the scenario found in the segregated A1 terraces, as whole spaces, or the segregated hidden spots inside library A1, as parts of the whole area. In those locations, activities diversify while teacher supervision is nearby but not direct over the students, therefore, bringing in again the discussion of surveillance in relation to the spatial configuration (Markus, 1993). So, considering the configurational diversity (of shallow spaces with interactions and vibrant self-directed activities and deep spaces with quieter activities), the school design maximises the potentiality for learning practices. In sum, acknowledging these finding, this research provides knowledge of the configuration of
informal spatial functions and their influence on the types of activities in space, thus, feeding back into the architect design process to understand the implications of their designs on the operation of informal functions.

The school area, functions and configurational properties, as elaborated above, are the product of the design process, where the architect undertook strategic design decisions that primarily define the spatial potentiality. Some design decisions are expressed on the holistic scale, such as deciding the building typology, i.e. a compact building, a wing structure, clusters of spaces or a campus environment. Further holistic decisions but of a smaller scale entail the distribution (or consolidation) of the play areas across the school site or the allocation of common resources, mostly of an informal nature, like the dining areas and the library. Decisions further zoom in to the options of designing a unified or multiple dining units and their connections to corridors and vertical cores. Other zoomed-in design decisions consider the configurational layouts of different functions in term of their level of porosity, such as the library space. The aforementioned decisions are highly entangled, impacting each other and deciding on the spatial potentiality of the school building. All those decisions are not mutually exclusive, since a holistic decision defines another set of decisions, specific to the scale of configuring and allocating individual functions, while changes within one space in return shape the holistic configuration or building typology. In that essence, the architect design decisions of all scales constitute the origins of the design potentiality for student movements, interactions as well as locations of student gatherings and pursued self-directed activities. They are the roots that define the learning practices of a school organisation. Considering that literature previously defined the design process as a complex multi-layered process involving different stages and different stakeholders (Chintis, 2020), this research has added an extra layer that ties down the school design to its potential outcome of activity possibilities.

10.1.2 Building Actuality

While the school design yields certain spatial properties, composing the design potentiality, their impact is not only among each other but expands to influence the school operation. The relationship between space and activities is established upon studying the student learning practices in the school. The dispersal and diversity of student interactions and self-directed activities are primarily shaped by the school spatial configuration. It is portrayed through the significant variance (ANOVA test; p-value <0.0001) in the configurational accessibility of each student activity recorded in two operational buildings. The accessibility was measured through visual mean depth (space-syntax analysis) and the activity type was recorded during observational fieldwork. This indicates how student interactions and self-directed activities are not randomly dispersed but follow certain configurational potentiality. Moreover, it is concluded that spatial functions impact the distribution of student activities, as portrayed through a significant difference (chi-squared test; p-value <0.0001) in student activity distribution across the spatial functions. Each spatial function, including the informal functions of corridors, libraries, dining spaces and play areas, has distinct activities, resulting from their operation as attractors for students. However, one spatial function never accommodates a single activity, as assigned by the architect and regulated, in some scenarios, by the management, which ties back to the role of the design potentiality to offer possibilities for student learning practices in the respective space of each function. This idea is further elaborated in the next section.
The established relationship between activities and the spatial design is reflected in the operation of the two schools where observations occurred. While both schools encompass student interactions and diverse self-directed activities, informal spaces have different operational schemes. In other words, the differences in school design yielded different atmospheres of learning practices, relative to different potentialities. For example, quiet learning activities, which are mostly individual and portray high student concentration, are more apt to one school (A1), either inside its segregated enclosed library space or upper-floor terraces. These patterns are significantly missing from another school (B1) whose design, despite being of highly enclosed spaces, i.e. possibly accommodates quiet activities, is not activated by the management that prohibits student occupancies in classrooms or corridors during breaks. Even the quiet corner of B1 library is closed by the librarian who prefers to have full control over all the space which is hindered in the segregated corner. The only cases of quiet interactions, which do not grow into collaborative self-directed activities, are portrayed in the student patterns within segregated corridors around their lockers which are still unfavoured by the school.

As for vibrant collaborative learning activities, they are possible in the studied schools but alternate between different informal space, relative to the design potentialities and the subsequent actuality of interactive learning. For example, upper-floor corridors in one school (A1) promote interactions and expand the student activities into collaborative self-directed intellectual studying and revising within the open studios, functioning as informal learning spaces. The equivalency of those activities is missing from another school corridors or cellular classrooms but is manifested within an open-layout library (B1) which also provide diverse stationery and is equipped with group-sitting furniture. Furthermore, one unified dining space (B1) triggers dense student encounters and mixing patterns which yields interactions and vibrant self-directed activities, being unrelated to eating activities but permitted by the management. Similar patterns of social learning practices occur in another school’s playground (A1). Still, there are certain self-directed activity types and modes of intellectual studying which are only found in one school (A1) not the other (B1), for instance, quiet studying in one dining unit as a revision hub; collaborative games invented by students in the playground; or just relaxations and disconnecting from the hectic school day.

10.1.3 The Re-definition of Spatial Function

Through the study of the school design potentiality, ‘spatial function’ has been applied in compliance with the definition of function, as the purpose behind designing a space (Oxford dictionary, 2017). Functions, from the architect perspective, are the main purpose of each space, for instance, classrooms, library, playground, etc. However, since the research focused on the student learning practices outside the formal setting that is driven by the teacher, it understood functionality from a learning perspective, where a space is primarily a formal or informal learning setting. This facilitated the exploration of informal functions, like corridors, dining spaces, libraries and play areas, being the locus of student interactions and self-directed activities. Until this point, function is recognised as a spatial component.

Nevertheless, through the exploration of informal functions as student attractors and their occurring interactions and self-directed activities, the term ‘activity’ was rendered as more
expressive of student actions. Activities occur individually or collectively as learning practices, following constructivist ideas on social and collaborative learning. In that essence, whilst functions have a spatial foundation, mostly recognised by architects, activities, on the other side, have a social foundation, based on students (users) and their practices. Both notions (spatial function and social activity) are entangled, projecting a spatial demonstration of activities in the physical environment (school building) and implying a social connotation of functions through actions in place. For example, dining spaces signify the student eating activities in school; however, rarely do dining spaces only accommodate eating activities but mostly comprise other interactions and self-directed activities, according to further possibilities in space.

In the light of the dining space example that portrays the operation of one school building and following the study of the spatial functions, configuration and furniture, this research understands student activities as diverse and multi-layered within a single space. They are not constrained by the functional nametag assigned by the architect. For instance, students stretch and relax in the gym area, while others play football in the quiet social space. They study in dining spaces and chill in the library. They stand in corridors but run around terraces. And above all, they socialise and interact everywhere. In short, activities un-match the architect’s assigned spatial function, since they follow the design potentiality and possibilities in space, i.e. affordances. Students perceive space through their needs in different engagements. Yet, they are possibly constrained, in some cases, by the regulations. When regulations are absent, space reverts to afford multiple layers of activities, where one space is not an incubator of a single function.

The multi-layering of activities in one functional space (as assigned by the design team, e.g. a dining space) challenges the definition of a spatial function. Hillier and Hanson (1984) discussed the everyday use of spaces (for events) as the function in an urban or a building environment. Hillier (1996) also described the generic function of the building as the local-to-global spatial laws that govern the occupancies and movements inside the building. This research acknowledges a more inclusive definition of the spatial function in recognition of the multi-layering of activities. In other words, alongside the mainstream (typical) use of space which is assigned by the design team and labelled to space, for instance, dining spaces for eating, libraries for reading and corridor to circulate, the research acknowledges the evolving process of spatial usage by the main user-group, i.e. students. For example, students (inside the school building) study in dining spaces, socialise in libraries and interact in corridors. Those functionalities evolve relative to the spatial potentiality which yield possibilities, i.e. a rich landscape of affordances for students to follow their preferences. They also connect to affordance that command to be acted upon which influences the student preferences, as discussed in the next section (10.2). The evolving function also varies according to the student needs in different engagements and their psychological state (e.g. desire to interact vs need for solitude).

In sum, the multi-layering of student learning practices of interactions and self-directed activities are never defined through a single spatial function to every space. If the school environment, portrayed in the informal learning spaces, exhibits possibilities for multiple activities within the same space, then it is hindering (in the design process or building evaluation) to perceive a single functionality per space. In fact, the architect has to fully
understand the student activity patterns and preferences to be considered in the final school design. This brings in the role of the design potentiality to diversify the activity possibilities and shape the spatial affordances.

10.1.4 Summary of the Design Potentiality and Operational Actuality

In summary, there are spatial properties in terms of areas, functions and configuration of the school design which are derived from strategic design decision by the architect, concerning the building typology, functional allocations and configurations of the spatial layout. The research defined those properties and their relationships through multiple significant variances which are not desirable nor detrimental but indicate the interrelation and entanglement of the spatial parameters. This defines the design potentiality which in return offers different types of social interactive learning opportunities and collaborative self-directed activities. The school spatial properties, composing the design potentiality, impact the occurrence of student learning practices of interactions and self-directed activities. This is portrayed through significant variance of the configurational accessibility of different activity types and the significant variance in the distribution of activities among the spatial functions, such that each space has more activity variation than its assigned functionality (by the architect). The activity variation within a single informal space renders the multi-layering of the student learning practices and recognises the spatial function to accommodate the mainstream activity (the glimpse function) and more importantly the evolving activities (genuine function) according to the spatial potentiality and possibilities in the environment. The aforementioned relationships established between spatial properties themselves and the learning practices, laydown the foundation to study the affordances of the school building, based on its design potentiality and building actuality, as discussed in the upcoming section.

10.2 Affordances: From Design Potentiality to Building Actuality
There is a sequential development of the school building from the early decision of creating a school until the actual school operation (figure 10.1) which goes through multiple filters that shape the occurring student learning practice. Initially, there are distinct spatial properties that distinguish one building from another, i.e. a school from a hospital, which is the ‘global function’ of the building as described by Hillier et al. (1984). Nevertheless, there are still infinite school design possibilities, being filtered out during the architect design process to produce the final school design of a building typology with embedded functional allocations and spatial configuration. The spatial functions and configuration are the primary parameters that impact the spatial affordances, i.e. possibilities for learning practices. For instance, functions are attractors to student occupancies of diverse activities. Moreover, the spatial configuration shapes possible movement patterns, co-presence, encounters and interactions, according to natural movement routes that follow configurational accessibility. This mode of operation, in terms or movements and subsequent social events, is founded on understanding the ‘generic function’ of buildings as the configurational relations responsible for “structuring the pathways from combinatorial possibility to the architecturally real” (Hillier, 1996, p. 247). Configurational diversity (shallow vs deep spaces) also shapes the school environment of vibrant or quiet spaces which influence the possible student self-directed activities. Up until this point, affordances are argued to be shaped in relation to the possibilities of design and the spatial configuration which is not the complete picture. Nevertheless, the building programme, expressed through social rules (Hanson, 1998) by the management and control and supervision (Markus, 1993) by teachers during the school operation, contributes to the affordances for student interactions and self-directed activities. Hence, affordances are shaped through spatial and operational factors combined together.

Existing literature defined affordances as possibilities for actions occurring by organisms on their environment, and in return, the environment affords those action (Gibson, 1979). This research perceives those possibilities as the learning opportunities offered to students in
terms of interactions and self-directed activities. Those learning practices are afforded by the environment which shapes those possibilities through the building configuration, functions, furniture, tools and landscape. Thus, the school building itself is rendered as the environment, described in literature as a ‘rich landscape’ of affordances (Rietveld & Kiverstein, 2014). Nevertheless, affordances, as possibilities, do not all translate into occurring learning practices. They are further filtered, relative to users in the environment (Rietveld & Kiverstein, 2014). This research understands those users as the members of the school management, teachers and students. By studying those user input, this research has explored the articulation of the theory of affordances as spatial possibilities through providing a detailed empirical account of the mechanism of affordances in the school environment, i.e. from a generic theory to a specific application in a defined environment: the school building.

The input of the users on the affordances is expressed through examples from the school. For instance, the management implements regulations which restrain interactions and self-directed activities, even if the school design affords their occurrence. Teachers also have their input through their guidance and supervision which shape the student decisions and impact their activities, even outside the class-time or outside the boundary of the classroom, i.e. informal spaces: corridors, school libraries, dining spaces and play areas. Finally, and more importantly, the students themselves, their needs and preferences, influence what they pursue in the environment when granted freedom of selection. Student preferences are exhibited in their choices of interactions or activities, derived from the nature of the studied activities as self-directed which guarantees a degree of autonomy, especially during break-times as students move freely around the school.

In summary, the school, as an organisation with diverse student learning practices, is the final product of a spatial and social process. The design decisions (by architects during the design process) filter out many possibilities into a final spatial design. This design has embedded functions, configuration and furniture, thus, constituting the spatial potentiality which offers possibilities for student learning practices in the school building which is rendered as a rich landscape of affordances. Yet, affordances for student learning practices are not automatically translated into actual activities in space. They are governed by the building operation of management schemes, regulations, teacher guidance and supervision and student preferences.

10.2.1 School Affordance from a Holistic Approach

Affordances are exhibited on a holistic level of the whole building typology, functionalities and configuration, such that the design potentiality, shaped through the architect decisions, affords certain possibilities for interactions and self-directed activities, relative to functionalities and configurational properties, supported by the building typology, which all maximises or minimises the affordances for student learning practices, before being regulated by the school operation.

From a holistic approach, for example, the architect configures spaces (of a cluster, wing or compact block) as mono-functionalities which minimises possibilities for social interactions or collaborative self-directed activities. Students are constrained to the cellular spaces that afford typical teaching activities of content delivery. This setting also exhibits configurational
monotonous, most probably of similarly segregated classrooms, which further minimise the possibilities of encounters and interactions. Even if the cluster is relatively shallow, thus, affording higher movements, still, corridors are highly insulated from classrooms, thus, functioning mainly as movement routes where co-presence does not lead to interactions, and there is no room for self-directed activities to emerge. In this scenario, the managerial operational actuality, as a filter of the spatial affordances, is mostly supportive of the cognitivist model of teaching which values the in-class activities, controlled and enclosed spaces and inhibits any seed for interactions or self-directed activities. The management assigns supervisors to inhibit interactions. They block access to the insulated wing or cluster during student free-movement times (breaks).

In an opposite spatial scenario, the architect may decide to diversify the functions in a cluster, wing or compact block, thus, yielding a mixing of formalities that maximises the possibilities for interactions and self-directed activities. Within a cluster, the architect can configure formal teaching spaces around an informal local courtyard, connected through a circulation corridor. The difference (from the previous example) is not only the mixing of formalities but also the outcome spatial configuration of diversified accessibility properties. The courtyard is relatively shallow and open towards the circulation network which triggers local movements and encounters among the students, allowing for interactions possibilities. Moreover, the configurational diversity supports self-directed activities either within the vibrant and shallow courtyard or corridor (among the interactions) or towards the deeper and quieter classrooms. While the affordances for learning practices are maximised, according to the design potentiality, the building operation (by the management) controls the degree of transcribing those possibilities into actual patterns. Regulations either restrained the student movements and subsequent interactions and activities or allow the spread of activities following the student preferences and the spatial potentiality.

While the previous examples possibly portray the ends of the spectrum, another design model portrays the in-between scenario, where the building does not exhibit a mix of formalities nor mono-functionalities. It sustains a mix of functionalities within the same level, as the architect integrates classrooms with studio and teacher offices, all of formal setting. It is mostly associated to compact buildings that have tight sites, thus, not affording the spatial division of clusters or wings. This organisation maximises the potentiality for student-to-teacher interactions, in response to their high encounter possibilities, upon mixing their spaces and their movement routes. Furthermore, the integration of open studios, connected to the main corridor, maximises the configurational diversity, i.e. shallow open studios vs deeper closed classrooms, which increases the possibilities for interactions within the shallow corridor and open studios beside further possibilities of vibrant self-directed activities in those locations or quieter activities in the segregated cellular spaces. In this example, the school operation has significant influence on the spatial affordances, since the management regulations are interchangeable between the class-times and the circulation-times (on one side) and the break-times. During the former periods, the management inhibits the possible interactions. They terminate corridors and divides open studies (using board partitions) into typical classroom settings. This is embraced with strong regulations and teacher supervision over the corridor access gateways. In other words, the school changes the design to fit its pedagogic model of typical teaching events within enclosed spaces. Contrarily, this setting is dismantled during break-times, where boundaries (imposed on circulation or within the open
studios) are removed and students are granted freedom to move, meet, mix, interact and perform self-directed activities either in the shallower open studios or the quieter classrooms. The school reverts to its generative design, where potentiality is maximised, and affordances, as a rich landscape of possibilities, are only relative to the student preferences.

Table 10.1 Scenarios of Affordances for Different School Functional Allocations and Spatial Configuration

<table>
<thead>
<tr>
<th>Functionalities (of spaces in one zone)</th>
<th>Configuration (of spaces in one zone)</th>
<th>Affordances for interactions and self-directed activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mono-functional</td>
<td>Monotonous accessibility</td>
<td>Low affordances</td>
</tr>
<tr>
<td>Mixed functions Mixed Formalities</td>
<td>Diversified accessibility</td>
<td>High affordances</td>
</tr>
<tr>
<td>Mixed Functions Mono-formality</td>
<td>Diversified or monotonous accessibility (following management alterations in the design)</td>
<td>Alternating between low and high affordances according to the mode of operation</td>
</tr>
</tbody>
</table>

In the end, while the previous examples (summarised in table 10.1) portray three cases of the functional allocations and spatial configuration, there are endless variations for the degree of design potentiality and the subsequent affordances, considering the diversity of the school design possibilities and also in respect to diversified operational schemes (that shape affordances). The first two scenarios portray the ends of the spectrum, i.e. restrictive design and operation (minimal potentiality and affordances) vs a design that promotes student interactions and self-directed activities (high potentiality and affordance), conditional to the school operational scheme. The latter scenario illustrates an in-between school spatial model which is also changeable across the time of the day and morphed through managerial operation decisions.

10.2.2 Affordances of informal spaces and their popularity

Spatial functions and configuration are entangled parameters that shape the affordances from a holistic scale of blocks, zones and whole levels, as discussed in the previous section. Nevertheless, affordances are also exhibited on the scale of individual informal spaces. The popularity of those spaces among students is shaped through the possibilities offered by the school environment for different learning opportunities. Thus, this research infers that the spatial popularity is the product of affordances. What the design offers to the student (as users) yields variation of possibilities among different informal spaces, thus, rendering different degree of popularity for each space, as studied for corridors, libraries, dining spaces and play areas. In other words, when a possibility for an activity is offered by the environment, the space becomes popular for this activity which happens in space, if pursued by students. Accordingly, when one informal space has more possibilities for learning practices, i.e. higher affordances, it is more popular among the students who occupy the informal spaces, mainly during breaks, and perform various interactions and self-directed activities. If the possibility for an activity is missing from the design potentiality, it does not happen in space, unless the school management, teachers or students alters the design to fit their needs, i.e. create new possibilities and pursue them. The existence (or lack) of possibilities in space is the first filter which decides whether the learning practices happen in space or not and subsequently define the spatial popularity as a product of affordances.
Alongside the existence (or lack) of possibilities in the environment and their variation from one space to another, literature has suggested that different affordances have different degrees of influence on the users who pursue activity. The research articulates those variations in the forms of affordances in this context of the school environment (figure 10.2). For example, Rietveld and Kiverstein (2014) explained that some possibilities are available within the environment, as a rich landscape of affordance for users to select from. In this case, the emergence of affordances from possibilities into actuality is therefore driven by the student preferences. If preferences match possibilities, they translate into activities, rendering the informal space popular with those activity choices. In short, those affordances are originally initiated by the students themselves. Nevertheless, Rietveld and Kiverstein (2014) distinguished other affordances that have higher influence on users, i.e. the students and their activity choices. They are described (in literature) as affordances that ‘command’ to be acted upon. A school design feature, a spatial function or a configurational property heavily influence the student choices of interactions or self-directed activities. In that case, those possibilities, being promoted by the environment, are very likely to translate to actual activities in space, i.e. being popular scenarios that also project on the spatial popularity. This is the highest degree of influence the school environment could exhibit on students, since the environment itself is almost the initiator of the learning practices.

Sometime, the school regulations and supervision schemes, which are moderators of the affordances, oppose the possibilities of learning opportunities offered by the school design which in return impact the popularity of different spaces. In that case, the aforementioned forms of affordances contribute to how the school building operates and what activities happen in space. For instance, when activity possibilities are afforded by the design within
the rich landscape but against the management policies, there are high chances that they will not emerge into occurring activities, whether they match the student preferences or not. Contrarily, when affordances ‘command’ to be acted upon, there are high chances that activity possibilities (supported by student decisions) override regulations and follow the natural choice, unless supervision is very strict.

In summary, the relationship between the design potentiality, which offers possibilities, and the building actuality of occurring student learning practices defines the popularity of different informal spaces for student short-period encounters or more importantly long-period occupancies of interactions and self-directed activities. Hence, popularity is a product of affordances, and possibilities for learning opportunities vary from one informal space to another. Moreover, different possibility, themselves, have different degrees of influence on the student to pursue the activity. Affordances either exist in the school environment for students to select from or they actually influence (command) the student choices to act on them. Those scenarios of affordances for student learning practices are discussed in the next section (10.2.3) through examples from the school building design and operation from a zoomed-in scale of individual informal spaces.

10.2.3 Examples of Affordances within Informal Spaces

The study of individual informal spaces explores the furniture setup of each space, expressed through the interior design, furniture type and layout. This discussion connects to the ideas from Stewart Brand (1994) who described how the furniture (space plan; as referred by Brand) contributes to building operations, being a changeable factor across time at a faster pace than other building elements (site, structure, skin, services). The spatial function operates on the holistic level to attract students into different spaces for different activities, relative to functionalities, for example, eating in dining areas, doing sports in courts or studying in the library. Once students are inside, affordances for student interactions and self-directed activities are shaped through furniture setup, i.e. interior design attractors which diversifies activities. The furniture setup is the local extension to the holistic spatial functionality, while the spatial configuration remains as a constant contributor on the holistic and the individual-space scale. The potentiality, emerging from both parameters (furniture and configuration), ties back to the idea of affordances which are described in section 10.2.2, either as possibilities that exist within the rich landscape of affordances or further possibilities that are more popular, being promoted by the environment, i.e. affordances that command to be acted upon (Rietveld & Kiverstein, 2014). The following examples discuss both forms of affordances for the corridors, school libraries, dining spaces and play areas.

For instance, affordances that command to be acted upon are portrayed in the design of a shallow corridor segment along a main student route, equipped with a side break-out space with seating benches (school B1; level two). This setting, i.e. shallow configuration and furniture, firstly, triggers student movements and encounters, before heavily influencing their choices to sit, interact with each other and passers-by or initiate a quick self-directed intellectual activity (e.g. do homework collectively). The probability of this scenario to happen in space is very high, supported by the design features (configurational accessibility and the furniture setup). To stop it from occurrence, the school management, which does not
promote these types of learning practices, is required to implement a high level of supervision
and strict penalties to alter the student behaviour.

The same impact of configuration and furniture setup is replicated within similar design
conditions but on a larger space, where the main student route, shallowest in the floor, pours
into open studios, equipped with tables, chairs and a stepped seating sofa (school A1; upper
floors). This setting attracts students for interactions and self-directed activities of various
types (e.g. intellectual, performances, games, etc.). The main difference (from the previous
B1 example) is the school regulations which allow for those affordances to be translated in
space during break-times, unlike the earlier management that restricts occupancies in
corridors or break-out spaces. In the end, the corridor environment, as a rich landscape of
affordances for interactions and self-directed activities, is driven by multiple entangled and
co-dependent parameters of the configuration and furniture setup. This explain the reduction
of possibilities for learning practices, if one spatial property is alternated, for example, shallow
corridors of high movements but narrow in width or wider corridors but segregated and not
equipped with furniture.

Affordances that command to be acted upon are also portrayed in the school library. For
example, the layout of bookshelves creates smaller in-between pockets which are
segregated, quiet and secure student privacy beside being equipped with beanbags. These
pockets trigger student to sit individually to relax and read or sit in pairs (by moving furniture)
to have discrete conversations (library A1). An opposite scenario of vibrant interactions and
self-directed activities are afforded around tables, equipped with stationery tools, in another
school library (B1). They afford higher degrees of student mixing, due to their location at the
shallow entrance and their proximity to the library’s low-height partitions that connect
occupiers to passers-by in the corridor. The possibilities of self-directed activities are not quiet
reading but collaborative drawing, colouring (facilitated by the available stationery) or loud
interactions (due to the spatial configuration). While both spatial scenarios offer affordances
that match the preferences of different student groups (seeking quietness or vibrancy), the
difference is the teacher responses. They grant student freedom in the former example (A1)
but restrain their interactions and push for a quieter atmosphere in the latter (B1), despite
the spatial potentiality that afforded (commanded) the vibrant environment in the first place.

The magnitude of certain affordances over others continues to manifest in the school dining
spaces, where eating is rarely a singular activity but accompanied by social interactions. For
instance, the spatial configuration on its own (without input from furniture yet) renders one
dining unit (among other units) as the natural destination. In one school (A1), it is the dining
unit along the shallow natural movement route (from upper floors), and in the other school
(B1), it is the dining space of open layout, proximate to the kitchen queuing area. In terms of
affordances, the popularity of those units influences (commands) student to stay, mix,
interact while eating. In both schools, affordances for those mixing and interaction patterns
(while eating) are opposed by management regulations that distribute students over different
dining units, not following their preferences but abiding by assigned allocation. Still, the
influence of the spatial configuration triggers students to get their food (from other units) and
migrate to eat with friends in the popular unit or completely abandon the dining units to meet
in the popular playground.
Finally, play areas are considered the informal spaces which exhibit the most affordances that command students to interact or perform diverse self-directed activities. The direct example is the playground bench which triggers group sitting and interactions. However, affordances are further portrayed in the rich landscape of design features. For example, grass spaces or soft scaping influence the student choices to sit and relax which do not relate to the original functionality, i.e. designed as an outdoor gym. Similarly, the stepped amphitheatre triggers students to gather in social groups, talk and eat, even if the latter is against the rules. The same applies to a bridge which triggers social groups to stand, look downward to watch sports. All those variations shape the affordances for activities, only conditional to the spatial configuration. The grass area would not afford nor trigger sitting and relaxations, unless it is cornered away from the main student route (not the shallowest configuration). The stepped amphitheatre would not attract social groups if not configured around the shallowest platform and being in front of the dining units. Hence, it is argued that affordances are not relevant to a single parameter but are much more complex in their nature being the product of multiple spatial parameters, before being guided through the operational schemes of regulations, supervision and preferences. In the case of play areas (and other informal spaces), the combination of landscape design and configuration is the prime contributor to yield affordances that command to be acted upon.

Further examples of affordances portray how possibilities for activities translate within informal spaces as a rich landscape of affordances. The main difference, distinguishing them from affordances that command to be acted upon (previous examples), is that they are initiated, relative to the user in the environment, in this context, the student, their needs and preferences, rather than being triggered by the environment. Still, their occurrence is fundamentally conditional to the spatial configuration and furniture setup. For example, unlike grass areas which command sitting, an empty space (not a pitch; with no markings nor equipment) does not command student to play football nor even hint to it. Yet, the activity is primarily driven by student need to do sports (not fitted in the main pitches). The need is thereafter afforded, i.e. facilitated, by the spatial design which renders a segregated space, away from movement routes (that disturb or be disturbed by sports) and confined from both sides to act as a pitch-like zone. Its design also provides privacy to students who are not confident enough to play in main pitches (watched by other students) or do not wish to play rule-based football but prefer unrestrained ball activities.

Similar examples disperse across play areas and other informal spaces. This includes the student need for physical challenges, natural at this age-group, which are facilitated within different spaces in the playground or upper-floor terraces, yet all sharing the same configurational segregation. Moreover, the student preferences to play invented games are supported in different play areas (for different social groups), all sharing the same cornered configuration and mid-range accessibility. Board and card games are supported around cornered tables in one school’s dining area or another school’s cornered grass area in the playground. The student preferences for performances are met in the shallowest outdoor platform, the shallow indoor dining area or inside segregated classrooms, where the configurational variation is chosen to match the student intended level of being seen, i.e. how shy or brave they are. Finally, the student desire to perform intellectual self-directed activities, which is common within the school environment, is fulfilled in various informal spaces. It is afforded within the library spaces around tables for collaborative revising or at
individual seats for independent reading or on both for using laptops. Nevertheless, intellectual activities spread beyond the library to happen in dining spaces, while students have lunch, especially since the dining area is a highly popular activity hub, or as the school trains students to use one dining unit as a revision hub. Intellectual activities are also afforded inside upper-floor closed classrooms for quietness and concentration. Finally, intellectual activities are facilitated in outdoor spaces, such as under the bridge, being configurationally shallow but confined and equipped with benches, or within the quiet and segregated upper-floor terraces. Both spaces grant students a degree of privacy.

In the end, student learning practices emerge from possibilities offered by the design, according to its potentiality, into actual patterns of interactions and self-directed activities within informal spaces, governed by operational schemes. Nevertheless, this emergence from possibilities into actual patterns exhibits diverse degree of affordances within the rich landscape of the environment. The highest degree is an affordance that commands (heavily trigger) students to act upon. Other affordances are primarily driven by the student, before being facilitated by the environment through possibilities offered by the spatial configuration and furniture. In some cases, activities do not happen in space, being restricted by regulations, while in other cases, the high influence from the environment triggers activities to emerge even against the regulations. In all scenarios, the occurrence of interactions and self-directed activities are shaped through various degrees of affordances that translate into various degree of popularity for the respective informal spaces, to afford the student long-period occupancies or, at least, afford their short-period encounters and interactions.

10.2.4 Summary of Affordances in the school building

The concept of affordances has been introduced in this research as a set of possibilities, shaped by the physical environment of the school building which defines the school design potentiality through the spatial functions, configuration and furniture setup, while affordances is also a relational concept depending on the intents and abilities of inhabitants. Affordances as possibilities were already filtered out during the architect design decisions (part of the design process) which finalised the spatial design with a specific building typology and spatial properties, selected from endless possibilities. During the school operation, affordances are further filtered out through the social and cultural practices, decided by the school inhabitants as the management and the teacher which implement regulations, guidance and supervision. Affordances are also relative to the students, their needs and preferences.

The research has expanded on the affordance theory through investigating multiple scenarios of affordances for student learning practices that emerge in the school environment. Firstly, a possibility for an activity is selected by the student from the rich landscape of affordances. It matches their preferences, thus, translates into an activity, being afforded by the design and allowed by the regulations. Those activity possibilities do not happen in space when being restricted by regulations, even if being desired by students. There are further activity possibilities, afforded by the design and heavily influencing the student choice, i.e. commanding to be acted upon as natural choices, thus, transcribing into activities or interactions. If the school regulations oppose those latter possibilities, there are high chances that student decisions override regulations and follow the natural choice, unless supervision
is very strict. Finally, if the activity possibility is not afforded by the design in the first place, it
does not happen in space, unless the school management, teachers or students alters the
design to fit their needs.

Affordances are expressed, in this study, from a holistic approach or being specific to different
informal spaces. Holistically, the building typology, the functional distribution and the
configurational variations maximise the design potentiality through mixing functionalities,
formalities and diversifying configurations, supported within different building typologies,
which accordingly maximises the possibilities for learning practices of interactions and self-
directed activities, i.e. maximise the spatial affordances. Contrarily, limited potentiality of
monofunctional clusters of monotonous configurations yield limited possibilities of learning
practices, i.e. fewer affordances. In terms of the affordances of certain informal spaces, like
corridors, libraries, dining spaces and play areas, their design potentiality, formulated through
furniture and configuration, promotes certain affordances. They alternate from one space to
another, so what is afforded in one school’s informal space is sustained in another school’s
different informal space. The magnitude of the affordance is exhibited in the degree by which
informal spaces trigger specific activities more than other and more importantly the
persistence of student interactions or self-directed activities even when being opposed by
regulations or not encouraged by teachers.

In the end, spatial affordances are morphed through the spatial design which yields the
potentiality, driven by the spatial configuration, functions and furniture. Nevertheless, the
building operation defines the actuality of learning practices as a subset of many possibilities
according to managerial schemes, teacher guidance and supervision and student needs in
different engagements. These factors moderate what affordances translate into reality, as
student interactions and self-directed activities inside the school building informal spaces.

10.3 Spatial Boundaries and Control – Classification and Framing

Classification and framing are pedagogic concepts that transcend beyond their educational
type representation to be applied to the school spatial design. From a pedagogic
perspective, Bernstein (1971) defined classification as the degree of boundaries between the
curriculums or programmes of study. The strength of the boundaries renders strong or weak
classification. Strong classification reflects rigidly isolated curriculum materials, and weak
classifications signifies collectively blended materials. Framing, on the other hand, is the
degree of teacher control over the learning practices. Similarly, there is strong framing,
representing high teacher control, or weak framing, providing higher student freedom.
Examining the portrayal of classification (boundaries) and framing (control) in the school
design connects to ideas of affordances (previous section 10.2), especially in the light of
understanding student interactions and self-directed activities as opportunities for learning
practices in the school building. In short, the research creates a conceptual framework that
brings Gibson's environmental affordances together with Bernstein's theory of the sociology
of education, where classification as boundaries and framing as control influence the learning
opportunities, i.e. shape the affordances for learning practices.

Classification and framing have significant resemblance in the school building environment,
either on the holistic scale of configuring whole building blocks, clusters or levels or on the
zoomed in scale of individual informal learning spaces, in the same manner affordances are also portrayed. The following discussion elaborates on the holistic classification (boundaries) and framing (control) in the school building and their entanglement to affordances. It proceeds to elaborate on examples of boundaries and control within informal spaces, like corridors, school libraries, dining spaces and play areas.

Holistically, architects may decide to implement strong boundaries, i.e. strong classification, to separate functionalities from each other, such that formal classrooms are separated from other zones of informal resources, like the library or the dining space. This spatial model is supported by strong spatial control, i.e. strong framing, over access gates towards those insulated zones. At the same time, the mono-functional cluster (or wing) also has more internal boundaries that divide cellular formal classrooms, thus, yielding strong control over the teaching activities within each classroom. In other words, the school does not only exhibit strong classification and framing in its cognitive teaching model (e.g. teacher lecturing inside classrooms), but it also transfers those boundaries and control onto the spatial layout, assisted by the architect design and further embraced by the management regulations. The aforementioned design and operation scheme have been discussed previously (section 10.2.1) for its low affordances for student interactions or collaborative self-directed activities. Hence, this example clarifies how classification, as spatial boundaries, and framing, as spatial control, influence the affordances for learning practices.

Contrary to the previous example, still, from a holistic approach to school design, architects may implement weak spatial boundaries (classification), where functionalities mix within a single zone. This is portrayed in mixing teacher offices among student classrooms which maximises the affordances for student-to-teacher interactions. Weak boundaries are also expressed through mixing formalities, as classrooms are clustered around an informal courtyard or being in close proximity to an outdoor terrace. These spaces afford student interactions between class-periods and collaborative self-directed activities during breaks. Alongside weak boundaries, the spatial configuration portrays weak control, i.e. weak framing, through the high degree of spatial porosity (open learning spaces) which grant students the freedom to move, mix, interact and perform their activities.

Nevertheless, it is the school management decision to embrace this spatial model of weak classification and framing or enforce regulations and teaching events with high boundaries and control, thus, restraining the affordances already supported by the school design. For example, the management (of school A1) decided to alter the spatial configuration by dividing open studios (using board partitions) into typical classroom settings. This is embraced with strong spatial control (framing) over the corridor access gateways by regulations and teacher supervision. In other words, the school has changed the original design to fit its strong classification and framing pedagogic model of insulated teaching events. Still, this setting is dismantled during break-times, where boundaries (imposed on open studios) are removed and the spatial control is replaced with student freedom to move, meet, mix, interact and perform self-directed activities either in the shallower open studios or the quieter classrooms. The school reverts to its generative design, where potentiality is maximised, and affordances, as a rich landscape of possibilities, are only relative to the student preferences.
Alongside their holistic representation, spatial boundaries (classification) and control (framing) are exhibited within informal spaces. This has been studied through corridors, school libraries, dining spaces and play areas. Considering the design of corridors, while partitions enclose formal teaching classrooms (or other functionalities), they are also defining the corridors, adding boundaries to space, i.e. strong classification. This model inhibits possibilities for interactions or self-directed activities, considering the long, narrow corridors, designed to maintain efficient movements. Schools, which desire this organisation, also show interest in controlled access gateways, as they altered circulation routes and regulated movement directions. In other words, they maintain strong spatial control, i.e. strong framing. Contrarily, open learning space blend into boundary-less corridors, thus, portraying weak classification. This spatial configuration yields shallower routes where interactions emerge, accompanied with self-directed activities that spread into the adjacent open spaces. The operation of this model is still conditional to weak spatial control to allow free student movements and access into the corridor network.

Similar configurational scenarios apply to other informal spaces, such as the school library, dining spaces and play areas. Spatial boundaries are manifested in the design of an enclosed library space, away from student routes, or different insulated dining units, defined by year-group or other division schemes (e.g. the house-group). There are also boundaries that define play areas into zones. Those spatial scenarios do not just yield configurational segregation, which inhibits movements, encounters and interactions; however, they also isolate certain activities from the diverse student social patterns. For example, spatial boundaries intend to separate intellectual activities (in the quiet library), eating activities (in dining units) and sports (in the playground courts) from socialisation groups, interactions or other student activities. This insulation of activities (mostly by functionalities) does not exist naturally, because student activities, by default, are self-directed, spontaneous and grow organically and simultaneously from possibilities (affordances) in the environment beside the student needs and preferences. Accordingly, those imposed spatial boundaries defy the nature of activities (to blend and emerge) and require strong spatial control (framing) which is imposed on informal spaces to maintain the insulation of student activities. It is portrayed through altering the student routes, closing gateways or at least controlling accesses which are regulated by teacher supervision, rules and penalties.

Contrarily, the design of libraries, dining spaces and play areas also exhibits weak spatial boundaries (classification) and control (framing). It is expressed through a porous library space, a boundary-less dining area or a central outdoor platform or courtyard, all, being configurationally shallower (than partitioned spaces) and situated along the main student routes. Their configuration yields more interactions along movements and attracts more students towards the final destination. Within those space, self-directed activities grow organically (through movements and encounters) and expand beyond the main architect-assigned function, i.e. beyond studying in libraries, eating in dining areas and doing sports in playgrounds. Those self-directed activities are driven by possibilities in space and the student preferences which bring back the role of affordances that command to be acted upon and the rich landscape of the informal environment. Weak spatial classification matches weak framing, as the spatial control is minimised in those configurations, unless the school implements regulations and strict supervision to influence activity types. Still, this control scheme is more managerial rather than spatial.
While the degree of boundaries and control correspond to the spatial potentiality and the number of possibilities offered in space (affordances); nevertheless, it is not always a one-way relationship where more boundaries (and control) yield less possibilities. In other cases, more boundaries maximise the affordances for student interactions and self-directed activities. For example, interior boundaries, through bookshelves in one library and extended partitions in the other, create segregated pockets or cornered spaces which secure student privacy, minimise the librarian control (weak framing) and offer more activity freedom to read, study, paint, use laptop or just relax. While the spatial control is minimised (weak framing) through strong classification (boundaries), this spatial model is either embraced by the school management, where the librarian permits the diversity of self-directed activities, or opposed by the librarian who closes hidden corners and retrieve high supervision (control).

Moreover, the partitioning imposed on play areas (by the management), to control student access to the sports courts, portrays strong classification and framing over the students playing football. However, strong boundaries yield a segregated social space (as a by-product) which maximises the student privacy and minimise the teacher control, i.e. weak framing, as student activities diversify away from the teacher supervision. A similar example portrays boundaries, created by the building footprint (not imposed by the management) which segregates a play area to provide the same privacy for students and yield more possibilities for self-directed activities, even functioning as a football pitch. In the end, those examples (whether in libraries or play areas) defy the assumption that perceives configurational porosity and shallowness as the only expression of weak classifications and framing and higher activity possibility. Those examples also expand on Bernstein’s conception which linked strong classifications to strong control within the pedagogic framework. Yet, from a spatial perspective, strong boundaries possibly yield strong or weak control.

In the end, the school management is in control of the building boundaries and subsequent spatial control. Regardless of what the design communicates, whether strong or weak classification and framing, the management possibly eases regulations and grant student freedom or impose stricter regulation and supervision. In play areas, they permit sports outside their designated areas or restrict their occurrence to courts and control occupancies and types of activities. Managerial schemes are also illustrated in the differences between allowing free dispersal of social groups and uncapping the group-size or restraining social interactions to benched social areas, limiting group formations and capping their population. Moreover, it is portrayed in distributing students over different dining units (by year-group or house-division) or allowing them to eat wherever they desire. Finally, librarians either maximise their control over activity types and student distribution in libraries or minimise their supervision just to prevent misbehaviours.

In summary, classification and framing are pedagogic concepts that reflect the degree of curriculum boundaries and teacher control. The concept has a spatial manifestation through spatial boundaries and control, applied to school buildings. It is studied from a holistic approach of configuring clusters or wings as well as the zoomed-in scale of individual informal spaces, like corridors, libraries, dining spaces and play areas. The decrease in spatial boundaries and its accompanied minimised control draw attention towards configurations that facilitate the spread of movements and interactions along shallower routes and
maximises the possibilities (affordances) for self-directed activities. This holistically applies to mixing functionalities and formalities; and applies to individual open learning spaces and their adjacent corridors, open-plan dining areas and porous library spaces. Contrarily, the increase in spatial boundaries renders segregated spaces (strong classification), supported by strong spatial control (framing) through regulated or closed access-gateways and alterations to the student movement routes. This is illustrated in the design of long, narrow corridors, the design of closed libraries and insulated dining units. In those scenarios, spatial boundaries and control yield minimised design potentiality and limited possibilities for interactions and self-directed activities, i.e. less affordances. Nevertheless, while classification and framing always correspond to the design potentiality and activity possibilities, it is never a one-way relationship. In some cases, strong classification, in terms of more boundaries, yields more student activity variations upon segregation that grants more privacy, especially when the teacher control, in the form of supervision, is lowered. This applies to the in-between-shelves pockets of a library space, a segregated social space or a confined playground backside where activities diversify in respect to higher privacy. Finally, while spatial boundaries and control are exhibited in the school building, it is the management decision to embrace the spatial design (whether it is strong or weak classification and framing) or impose regulations and supervision schemes that alter the building operation from its original design.

10.4 Student Behaviours and Satisfaction with the School Building

In this research, the student degree of satisfaction with the school building is interpreted through their spatial behaviours and preferences, as collected through student questionnaires or recorded during observations. This is considered an interpretation (and open for further improvement in upcoming studies), since the research does not directly ask students to evaluate their school spaces. Nevertheless, there is an opportunity to express how students react to the spatial design of their informal spaces, especially as observations (conducted inside the schools) lasted for sufficient periods of time (more than one month), monitoring how students behave in space. There are multiple spatial and operational factors that are interpreted to influence the student satisfaction and accordingly impact their behaviours.

It is argued, in this research, that student satisfaction possibly links to the design potentiality and its consequent student long-period occupancies. The research has previously referred to certain affordances, being derived by user preferences before being facilitated by the environment. When the student preferences (obtained from the student questionnaires and observations) align with the design possibilities and the school regulations, students are satisfied. This is portrayed in most of the student interactions and self-directed activities in dining spaces, libraries and play areas. In another scenario, preferences are opposed by regulations yet afforded by the design. Hence, the design facilitates the student actions against regulations, also yielding student satisfaction. This applies to the student satisfaction with their interactions in locked-down corridors, eating activities in the playground among their social groups and their physical challenges in segregated play areas. These patterns are all facilitated through the spatial configuration (mostly segregation) and furniture (e.g. lockers; alibi to stay in corridors) which support the student activity against regulations, while students exhibit situational awareness and understanding of their school landscape. If the
management imposes stricter rules and more supervision to alter those student behaviours, they might result in student dissatisfaction.

In summary, the student satisfaction can be argued to be derived from the fulfilment of the student needs through maximising the spatial potentiality, i.e. more possibilities for interactions and self-directed activity, while simultaneously minimising school regulations that are associated with break-times to provide student freedom and not to inhibit the spatial affordances. Still, regardless of regulations, some possibilities for interactions and self-directed activities emerge in space. They are triggered by the environment or initiated by student preferences and facilitated by the design potentiality, thus, in all cases, yielding student satisfaction.

10.5 Summary of Main Discussion Points

This research has started with one main research question, aiming to understand how the spatial design of the school building affords the student learning practices of interactions and self-directed activities. For that, the study went through a multi-dimensional investigation of the school design potentiality and building actuality. Findings have inferred that the design potentiality for student interactions and self-directed activities is shaped by size (area), functional and configurational properties as prescribed through the architect’s strategic design decisions on the building typology, allocation of functionalities and configurations of the spatial layout. The interrelations of those spatial parameters have been portrayed through syntactic analysis and multiple significant correlations (between the spatial parameters). They govern the design potentiality which in turn influences the occurring student learning practices of interactions and self-directed activities inside the school building. The relationship between space (school building) and the occurring activities (student learning practices) links to the actuality of the school and lays down the foundation to study the affordances of the school building as possibilities for activities, based on design potentiality and operational schemes. The relationship between design and activities also draws attention to a more specific relationship between spatial function and self-directed activities, such that a single space (with an assigned function) is never associated to a single activity. Accordingly, the research introduces the term glimpse function, as the mainstream use of a space (eat in dining space), and genuine function, as the evolving use of space, which highlights the multi-layering the student interactions and self-directed activities relative to the design possibilities, i.e. affordances.

The research has expanded existing understanding of affordances in literature through articulating it application within the school building. Affordances are expressed through the holistic relationships of the school functionalities and configuration, shaped by the building typology. Those spatial relationships impact the affordances for student interactions and self-directed activities through defining the degree of mixing functionalities within one zone (e.g. cluster, wing or compact building), the subsequent degree of mixing formalities (informal spaces among formal spaces) and the degree of variation or monotony in configurational accessibility. Moreover, affordances are also expressed on the scale of individual informal spaces and their interior, being shaped by the spatial configuration and furniture setup. The environment is a rich landscape of affordance, defined by the design potentiality. it offers possibilities for students to choose from according to preferences. There are further forms of
affordances that command to be acted upon. They heavily influence the student choices and most probably happen in the school spaces, even if opposed by regulations, unless very strict supervision applies. This brings in the role of the building operational schemes, implemented by managements, teacher guidance and supervision and the student needs in different engagements which all contribute to what affordances translate into reality, in terms of student interactions and self-directed activities.

Affordances, as possibilities in space, are also relative to the spatial boundaries and control, being perceived through Bernstein’s pedagogic framework of classification and framing. Spatial boundaries and control impact the possibilities (affordances) for student learning practices. Strong spatial boundaries (strong classification), resulting from partitioning and configurational segregation, are either supported by strong or weak control (framing). In most cases, when both boundaries and control are strong, this spatial model yields less design potentiality, i.e. less affordances for student interactions and self-directed learning. However, in some cases, strong boundaries yield less control due to the increase of student privacy away from supervision which yields more possibilities for activities, i.e. higher affordances. The degree of boundaries and control prescribes the spatial affordances for student activities and therefore impact the student satisfaction. Student satisfaction is derived from fulfilling their needs which is relative to spatial potentiality and what is allowed through regulations and supervision.
11 Conclusion

The research has gone through a long multi-layered investigation of spatial and social parameters that relate to the school building, embodied through the spatial design from the very early design decisions (during the design process), proceeding towards the spatial functions and configuration of the output floor plans, zooming into on furniture inside different informal spaces and reaching the actual school operation in terms of student learning practices. The research is perceived as a cross-sectional study comprising data sets of spatial analyses and observations from multiple school buildings. While dealing with entangled spatial and social parameters, the research maintained a coherent methodology that defined the relationship between the built environment of the school building and the student learning practices of student interactions and self-directed activities. Therefore, the study of the design potentiality led to understanding the possibilities for student interactions and self-directed activities. This potentiality was compared to the actuality of school operation inside the building. The differences between potentiality and actuality were linked to the managerial factors of rules, supervision, teacher input and the students who also have their preferences.

11.1 Understanding the School Building Potentiality vs Actuality

The research has reached an understanding of the school building as an organisation through the design potentiality and subsequent building actuality. This finding has been derived from explorations of the design decisions by the architects during the design process, the spatial functions, configuration and consequent learning practices. The research outcome expands beyond understanding these as discrete parameters to define their entangled co-dependencies. Furthermore, spatial properties are demonstrated to not be mutually exclusive; on the contrary, small alterations of one property may have major ripple-effect throughout the design and operation of the school as a whole. The architect perceptions, intentions and final design decisions shape those spatial properties, thus, outline the design potentiality for upcoming building usage of learning practices, especially when considering self-directed learning activities. They provide a degree of student autonomy and are triggered through possibilities in space, i.e. affordances, unlike teacher-driven activities which are more shaped by the teachers with less impact from the built environment.

Whilst all design parameters are exhibited in the school simultaneously and co-dependently, the research concludes that architects have a fundamental role to produce the final configuration through functional prioritisations and configurational connections (or separations) that influence the building accessibility. The school building spatial configuration is established as the product of the design process, being the primarily contributor to the design potentiality for learning opportunities; nevertheless, it is also part of the evolving, co-dependent process alongside the spatial functions, the size (area) properties and furniture setup. Alterations in the functional allocations impact how spaces are configured, while different attempts to achieve certain configurations (connections or separation) impact the spatial functions.

A key hypothesis investigated through this research is that the design potentiality is the core asset that shapes the possibilities of student learning practices in space, therefore, impacting
the affordances of the school building for student interactions and self-directed activities. The spatial configuration and functions, embedded within a school building typology, shape the design potentiality. From a holistic approach, the school design outlines the degree of mixing functionalities which in return impacts the mixing of formalities, i.e. the allocation of informal spaces among other formal functions. These spatial properties are the seeds for student learning practices to start growing outside the classroom formal setting, following constructivist ideas of social and collaborative learning that focus on learning interactions and self-directed activities for student development.

Nevertheless, the variations of formalities only yield possibilities of student learning practices, conditional to the spatial configuration in terms of accessibility and the degree of accessibility diversity. The spatial configuration induces movements along the natural shallow routes which bring student together to mix, interact and perform vibrant self-directed activities (mostly collaboratively). Simultaneously, the configurational variation maximises the potentiality for further self-directed activities (mostly individually) of a quieter and more focused nature, relative to the configurational segregation. While the spatial function and configuration, combined together, shape the holistic setting of the school building for learning practices, the furniture setup, local to every informal space and supported by the interior configuration, determine the types, dispersal and frequencies of the different student interactions and self-directed activities in respect to each informal space, such as corridors, school libraries, dining spaces and play areas.

Upon studying the operation of the school building, the potentiality is inferred as the driving force for activity possibilities, i.e. the affordance for activities. Yet, the research also revealed that possibilities only translate into reality, i.e. the actuality of the building, conditional to the school operational schemes of management regulations, teacher guidance and supervision and student preferences. The lived spatial rules of operation often subvert architectural intentions through reasons, such as lack of understanding the architectural intentions or some perceived flaw in their operation. There are also changing circumstances across time in school operations. Accordingly, the school operation filters out certain possibilities (in most cases), introduce new possibilities (in limited scenarios) or keep the environment the way it is designed. In the latter scenario, the environment offers possibilities, fundamentally, as a rich landscape of affordances for students to decide their learning practices based on preferences, providing that self-directed activities operate through a degree of student autonomy (unlike teacher-driven activities). Nevertheless, in specific design scenarios, abundant within informal spaces, there are certain possibilities for learning practices that are highly probable to happen, being defined as affordances that command to be acted upon. In other words, the spatial properties yield very high potentiality for certain interactions or self-directed activities that even influence the student choices and are rendered natural to occur. If being opposed by regulations, there are high chances that they still override, unless strict supervision applies.

11.2 The Design and Operation of Informal Learning Spaces

Based on a constructivist, and social constructivist, learning perspectives, the research studies where and how student interaction and self-directed learning activities take place in informal spaces. Based on this, the research finds that informal spaces can be vital learning hubs,
holding a lot of potentiality to diversify the student daily activities inside the school building. While the focus of some architects and school managements is centred around the classrooms, learning practices within corridors, libraries, dining spaces and play areas are abundant (as demonstrated in this research), hence, deserving more research to understand their implication on the student learning outcome and experience. The importance of the design of informal learning spaces is proportional to the degree of autonomy granted to students to initiate their own types of self-directed activities and to interactively exchange knowledge in collaborative learning communities. In other words, activities are driven by clues in the informal space environment. Different informal spaces afford different activity possibilities, shaping the popularity of each informal space among students (e.g. highly popular playground vs less popular library space; reversed in another school design) and associating certain locations to specific learning practices, even if being unrelated to the original functional purpose (e.g. studying in the corridor or the dining space).

Whilst the design of informal learning spaces possibly offers multiple affordances for learning practices, this study revealed two general themes, either a quiet atmosphere which affords a mixture of discrete student interactions and focused self-directed learning or a vibrant activity-driven atmosphere with more diverse collaborative intellectual activities, sports, performances and challenges. The former spatial model (of quiet activities) is not exclusive to one type of informal spaces. It is found in libraries, as an expected location for quiet reading and studying. Yet, it is also found in the school terraces, where students escape the vibrant playground; in some corridors, where discrete conversations significantly dominate; in some dining spaces, where intellectual activities replace eating activities; or even within certain segregated spots of the playground, where relaxations and chilling prevail. On the other hand, the vibrant atmosphere, i.e. louder in interactions and denser in occupancies, is more abundant across informal spaces, whether within the playground, which is expectedly busy and diverse in activities; in other dining spaces, which are crucial social hubs during lunch breaks; or in corridors and open studios, where collaborative revising, solving problems and group projects occur. While the configuration is the prime contributor to set the level of space-vibrancy, furniture, tools and landscape are fundamental to facilitate the activities pursued by students.

There are several research conclusions, established from studying the informal spaces. Firstly, different types of learning occur in different kinds of informal spaces. Yet, the type of informal space is not solely associated to one types of activity nor even a general theme of operation (vibrant or quiet) which possibly alternates from one zone to another, from one day to another and from one lunch break to another. Moreover, the popularity of different informal spaces varies, according to the possibilities of activity types and also according to the degree of boundaries and control applied by the school management. In fact, self-directed activity choices in one space have ripple effects on other spaces. So, what is afforded best in the library space, happens less in the dining space, such that every informal space has its signature activities and mode of operation, again not following or limited by the assigned spatial functionality. This brings in the architectural challenge of meeting the client requirements (through the design) which becomes harder, thus, rendering the imperative for more research in the field of school building design and operation. Finally, the student satisfaction with their informal spaces grows through the fulfilment of their needs in different engagements. Students develop a sense of configuration knowledge and full understanding
of their informal landscape, its possibilities and limitations. Thus, students mould their informal environment and in turn are moulded by it.

11.3 Research Limitations and Future Work

Considering the multi-dimensional data types of observations and spatial analyses, with interviews and questionnaire as complementary, there are certain research limitations. Firstly, the number of architects (three) and their eleven analysed schools is a small sample, compared to the variation is school building and their abundance in the UK. Secondly, the research mainly focuses on one type of configurational analysis (visual mean depth) without expanding into other syntactic measures or different types of analysis. Thirdly, when it comes to data collection methods, they are all individually conducted by the researcher. It is difficult to investigate simultaneous activities or spatial performances, unless they are visibly connected. Moreover, the ethical approval has put limitations on the researcher’s direct interactions with students which is substituted by the online questionnaire. Still direct questions, in response to the student immediate actions in place, would have yielded clearer explanations of the student preferences or justifications for their activity patterns.

With intentions to expand research on school buildings, it is crucial to consider the future development of this study. Further observations on the existing case studies will help this research to grow from a cross-sectional study into a longitudinal research body showing how the student activities cultivate in the school across time, especially as the same student population grows from one year-group to another. The recruitment of more researchers to help in the data collection and fieldwork will facilitate simultaneous observations of different spaces within one school and different school buildings. Furthermore, inclusion of more case studies is rendered necessary to confirm the deduced design patterns and discover new ones. Since most of the UK state schools have the same curriculum, mission and vision, comparisons with other European schools might be beneficial to outline how different top-down educational systems impact the school spatial operation. Finally, an ultimate aim is to develop and execute a methodology that primarily bridges the connection between the students, the researchers and consequently the designers, in order to channel the student needs and preferences directly into the school design, with full understanding of the implications. This can be supported by a more interactive school design process as a methodology to reduce the gap of understanding between intentions and actuality.

Alongside the future works to expand this research, another potential future application relates to the current state of the school operations, post the break-out of the global pandemic of Covid-19. Considering how schools have implemented new operations of social distancing, this research framework of an affordance-based lens plus the systematic consideration of management rules would help in understanding how buildings could be occupied differently; how spatial configurations facilitate or hinder encounters; and how that impacts student learning opportunities of interactions and self-directed activities. In a simple example, pinpointing the design parameters that guarantee high interactions and mixing of students could be reversed to minimise physical encounters and promote social distancing.

11.4 Research Contribution
Quantitative and qualitative methods, pursued in this research, contribute to a landscape of mixed-data types to investigate how the spatial functions, configuration, furniture setup and operational schemes of schools impact the student interactions and self-directed practices during breaks, especially within the school informal spaces of corridors, libraries, dining spaces and play areas. Through the aforementioned data sets, the research provides a thorough description of how the social life in schools unfolds, and how a combination of spatial design and school rules distributes students and their interactions across various informal spaces and yields diverse types of self-directed activities. The research also decodes the translation of the school design, as a potentiality, to the existing student activities, as the actuality, in consideration of the spatial affordances as possibilities in space, not bound by spatial functions.

Having pin-pointed the main contributions of this research body, it is argued that the outcome has provided a framework to discuss school managerial rules systematically, and how they interact with spatial opportunities for learning activities. This has been achieved through bringing together the theoretical philosophy of learning as a social interactive process, environmental psychology of spatial affordances and educational sociology of pedagogic boundaries and control, applied spatially for the school building. In that essence, the research has unfolded a detailed description of affordances as mechanisms that bridge from potentiality to actuality, i.e. what learning opportunities translate to reality. This is all achieved through utilising space syntax theories, tools and analytical measures and more importantly adding to the space syntax paradigm, by not just focusing on the spatial patterns but also the exceptions in terms of spatial operations which are given proper consideration. The research also extends beyond the generic relationship between configurational movements and interactions, by providing thorough explanations to how interactions (in one context: the school) emerge from movements while considering further spatial and managerial parameters. This is beside drawing more attention to descriptions of activities and their spatial patterns (also in the school context), beyond just acknowledging their association to configurations. In the end, it is also important to acknowledge that this research, through the aforementioned contribution, is a continuation of and a support to multiple previous space syntax research which shares the same methods and goals of understanding the social dimension of buildings and user activities in space, whether for other building typologies, like hospitals (Pachilova & Sailer, 2020) and offices (Koutsolampros, 2021); similar building typologies with learning and knowledge dimension, like libraries (Koch, 2004); or the same typology of school buildings (Pasalar, 2003; Kishimoto & Taguchi, 2014).

The outcome of this research will be made available (through journal papers and conference presentations) for other researchers, especially those interested in the field of school building design and operation, to build on it and work on its expansion. The research and its findings will be made accessible to school managements (through shortened reports), for them to further understand the school building operation, the consequences of their regulations and the potentiality of the available spaces for learning opportunities. Finally, the research outcome (especially the spatial analysis vs observations) will be available for architects and designers, to help in the school design process, through providing data on the implications of different design decisions on the occurring learning practices of student interactions and self-directed activities.
12 References


Knapp, E. (2007). School Building in Developing Countries: Is Quantity the only Relevant Dimension of the Problem? In E. Knapp, K. Noschis, & C. Pasalar (Eds.), School Building Design and Learning Performance: with a Focus on Schools in Developing Countries (pp. 9–34). Lausanne: Comportements and authors.


13 Appendices

The appendices provide details on multiple data sets collected during this research to understand the spatial design and operation of the school building. This is alongside elaborated analyses of the school buildings which were not included in the main text but summarised for their resulting design potentiality. The appendices are structured as follows.

13.1 Qualitative Data of the Design Decisions During the Design Process: Architects Interviews

- 13.1.1 Information Sheet
- 13.1.2 Consent Form
- 13.1.3 Interview Structure
- 13.1.4 Interview Questions
- 13.1.5 Transcription of the interviews

13.2 Detailed Spatial Analyses of Eight Cases Studies (Expansion of Chapter 4)

- 13.3.1 School A2
- 13.3.2 School A3
- 13.3.3 School A4
- 13.3.4 School B2
- 13.3.5 School B3
- 13.3.6 School C2
- 13.3.7 School C3
- 13.3.8 School C4

13.3 Ethical Application for Onsite Observations Inside the School

- 13.4.1 Filled Application Document
- 13.4.2 Approved Document

13.4 Introducing the Researcher to Students of the Observed School Buildings

13.5 Qualitative Data of School Management Interviews

- 13.6.1 Information Sheet
- 13.6.2 Consent Form
- 13.6.3 Interview Questions
- 13.6.4 Transcription of the Interviews

13.6 Qualitative Data of School Teacher Interviews

- 13.7.1 Information Sheet
- 13.7.2 Consent Form
- 13.7.3 Interview Questions
- 13.7.4 Transcription of the Interviews

13.7 Student Questionnaires

- 13.8.1 Information Sheet: Sent to the Student Parents or Guardians
- 13.8.2 Parent Opt-out Form
- 13.8.3 Information Sheet (For Students) Before Taking the Questionnaire
- 13.8.4 Student Questionnaire Content (18 Questions)
- 13.8.5 Outcome of the Student Questionnaires

13.8 Quantitative Data of Snapshots

13.9 Quantitative Data of Gate-counts
13.1 Qualitative Data of the Design Decisions During the Design Process: Architects Interviews

Architect interviews are the main qualitative data, collected to understand the design decisions of the design process. The following section displays the information sheet (13.1.1) and consent form (13.1.2) handed to each architect before the interview. The section also presents the interview structure (13.1.3) and questions (13.1.4) and the transcription of the three recorded interviews (13.1.5).

13.1.1 Information Sheet

The interviewee is handed in an information sheet and a consent form to participate in the research.

Research details

Researcher: Ahmed Tarek Zaky Fouad
Research Title: Implications of the Spatial Design of School Buildings on Student Interactions and Student Self-Directed Learning Activities
As part of a PhD in architecture at the Bartlett School of Architecture – University College London

Participation
This research invites you to take part of this study in the form of an interview. You were chosen since you participated in the design of school C1 which is one of the case studies of this research. The research includes other participants who are involved in other school projects in other design firms. participation is completely voluntary; refusal to participate will involve no penalty or loss of benefits to which the participant is otherwise entitled; and the participant may discontinue participation at any time without penalty or loss of benefits.

Procedures
The whole interview will take no more than 35 minutes and will be voice recorded. Please inform the interviewer if you do not wish to be contacted later through email for further information about the project. By participating in this study, you are contributing to the study and the whole research which is primarily concerned with the importance of the design decisions (during the design process) of school buildings on learning.

Data Protection
The research does not intend to collect any personal data. Still all data will be collected and stored in accordance with the Data Protection Act 1998. Please do not hesitate to contact me (the interviewer) concerning any questions about the research and your rights as a participant.
Outcomes
Results will be disseminated in the form of a PhD thesis and might be used in conferences, journal articles and academic blogs. The results will be shared with the you as a participating architect (if you are interested).

Appreciation
Finally, the researcher would like to sincerely thank you for considering taking part in the study which abides by UCL Research Ethics Committee requirements.

Research Context
The research explores the relation between the built environment (the physical) and the learning process (which is a mental process) in the context of the school building. The research is interested in this relation to understand the impact of the built environment on the learning process. In one sentence, the research focus could be summarised as the affordances of the spatial design for self-directed learning initiated by the students and taking place inside the school building and especially within non-formal learning spaces.

To fulfil the criteria for this research, certain case studies (school buildings) were chosen for the research. School A1 is one of these case studies. Beside achieving a BREEAM rating of Excellent, school A1 excels as a learning model adopting the idea of a ‘Super-studio’ as the centre of its learning resource and a ‘house’ as its social and pastoral centre.

Purpose of the interview
This interview is held to
- Provide the research with information about the design process of the school buildings.
- Define the stages of the design process.
- Understand how the design ideas and concepts develop into final building drawings that translate into an actual building.
- Understand the architect’s perception about the school spaces and some terminologies in the context of the school building:
  - Spatial Affordances
  - Informal learning spaces
  - Self-directed Learning
13.1.2 Consent Form

Please complete this form after you have read the Information Sheet and/or listened to an explanation about the research.

**Project Title:** Implications of the Spatial Design of School Buildings on Student Interactions and Student Self-Directed Learning Activities

**Researcher:** Ahmed Tarek Zaky Fouad

Thank you for your interest in taking part in this research. Before you agree to take part, the person organising the research must explain the project to you.

If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you to decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

**Participant’s Statement**

I agree that:

I have read the notes written above and the Information Sheet and understand what the study involves.
I understand that if I decide at any time that I no longer wish to take part in this project, I can notify the researchers involved and withdraw immediately.
I consent to the processing of my personal information for the purposes of this research study.
I understand that such information will be treated as strictly confidential and handled in accordance with the provisions of the Data Protection Act 1998.
I agree that the research project named above has been explained to me to my satisfaction and I agree to take part in this study.
I understand that my participation will be taped recorded and I consent to use of this material as part of the project.
I understand that the information I have submitted will be published as a report and I will be sent a copy. Confidentiality and anonymity will be maintained, and it will not be possible to identify me from any publications.
I agree that my non-personal research data may be used by others for future research. I am assured that the confidentiality of my personal data will be upheld through the removal of identifiers.

**Signature:**

**Date:**
13.1.3 Interview Structure

Asking the main question would allow complete freedom for the interviewee to answer in the way they intend (which might come up with unforeseen aspects by the researcher). If the answer is somehow unrelated to the question, the researcher (interviewer) would seek answers through asking the set of sub-questions. If the sub-questions are automatically answered by the interviewee, the interviewer moves on to the next main question. Otherwise, the interviewer would ask for details about the missing sub-questions. For example; the main question is: What was your main responsibilities/tasks in this project? The sub-questions are related to managerial, design and coordination tasks. If the interviewee’s answer included all of them (or maybe more), the interviewer moves on to the next main question. If not, the interviewer would ask further details concerning the missing parts, as illustrated in the flow diagram (figure 13.1).

![Flow Diagram of the Interview Structure](image-url)
13.1.4 Interview Questions

**Project:**

**Architect’s Position in the office:**

**Architect’s Position in this project:**

- As an architect, from your perspective, what are the principal concepts that differentiate a school building from any other project?

Sub-questions

Are there specific differences to other building types in terms of design?
Are there differences in execution and project management?
How different is the client of a school building?

What are the significant responsible parties?

- Can you provide details about how the project started?

Sub-questions

Was the project a direct commission, a competition win, etc.?
How did the design firm get involved in the project?

- What was your main responsibilities/tasks in this project?

Sub-questions

Did you have managerial tasks in this project
What where your design tasks?
Were there any coordination tasks?

- Can you describe the design process of this project?

Sub-questions

What was the main inspiration for this project?
Did the design fit with the standard design process of the practice?
Did you employ any special techniques for this project or school designs in general?
Could you further elaborate on the main stage benchmarks?

- What are the main design constraints in this project?

Sub-questions

Was the design modified or impacted by any budget constraints or cuts?
Did the design have to comply with any size/area/number of floors constraints?
Were there any specific client’s requirements that restrained the initial design of the school building?
Were there any differences of opinion within commissioning team, design team and between them? What were they about? How were they resolved?

- What other parties (beside the architect) were involved in the design process of the school? and how?

Sub-questions

How did the school management participate in the design process?
What was the role of the government in the design process?
Did the teachers have any role in the design process?
How did the design incorporate the Parents? Pupils? The local community?

Were there any tensions, differences of opinion that surfaced?

- How did the design process consider student preferences within the school building?
  Sub-questions
  Can you specify how learning preferences were accommodated?
  How did the design consider/interpret the student social relations?
  How did the design consider/interpret the student psychological needs?

- From your perspective as an architect, how would you describe the different types of spaces inside the school building?

- From your perspective as an architect, what are informal learning spaces inside the school building?
  Sub-questions
  Can you provide a definition for the term?
  What do you think about the benefit of those spaces for the students?
  How do you imagine the students would use and occupy these spaces?

- From your perspective as an architect, what do you think is self-directed learning and how important is it?
  Sub-questions
  Can you provide a definition for the term?
  Did the final output consider this term at any stage of the design process? If yes, can you explain?

- From your perspective as an architect, what does a school building afford?
  Sub-questions
  Can you provide a definition for the term?
  Did the final output consider this term at any stage of the design process? If yes, can you explain?

- Were there any other alternative design in terms of spatial configurations / design decisions that were discarded in the process?

- Do you have any comments or suggestions that you wish to add at the end of the interview?
13.1.5 Transcription of the interviews

There are three architects being interviewed. The following sections present the transcription based on the recordings

13.1.5.1 Interview with Architect A

[00:00:04] I think this should be fine. But we can do it a bit So, you can see...

[00:00:11] Yeah. So, can you define the project, your position in the office and in this project?

[00:00:20] So, the project was to build an Academy which was a new secondary school. It was to be together on the site with another SEN school which is a school for special needs. And the two schools were going to share the site. So, they were going to be on the same site co-located but not working together just sharing some external areas and it is a standard secondary school funded by the local authority. But was going to be built under PFI agreement which is a private finance agreement under a BFS building program. My role was the project architect for the academy and also project architect for the whole site. But there was another project architect looking after the SEN school. So, I was looking after the whole site because it is quite complex.

So, from your perspective as an architect, what are the principal concepts that differentiate a school building from any other typical project?

[00:01:42] I think schools are quite challenging because they need to provide a set of spaces that are very functional but on the other hand they also need to be quite welcoming and easy to read for the users and they usually made up from some rooms which are quite repetitive. So, for example all schools have classrooms. So, classrooms will be similar in the language in their size and then there’ll be lots of little or very big rooms that are supporting the classrooms. So, generally, schools become quite different. They have body parts almost. And you get to... you know get to it. I think the art of designing schools comes from how you will put those body parts together. So, every school will have different requirements but usually what you do is try and locate big areas that are called assembly areas So, that they are used to gather everyone So, let’s say where you eat or where you go and listen to presentations like the main hall and the dining room and stuff like that. Those areas need to be close to the entrance on the ground floor and then classrooms can be somewhere else easily accessible. So, in that sense there are certain rules and then there are certain ways of breaking the rules and that the success will be depending on how well the school works not just for the pupils but for the whole community and all the teachers and staff you know So, they become quite complex kind of beasts.

[00:03:31] Do you think that there’s any difference in terms of the client building the school?

[00:03:43] No, I mean when we’re building schools you generally get many clients. So, your main client might be the body that pays for the school and that could be government or could be local authority... could be a church if it's a church school So, you know the different bodies who pay for the buildings to be erected. Then you have an end user client which the school itself which is the people who are going to be using it. you sometimes have an intermediate client who is maybe running the schools. So, for example we often have the dices which is the Church of England governing body. Sometimes they run the school but there is also the school who lives inside. So, with schools similar to hospitals for example you have to be able to please a lot of clients. So, maybe the client who is paying is saying
this is to be quite small you know and then the client who is using it says no, this needs to be really big So, you know clients will have within themselves, clients will have different needs and I think to get a successful school building, you need to be able to listen to all of them and decide what is the most important thing yeah and fit within the budget as well.

Can you provide details about how the project started? The initiation phase?

[00:05:22] Well this project is very unique because it we designed almost all of the initial stages of the design within a competitive process. I don't want to complicate things too much. But normally you if for example you do a competition you win the project to be the architect and then you design, but because this was ‘Building School for Future’ (BSF) we were competing and designing, and another practice was competing and designing and a third practice was competing and designing. And after three months one fell out and two stayed a bit like a bit like kind of a music competition where you sort of get rid of people on the way. Then we stayed it was us and another practice and we continue designing to stage three I don’t know if you know RIBA stages 1, 2, 3. So, we go to very detailed design but still competing with another practice. That is quite difficult because it means that we were having to show to the client that we’re doing all the things they want. But we also have to comply with all the competition rules. So, in that sense the briefing was quite tricky, but the concept was developed very much to allow the school to fit on an urban site together with another school. So, it’s quite a lot So, basically the total area for the schools was bigger than the total area of the site if you can imagine. So, if we put them all on the ground floor there will be absolutely no playgrounds nothing yeah. So, that's why SCHOOL A1 became on lots of levels. So, the total area of that and that would have covered this whole side and more it would probably cover that much. [00:07:28] So, we have to go on lots of levels So, that instantly told us that at least the school will have to be on several levels. And because it’s in the urban zone we could go up to six floors which is quite unusual for a school

And what were your main responsibilities during this project?

My main responsibilities were to run to organize our own team. So, we had a big team in in office but also to organize the client consultations So, I was the main point of contact for everything and then I would speak at the presentations and make sure everyone understands what we're doing. So, kind of client liaison you'd call it

Can you describe the design process of this project?

Okay So, in brief, we located the two buildings first So, that we know where each is going to be and it made sense for SCHOOL A1 to be on the urban edge you know in the busy edge because special schools are more you know more kind of private and they need drop of areas for buses and stuff. So, we first locate two schools then we focused on SCHOOL A1 to give it enough playground. So, we lifted like a podium of the ground to hide all the parking underneath and that allowed us to have one two three places for play. otherwise they would have had no room to play. You know it’s almost eighteen hundred kids. So, can you imagine when they all come out, they need to be able to play somewhere. then the main internal organization of the school was designed by the brief to be separated into five House households and they are like schools within schools. So, you have a sports house, you have a science house, you have a DT house which is design technology and I think there was a music and art house. and each house ended up having its own staircase So, that you could go up and down between the rooms for the house just using that one staircase. I could show you some diagrams later on. So, really it was very clear how the building was split internally into different houses and a very important one actually is the science house for example. That science house is completely on the top and it has got a fantastic big lecture theatre. And if you are going to the science presentations you just go in and
you go to the lift and you go straight to the top. So, in a way it is kind of the concept of how the school works then translated into how the school is organized internally.

**What were the main constraints during the design process?**

The main constraint was how tight the site was. So, we had some very major obstructions in the site. There is a network rail tunnel running through the site. And the tube tunnel is just on the north of the site. And then there is also a Thames Water Sewer running through the site. So, wherever those tunnels are we couldn’t put the building. So, also I’ll show you a little diagram. So, the building set to kind of sit like this and let the tunnels go through the site. So, that was the major and then we also found an electrical cable which made us have to move the whole building one meter down quite late in the design. So, these are quite significant things basically. Other restrictions were really the programme we had to be obviously you know very fast to fit the BSF Program and the third restriction is simply the amount of area which made lots of play areas be on the terraces. So, imagine if you were in a lovely village somewhere and you had lots of room you wouldn’t put the building on So, many levels you make it two storeys maybe or one storey and you have lovely playgrounds outside. But because this is such an urban site, a lot of the playgrounds are actually on the classrooms... on the terraces. So, for example, this is the art classroom in here and then you have got all like a really lovely terrace. So, they do not go all the way down to paint and draw, they just put their stuff outside and just do it outside on the terrace. So, those are the key restrictions really.

**What other parties (beside the architect) were involved in the design process of the school?**

Yes, there was there was a quite a big team involved because this is a fairly complex project. So, we had mechanical engineers, structural engineers, acoustician. We had civil engineers and we had FFNE designers for fittings and furniture yeah. We had catering for catering designer to design the kitchen and how the food is served. Because for example SCHOOL A1 has five different dining rooms not just one. So, the kitchen serves five different places, So, you have to cook and then you have to take the food in the trolleys and then serve it out to sort of like cafes basically they look like Costa Coffee at the airport. So, they have serveries and they have hot food and cold food. And you bring the food to that, So, they have five of those because they fit the five houses. It is quite a new concept basically, So, they are quite small room. They are smaller than one big dining room would be, but it means they could use them to study later.

**How were the students involved in the design process?**

Well it’s a good question. We worked with students from university actually and we worked with some secondary schools from the area. But this school didn’t exist. So, the new students only arrived once it was built if that make sense and they didn’t arrive all at once. They started with two years and then added two years and then added two years. So, it’s only full capacity now that it started back in 2013. So, it took three and a half years to fill up sequence and filling up which is good because sometimes if you start with everyone to get there you can be quite messy. That was a management decision by the local council...by Camden. Before we got involved, they said this is how we want to do it. Because it is a new school.

**How did the design process consider student preferences within the school building?**

Well we did a briefing with the students. With the selected students from other schools in Camden. before us the architect who did the brief who put together the brief they also did lots of visits to Camden schools and developed with them what they think is the best and they did a lot of workshops with Bartlett School as well to design how they think the school should work. So, there is some involvement from Bartlett as well which is really good.
So, from your perspective how would you describe the different types of spaces inside the school?

Yeah okay So, they have the big the big concept idea was that we're providing a whole range of different spaces for learning and that children are different, and everyone learns differently So, some people learn well in a kind of standard classroom scenario and some need more quiet learning and stuff. So, basically, all the spaces have a variety of different seating arrangements and a variety of ways of learning available within them. And the other concept was that you were moving into learning through stage not through level. Yeah. So, if you're very advanced if you're very clever you can move through stages quicker. So, basically, you can be taught within your year group but you're being taught from a curriculum from the next year if you are very advanced. That was that was the initial idea. I don’t know whether they are still doing that. it would be good to talk to them. Talk to the school and find out what...but it is very brave to kind of ...So, you progress through stage rather than through class by class. And then the big idea was open plan learning So, in a cluster of classrooms six central classrooms would all be one. And within that space you do like a project presentation first and then you go and break out and you have kind of your study area and they really do that really successfully. So, that is quite of groundbreaking kind of idea really.

You mentioned earlier that eating spaces change into study spaces?

Yes, they are mostly used by six formers because they have free times when they can study or meeting groups and do kind of group study. Or they are used by teachers to take a whole class downstairs to the dining room outside of dining hours and to do a presentation, So, they all have little screens or whatever. So, a teacher can take the whole cloth downstairs and do like a big presentation where they can be available free.

So, how would you define informal learning spaces? from your own ideas, in general, and in this school

Well, I think in secondary schools I don’t know if you know a standard secondary school just has a lot of classrooms a lot of classes. You just have a classroom, classroom, classroom and you just move from a normal classroom where you sit in rows and you listen to something to a lab which makes you know if you have science or physics or whatever biology you go to a lab...you know laboratories say you using equipment and staff but that you can make normal secondary schools just out of lots of classrooms.

SCHOOL A1 is very different because it has open plan areas. So, each element that you teach you teach in a big open plan like this central area and then when you need to do some focus work you go to classroom. So, I think the kind of free learning happens in the big open area just like that... people sitting and talking and exchanging ideas and then when you need to work on your project you maybe go to the computer and you just work on it. And it's very much like university I think it kind of brings university type of learning into schools to be kind of self-directed or starts introducing some self-direction into secondary school learning if that makes sense...part of the main idea of the school. It used to be called tailored learning ...I wouldn’t remember. There was like a specific term for it, but it means that it gives it allows kids to grow up a bit quicker by choosing how they' want to learn. Obviously within being looked after by teachers because hey you know secondary school kids are not always that hardworking. Yeah but yes OK. So, it was called personalised learning. Yeah. And it meant that you know for example you all go to a briefing in the morning. You get told what you are going to do that day. And then you can go take a bit of time off and you do your learning and then you come back and present this. So, it is quite almost like a university basically. The spaces are tailored to kind of encourage kids to behave in a certain way.
So, the word tailored would you consider it similar to “afford” or spatial affordances?

Oh yeah, I think So,. I mean up to a point I guess you know you could argue that you know a blank room like this you and I could do all sorts of things without the room changing. But on the other hand, if you give sort of if you give people a room where there’s like a fore-room you know like a seating. Then they do a much more focused presentation because they’re all sitting around the first second. So, up to a point you can... describe... you can push people into doing things by designing space well.

**Were there any other alternatives design in terms of spatial configurations / design decisions that were discarded in the process?**

Yes, there was a lot of different options proposed during the early stages design mostly because to resolve how to five houses come together. Ok yeah that was tricky. And also, to resolve many floors yeah. School don’t like being on many floors. It is a bit tricky. So, the options were mostly to resolve those things.

**So, the idea of five houses was presented at the very early stage and then you developed different alternatives to house this idea?**

Yes, and to make it work with a six-storey building because it is quite tricky. So, for example, if we had a big site, we could have done five different buildings and that would have been easy. You know, one building, one house easy, but if you have to put it in a network of stairs, it’s a bit tricky. But the five houses were defined by Camden you know and by the brief and they didn’t take away they didn’t step away from that. They wanted to keep that.

**That was actually the last question. Do you have any further comments?**

No, But I would say because you are you are basically writing something that describes how the same influences the learning. I think you should probably emphasise the bits that are unique about this school and the bits that are unique are definitely being on many floors. That is not very common for schools maybe nowadays but usually schools are on two floors on three floors maximum. So, that's quite unique. And then having opened plan super studios is very unique and I don't know how many people do that nowadays. So, because when you have a big space like, you also have to sort out the acoustics. So, for example, we had special speakers that were playing background sort of almost like a noise to cancel the acoustics. So, the 90 to 100 kids could all be in one big space all learning and stuff.

[00:24:43] So, it's got quite a lot of different things that are quite specific.

**So, the unique features of this school are the levelling and how to deal with the super studio?**

And how to deal with the super studio simply Practically you know 90 kids all in one space. And just the fact that five houses have five dining rooms which is very unusual for secondary schools. But all opening on to the courtyard. So, those things are quite brave to do in a school as a new idea.

[00:25:21] And when we met the teachers you know when they when they started interviewing for the new teachers to join, the teachers had to show that they really embraced the idea and they will actually put it into practice. It’s very important to have teachers on board.

**So, teacher took part of the design?**

Yeah, big time. Yeah. And also, they then teach the kids how to use the design if that makes sense. Yeah. I think it's important. because they’re the ones using it every day.
They are the ones driving exactly. So, you give them a product you know to use the car analogy you know you get in the car. But they’re the ones who are learning to drive. So, they need to, they need to teach the kids how to use the building correctly. And I think they were doing a great job because they started with not too many kids. So, they taught first two years and then two New Years. And then, By the time the full capacity is the older kids and teaching the younger kids how to use the building. That is very interesting.

So, students-like teaching other students?

Yeah, and they are very proud of the buildings, So, they teach ...even when I go to visit, they say oh and here we do this and this and it’s like yeah, I know I designed the building. If you get the users to be proud of the building, then the building gets used how it is intended. So, yes, I think as a school it’s got some things which are not usual.

I think maybe those might be interesting for you to you know to go to go through and maybe elaborate a little bit more. depends how you would you this.

Yeah, I think you probably don’t need to be someone who can just say don’t read So, I just need to vent.

But this is mostly.

If it’s easier for you to think yeah oh yeah, I’m like this is brief that will tell you that as well.

It’s quite interesting.

Yes.

So, the idea was that there are five houses and each house has all the areas inside and then we tried to stack them sort of vertically and each stair takes you to one of the houses yeah that was initially important and all the super studios we tried to as much stick on top of each other. So, we don’t have to. And also, the five houses are also shown in the front elevation because every house has its own colour of the concrete.

So, that is the kind of the final elevations are coloured to show the houses to show the Houses. So, it is quite ambitious really. Statement to the outside world how the building works internally. And you see these really big windows there are the super studios in there. You can tell that is a super studio from the outside. So, each room had its own shape of window So, you can tell what’s going on inside. So, the library has a big curved window. You know that is the library. So, it is quite a brave concept. In terms of the houses the dining rooms, three of them are down here and two of them are on level two (first floor) and each has an outdoor part where you can go outside with your sandwiches and stuff So, the idea was that you have a house where you eat and also you can go outside to play directly and the houses which are the dining rooms are the main heart of the house So, if you want to go meet your mate you go down to your house and you meet them there. So, you know it sort of I think schools within school. So, five schools within the school and that means that you are meeting a smaller group of people, So, it becomes a bit more humane you know So, you get to know your mates first then a larger thing yeah. Which quite reduces bullying and stuff which is quite a good concept. Becomes more like a family than you know when you come to a huge school it is quite intimidating. The family then grows
This is a super studio. Super studio has a big room and in the middle of the big room there is a forum, So, it is like a presentation seating and then you have like a presentation wall at the back like a small auditorium and that is where you do your ...you get briefed in that and then you go to these different tables and you do the work but if you have a specific class then you go to a class like a normal classroom. This whole thing can hold up to 180 kids all at the same time. So, It is incredibly busy that is why we had to get the acoustics and everything to work perfectly in this. They really use it the way it is intended. For example, you could have said we don’t like it we are going to build some walls. But they didn’t So, they are quite ambitious basically
13.1.5.2 Interview with Architect B

Speaker 1 (00:05):
I'm going to start by asking you, can you introduce yourself?

Speaker 2:
Yeah, sure. I've worked for (this firm) for 12 years now. So, my current role is project director within the education team. Um, So, I've worked primarily in education throughout my time at (this firm), started down in the (first) office. We moved up to London a few years ago. But yeah, worked on a whole range of kind of, um, education buildings from schools, primary schools, nurseries, secondary schools, kind of six home colleges, universities, both in the UK and overseas.

Speaker 1:
What do you think differentiates schools from any other project?

Speaker 2:
Um, well I guess there's a kind of a unique set of challenges in terms of the number of stakeholders that you have to engage with.

Speaker 1:
So, what's the process of starting the design for typical school project in the office?
Speaker 2:
So, in general, the process is there, it's kind of two folds. So, we would normally be given a briefing document that would set out, um, some key objectives, like number of spaces in the school, what size those spaces need to be, what the kind of key adjacencies between different faculties needs to be. Um,

Speaker 1:
would you be able to give an example on one of those schools?

Speaker 2:
So, yeah, there's a project in Newbury, So, yeah, this one was done about 12 years ago and this one was procured under something called Building schools for the Future. Um, which was a labour initiative which had a completely different kind of procurement and funding strategy to the one that's in place now. Um, So, this particular project, we were given a design brief that had, um, the number of classrooms, the number of science labs, etc. Um, and then they had a few kinds of key education design drivers, one of which was for a central governance space for the entire school. Um, So, those were kind of educational design drivers and then linked to that where they're kind of site design drivers, surrounded by residential properties, um, how could we have a design that didn't adversely impact on those residential properties. Um, and the idea here was a cluster of kind of teaching fingers. Each one of these actually has a different base within the school. Okay. I think one of them was like Eavers, Patterson, can't remember the others, but um, each student was assigned to that particular base and then they're all clustered around a central governance space that was an external space that had a roof over the top. Um, So, that was the space where the entire school could gather for presentations, etc. But, and then within each of these fingers actually was a space big enough for that,
that base to me as well. So, there may have been like 300 students in each base, So, they could have all met here internally and then all the students, which would have been around about 1500, maybe 1800 students could fit in that central space.

**Speaker 1 (03:46):**
And how this school is different from these two schools (B1).

**Speaker 2:**
This is, yeah. Well. So, typically, this stretch of accommodation that will be given across secondary school will be very similar. Okay. So, there may be some kind of unique differences in that one maybe specialises in a certain subject, whether it's English or history, where that may push up, that kind of particular spaces. But yeah, typically the educational briefing we'll get will be very similar. So, I guess the biggest impact in terms of the overall design would be external factors: site conditions, orientation, almost kind of things that drive what the scheme would be. So, some, some schools have restricted site for example, So, you need to do what you can to maximize external space and link between inside and outside is important. Whereas others like this one, I've got much more generous site to play with there. Um, you know, some schools if they're in an inner-city location, have got much lower requirement or things like parking. Um, whereas suburban schools, you need to think about every one of those parents is likely to come and drop off that student, thy drop off spaces, number of parking spaces for teachers is increased.

**Speaker 1:**
When I visited the school the staircases had one direction of circulation, you think this was in the original design or that something the school adopted?

**Speaker 2:**
It would have been something we discussed at the time with the school. So, in terms of pupil flow, circulation, etc, and it's not uncommon for um, staircases in schools to operate on a one-way basis. So, sometimes we'll put like a handrail down the middle of a staircase for example. So, you can have a separate it up and down. Some schools just have each, each staircase going in one direction

**Speaker 1:**
On the third floor, the two wings are not connected. Do you think there was some issues during construction that you think led to the link not created or that was in the original design?

**Speaker 2:**
I wouldn't be able to answer that. I mean, in similar projects we've done where we haven't connected wings on the upper floor, it's because there was a very limited requirement for students to move between those two particular blocks on that floor. Um, sometimes there are other kind of design drivers such as, um, work to encourage students to come out. You don't want students just move in between spaces, you want them to come to a central space where there's opportunities for them to kind of socialise meet, etc, create like a lively environment within the centre of the school.

**Speaker 1:**
What do you think are the main design constraints for these schools, any of them?

**Speaker 2:**
Um, different for every single school...site would be it. Uh, well there's constraints and opportunities obviously in, in the site. Um, you know, obviously budget can have constraints on certain design aspirations. Um, you know, you might have to reflect that in terms of the way you approach the scheme. Um, as factors such as, um, you know, there may be, um, like a local plan in place, uh, planning restrictions in terms of, you know, how high you feel on how many floors you can go up and what that does to the, um, footprint of the building overall.
Speaker 1:
And how do you like interact with the management of the school during the design process?

Speaker 2:
So, we'll typically hold a series of engagement meetings with various people and we'll tailor the engagement according to who we're talking to. So, obviously one of the unique, unique things in schools is that you will engage with young students. So, we will tailor our engagement sessions accordingly.

Speaker 1:
What would you consider as the student spatial needs?

Speaker 2:
Yeah. from a learning point of view, So, I guess one of the key things is ensuring flexibility in the design. So, you know, even over the course of the last 12 years and when I've been at this firm, the way, um, you know, different pedagogies, etc, existing, the way people teach changes. So, the building needs to be able to adapt to that quickly. So, flexibility and adaptability in the design,

Speaker 1:
What are the informal learning spaces? So, spaces outside the classroom? Do you have any criteria of their design that you have in the office?

Speaker 2:
Yeah. So, there'll be, um, since very much dependent on the particular school or Academy and all of them, we’ve got different ways in which they see informal learning taking place. Typically, things like breakout spaces will be positions where there's good passive supervision. So, um, the teacher doesn’t have to continually leave the room to oversee those students, you know, they're able to observe them. Um, you know, the type of furniture, etc in that, um, breakout spaces important being able to move back according to the number of people that are in a natural group. IT: making sure there's the facility out there, whether it's floor boxes or flexible IT data provision that students can utilise.

Speaker 1:
And do you think space plays a role to make the students do some activities by themselves? example: when student takes a book to sit in the library, not the teacher telling him or her to go read the book. Do you think the space can influence decisions?

Speaker 2:
I think So, yeah. So, creating a quality of space will encourage people to use it. So, clearly if your library, for example, is in a constrained space with not much natural light, not great kind of ventilation, students aren't going to be encouraged to use that space. Whereas if it's some, the space itself is slightly more aspirational, lots of natural light. It becomes more of a destination for students.

Speaker 1:
I Have one question about this big space, it's considered like a dining space, like these tables, they are added recently. Do you think the design considered this space as a dining or it was just a reception? So, I think these, this is the kitchen, and this is the main dining and that's an extension. But nowadays they have the students also dining here because now they have more students. Do you think that it was part of the original design?

Speaker 2:
Oh yeah, I'm not sure. So, well I know one of the things, one of the exercises we did after the scheme was built was this extension. Okay. So, that was an additional area that was added on. Okay. Um, but yeah, I mean looking at the design, this looks like it's a space that has been designed such that it could operate as one big space, or it could operate as two independent spaces. So, there may be certain factors that maybe aren't immediately obvious. For example, the number of covers that the kitchen are able to serve at any one time. Um, and that can change when a head teacher changes. For example, they may encourage for a large number of students to go through at one time to keep lunch breaks, shorter or others prefer to separate it up and are happy for that lunch to spread over a long period of time.

Speaker 1:
Also, on the second food, can you talk a bit about the library, or other libraries in other design schemes?

Speaker 2:
Yeah, So, LRC, So, that what we refer for them, they normally form like the key spaces for the school. they kind of give off a certain impression with that school is professionalism of students engaged in different types of learning. So, we will typically suggest that they're located in a prominent position, you know, in terms of visibility from the outside, good visibility inside good links to the rest of the school. So, you don't want to look at, the LRC for example, being on the peripheral part of the design where students have to travel through corridors along to other faculties to get, you do want to sit them kind of very centrally. Visibility. Yeah. And as I say, making it a space that students want to go in and use. Okay.

Speaker 1:
And the corridors they have these shafts for ventilation, were they in the original design?

Speaker 2:
Yeah. Okay. So, I think one of the reasons, where you've got very long, narrow corridors without any natural light. So, um, typically when students are moving from classroom to classroom, you know, if you're, if you've got hundreds of students walking down a restricted space, okay. Bumping into each other, etc. You know, that's when kind of tempers can raise etc. And it can easily lead to some kind of antisocial behaviour. So, if you're able to eliminate that in design by creating opportunities for natural light, breaking up the kind of monotonies aspect of a long two-meter-wide corridor, um, I think it helps as well in terms of passive supervision. And wayfinding.

Speaker 1 (14:52):
Do you have major comments on the design of this school?

Speaker 2:
It's difficult as I wasn't involved in that particular, that particular design.

Speaker 1:
For example, you only have one access...actually two accesses to the outdoor area. But this one looks like a recent addition.
Speaker 2:
Yeah, yeah, yeah. So, I'm not, I've no idea why that was the case in this particular design. I know enough examples. It's been a case of you, you do want good links to external space, but would it be in a school you need to be able to manage those links and make sure that students are traveling to use those sports pitches and then they're not being tempted to go elsewhere in the school. So, yeah, sometimes those access routes can be shut down slightly just to ensure that the circulation,

Speaker 1:
and for the circulation, you have five main staircases apart from the fire escape considerations, how do you allocate the staircases in a wing?
Speaker 2:
Yeah, So, we'll obviously consider that pupil flow circulation routes where the clusters or spaces occur. So, if you've got lots of classrooms, for example, you want to make sure you've got a staircase close to that, potentially you've got 30 students in each of those classrooms, which is, So, if you've got a cluster of five spaces, that's a lot of students. Whereas the LRC for example, isn't going to be full of students the whole time. Um, the students are going to be circulating to and from classrooms. So, you want to make these staircases in those positions. In terms of the design of the staircase, it's open and visible as possible while still being, you know, consider um, fire regulations, etc... quite typically locate office space close to a stair So, that, um, that's that passive supervision element. Um, again, they are really well, um, observed or completely in those spaces, but once they're in the staircase and also well in between floors. So, again, it's where some of the kind of unwanted behaviour can occur in school. So, visibility from the outside helps there as well. If a student thinks that they can't be seen, they're much more likely to misbehave than if they feel that somebody's there and can see what they're doing. So, yeah, we will, we will try and cluster those together. Sorry, I was just trying to find some of the diagrams that we do. When we receive a design brief for an education project, we might kind of do something like this, which will be to visualise what the concept there is, what are the types of spaces are, what the activities are, you know, landmark buildings on the site, are the arrival space, may sit and work some of the keywords, heritage, innovate, showcase space, etc. So, try and do this just to capture what those key kinds of messages are from the, from the client.

Speaker 1 (20:38):
How do you think about social spaces, learning and social activities for the students?

Speaker 2:
So, if I, let me just show you one of the things. Some of the projects we did for example, that college. Um, So, one of the, um, So, North hearts college at the time was all about kind of entrepreneurship. Um, So, they wanted to create students that were capable of starting their own business, um, from kind of start to finish. So, they were really keen on the creating, a series of classrooms. But the spaces in between the classrooms were much more important to them. They wanted to create spaces where students that were interested in different things may like meet each other on regular basis. So, you may have, for example, a student, uh, a science looking at the science is in and another student for example, look doing care and beauty. I know the opportunities for those two to get together and you know, scientific element behind creating, a shampoo for example, could be shared with, with another student and creating opportunities there as well for like small businesses, students to start their own business within that space. Um, opportunities for the community to come in and use it. Presentation spaces, whether it's small like spaces like this where people could just chat or presentations places. Um, yeah, So, I think they're really important. I think that they are important in secondary schools,
but they kind of get more important as well as you get to go for your education experience. College. University.

Speaker 1:
Yeah, that's it. I am So, happy to meet you. thank you
13.1.5.3 Interview with Architect C

How long you think it's going to take.

Forty-five minutes. but if you want to go anytime it is fine.

So, can you identify without any names. Can you identify the project and your position in the office and the position in this specific project?

My position in the office is one of the directors and at that time I was one of the directors in charge of the project.

From your perspective, what are the principal concerns that differentiate the school building from any other building?

It is an interesting question. I think the school building is an addition of very different typologies because that's what probably differentiates it from any other project. That is very variable. You can build as offices for example as one of the simple elements, classrooms, but also technical buildings like theatres or science labs, music spaces. So, it's an assembly of So, many different typologies in one group. So, it's an amazing type of building to design.

Like how different is the client who approaches the project?

Client is always characterized by as typical term "multi-head" client. Which means that decision making is a lot more difficult than when you go one client. And you need to go through a long process of consultation. And see all the stakeholders and the different groups. So, decision is always a long process. That's the big difference. client. It is not one client. It's normally more than one person that take decision.

Can you provide details about how firm started this project?

We were selected by BAM construction as part of the design team for the building school of the future program for Camden. They were competing against three others or two other contractors.

[00:02:57] One was ABC and another. I do remember that was 10 years ago So, it's quite a long time ago that

We were basically part of BAM construction design team with another architect [A] design other two schools for this...called the sample schools. Do you know what is the BSF program?

No.

Building schools of the future program is Probably put in place by the last labour government actually from the labour governments all across from the first labour government to last. It was stop by the Conservative government in 2009. And it was basically in a few words a program to rebuild the entire secondary school body in the UK. It was very ambitious. It was a big... I think there was something like a 50 billion pounds investment in 10 years, So, about 5 billion pounds per year to be spent in school buildings. So, it was a very big ambitious project and the way that this was precured and activated was by...choose... So, basically the local authority with the help of the states are put in together consultants with private element which was a contractor firm...big one... we are speaking about like the dimension of BAM constructions, Skanska. And So, on that they had a lot of capital. So, it was part of investment of private money and public money.
So, it was I think used to be called PPP (Private Public Partnership) and to choose who between all the contractors that were competing will be the contractor appointed to join this partnership. There was this very long process of competition. It was like basically the State was asking three consultants to produce a very detailed design up to literately stage three. Nowadays they call it basically planning stage and going through an intensive and long period of consultation with the school. So, it was very a thorough process done on three groups in parallel. So, you can imagine the amount of time spent. Both from the states and from the private group to get to a level the competition could end, and a winner was chosen.

So, in this case, Camden had three sample schools. The sample schools are the schools that were chosen for the competition. If you don't know anything about it's very, I suggest you do go and read about it. In few words, Camden had something like twelve secondary schools that needed to be renewed from the scratch and they all... some refurbishments some completely new...often refurbishment because we are in the centre of the city and that they put three schools as samples and those samples meant that the contractor and the team had to design three schools to win the competition. OK.

What happened is that we had school C1 at that time it was South Camden Community school and architect [A] had I think [school A1]. So, that was consoles...per group. We put forward our proposal. I think it took something like something like six months to go through all the process of designing and getting that ...knowing the school, doing all the consultation process and we basically did a kind of all looks like a planning implication...a risk of BAM obviously and at that point we were chosen.

Very long explanation I hope it is going to be clear. The funny thing is that when Bam won the competition. It was literally only a week or two before the first Cameron Government was elected and as soon as the Victorians took power, they cancelled the program. But because we were, we won the competition. There was already an agreement between BAM and the local authorities, they could not stop the sample schools, So, they went with the sample schools, but they did not proceed with all the other schools which about 11 or 12 schools, other school. So, they did school C1, A1 and a special needs school were all finished and built. But that the whole shine that would make BAM really happy about winning this competition were like cut. So, in one way Camden got a very good deal for these schools because these three schools were the schools put forward to win the competition and you can imagine that the proposals were really you know they were like high promises ambitious with the hope that probably some of the money spent for these three schools could have been somehow rebalanced by the rest of the work that would come.

So, in one way they just got a very fantastic deal for quality that.

**What was your main responsibility in this project?**
It was mainly design and then I was part of the group during the competition, So, I have done the competition and then the development of the detailed design. and then R who sits out there took the building on site with my supervision. and the supervision of CW as well occasionally.

**Ok can you describe the design process?**
It is very difficult. Obviously the first stage was to meet the school...the head teacher and their architecture advisor and our team. So, we met many times we went through a very detailed brief that was prepared by the school with the help of their architecture advisor. It was a very valid brief. So, one advantage and I think one of the reason why this school is quite successful is that the head teacher
and the school body had a very clear idea of what they wanted. So, we went through a series of meetings going through the brief trying to interpret their needs and coming forward with several proposals. I think we started with four options then we came down literally to two and then very quickly to one with the help of the school because when we were putting forward this proposal we always asked the school their feedback and very very quickly in one way the process was clear that the scheme that we will be putting forward was what they really like in comparison with the other proposal which had elements of ...different elements of refurbishment and new build literally different typologies. And this idea of the school keeping the existing Victorian building was one of the firm things that we really like and the idea to connect the new with the old through the central spine. the arcade as we call it was very something they really liked. So, the process has been looking at different options discuss them with the school and proceed in detail with the one they prefer. So, we had the luxury during this competition to have a constant contact with the school and going to regular meetings with them which was very time spending but at the end what they have got a competition stage that they can inform the design.

**What were the main constrains in the design process?**

Oh, there were So, many. First of all, building a school you have to deal with the fact that it is often an existing school. So, they are in operation So, there is the constrain that I plan the decanting and the operation of the school while building it that is one constraint. the other one was the existing buildings were there. Some of them were at the end of their lives. So, it was quite a Straightforward decision to take down. other were like in-between and So, you have to justifiable them in terms of age to take them down. but there were maybe in the way of a reorganisation of the space that would we did benefit the school So, some of the decisions of taking down building is also being based on the fact that they were in the wrong location considering the new plan. Money. It’s one of the other constraints and I would say that these are the main constraints that come up to my mind straight away. and there was as i said the existing building on site, one of the existing buildings was a historical building was not part of the school even though it was the original school which is what is known as the medallion building and that building we though was crucial to keep as a memory of the original school but also as something that is recognised by the local community as a very important building over there. one of the things that was crucial in the brief was also opening up the school to the local community.

**Where there any opposing ideas during the design process?**

You know with the future potential clients you need to be no confrontational as a you know...have a constructive discussion and try to understand their needs. So, the spirit at that stage was like to listen more than try to impose an idea. within us, the office there’s been a lot of conflict on what what to do and what not to do. And you know there was a moment for example that my fellow directors saying they want to see that the option where we were taking the Victorian building was doing much better to the site. And So, we had very strong discussion about that and at the end, we decide to keep the existing Victorian building and make it actually the art of the development So, they start with discussion are. Yes always more within us than not with the client. And also, with the contractor that was sometimes saying...woo this is too expensive we cannot proceed in this direction we know it is not going to be affordable. So, sometimes there has been discussions on the affordability and the buildability of the building. Initially, the arcade at the very big for example, the entire roof of the arcade was glass and that very soon we decided that it was more sensible to do some element of our solid roof as well. So, that was coming mainly from cost reason and then we can also get a very good environmental reason.
Okay. How did you and the design team consider the student preferences?

The students were consulted by the school. basically the school had different groups. there was the group of teachers...obviously there was the head teacher and they are leading group of the school which was always present. but then we had a meeting with all the different representatives of the school including the students and the students, they were consulted by the school and the architecture advisor of the school to design the brief. So, the key was... the key concepts or the aspiration lets say of the brief had a big input from the students as well and then we met them a few times just to make sure that... just to present what we were doing and to listen their feedback. So, they have been present. Obviously a representation of the students not all the students. they were like a group of il don't remember maybe five or six students.

Can use discuss what are the most important components or spatial components in this specific school typology?

As I mentioned, the idea of the spine that connect the existing Victorian building to the new is definitely one of the main components. In fact, when you enter into the school it is the first impact you got. i don't know if you've been there. you get these massive very generous spaces So, the idea it was to give general circulation call it as call it spaces that have not a defined function but can be because generous used for other function. in this case for example there are a lot of assembly not assembly school assembly but then conferences and things where people are being invited within the space. Or exhibition and things like that. So, the main spine was one of the elements, but the entire school is designed around external space external to the classrooms that can be used for other function. the arcade is one but each department art, modern Languages, English, science maths and So, on...they got what they call at that time it used to be called home aces which actually are big generous internal piazzas almost where the classroom of that department opens up and those were the ideas that in the morning tutor teacher of each of these departments would meet the students in the morning or these spaces could be used as a support for the work done inside the classroom. So, outside they could go out and do presentations or they could be used for small exhibitions done by each department. even the idea i think it became a little bit more difficult an area where the Kids could eat in Support to the dining area So, that they didn't have all these big huge amounts of kids moving to the dining area. In fact, the dining area is actually quite under dimension compared to the size of the school because there was this idea of the localised eating. So, is a series of centre spaces with classroom around that define departments key departments of the school and then this big arterial or big central spine which is the arcade So, yeah that that's the main idea and then in terms of classrooms and other spaces the most functional spaces. There was this part of the brief was to ask for different size of rooms So, that you could do no more class with up to 30 kids. Or smaller classes at what they call seminary rooms So, that you could have a smaller group 24 and then down to other spaces where you could have 12 to 15 kids. So, flexibility in terms of size of room So, that you could have a classroom or more into kind of discussion and then this big space outside the class where everybody could gather.

[00:22:57] Actually that's very interesting because part of the research is interested in informal learning space which you have just defined. So, you agree that the design should consider these informal learning spaces from the beginning?

[00:23:15] Yeah, I think that they are useful I think school that the idea of the traditional school with the classroom which become the kingdom of the teacher is part of the past. is more like we in all our research about designing school we came to the conclusion that school has to be a series of spaces that they can become teaching spaces but they can also become spaces where informally people can sit down and discuss without teacher or an area where you can study or have a sandwich and look at
an exhibition So, it is more like almost a university space or an offices even that become like this one. you have areas that are well separated acoustically some that are more in between like this one where you can still hear what is going on and then a big space where you can meet more and more people and do presentations. definitely and they have technology now which is great because you do not need to have a computer area... things you go around with your tablet or laptop and every place can become a nice teaching area or learning area even a cafe.

[00:24:37] do you think that this would help within the student self-directed learning?

Yes, because it is about cross pollination is about meeting people that are not necessary in your group or your classroom. It also helps the teacher not to be shy and be always pushed to collaborate with other colleagues and that collaboration goes down to the students that They see that collaborating is the key of learning and success we believe that is crucial.

[00:25:20] So, can you define self-directed learning from your own perspective if you give that definition. As an architect

As an architect I think it’s about learning how to learn and being put in a position where you don’t ask for the answer but you look for it and being taught [00:25:47] more to what to look at and not to find an easy answers and a lot of kids nowadays I think at this... they want to know exactly what they need to do to get from A to B or A to Z and self-learning is exactly the opposite it is not to say hey you look teach you should be taught to look where to look but not to what to look and you need to have a little bit of autonomy in that and be able to deal and try to solve problems on..with yourself and not with yourself but with not the help of a tutor for example. That the tutor doesn’t become someone that takes you by hand to all the process but give you all the tools and then the role is up to you you get from one point or another. You can take long diversions and then would open up a series of rational things but at the end of the day the work of the school should be just trying to help you to then focus back not castrate. The fact that you can also take some direction. that I think self-learning is about [00:27:27] Choosing your own path and have the school helping you with the tools to make sure that you become on an efficient path an efficient way and not telling you every single thing. That’s what it is and it is our job I think because you need [00:27:53] To do things on your own often. You need to make space afford self-directed learning?

[00:28:20] I think space is not very for me. For me this is no only about space it is really much about how teachers teach. I’m sure that space is crucial, but you know at [00:28:38] The end of the day it is about what you read and what you do. So, [00:28:46] I think having access to good database and access to a library with multimedia information available all these things are very helpful. I think Nowadays you can access everything from a smartphone, So, space becomes less problematic, I think. I hope that answers the question.

Actually, that was the last question do you have any comments general ideas. you want to add?

[00:29:32] I would say that it depends I understand that you more focus on the importance of space for learning and I think I think it is also if you are interested in how you produce a good school in terms of I would say that the important thing is to have a client that knows what they want and i said that to the staff that a clear brief is fundamental and sometimes it is not about again to reproduce exactly the brief within the design...it is to have the chance to question things entering into a very constructive process with the client. without that which needs time and effort and energy I don’t think you produce a good result and that is what is probably what was very good about the BSF process for state school is the time allocated to design to define and design and enter in collaboration with the school at the
moment with the priority school program the time is very very short ... is what is replaced with that bsf is replaced with to a point where we don’t even participate anymore to this type of competition because they restrict they do too many constraints that are not ... constraints related to the site or how it works or time it is literally with the time that we can spend to design and the typologies were very very reduced because of cost you know where the money is allocated is very little So, again you need time but you need also the right resources in terms of money. you cannot build school buildings as they were like containers. they are complicated buildings full of So, many things on top of that nowadays we work to very high standards in terms of environment you know making sure that the building is efficient and everything in energy terms already they add a series of cost if you don’t allocate the right resources it is inevitable that you don’t build the school and that is exactly being right now my feeling we work a lot with private schools as well and the tendency is always like trying to spend as little as possible but if you want the good result you need to really put resources. School buildings are crucial because of the future of a nation and they also need to have a presence within their community in fact the beautiful thing about the fully comprehensive school system here is that they can become the centre of community the school you know they serve a local community and So, also these open school that the school should open up to the site to the local community become useful for other functions and these was one of the things we try to do with school C1 to be a hub for other activities in fact it was designed in a way it could segregate after the school hours you could close some elements of the school some spaces and then the school could become available for the local community the theatre is decorated out for small dance group or small theatre group is designed to be a self-contained theatre. the library and learning centre are accessible to the local community as well. So, the idea of a school that opens up to the local community is formulated and that is what we were doing So, it is a it is nice it is a fantastic typology that would benefit So, many people if it is built properly and that what the state should carry on doing hopefully the will.
13.2 Detailed Spatial Analyses of Eight Cases Studies (Expansion of Chapter 4)

In the main research body, the potentiality of the eleven schools (case studies) by the three architecture firms is presented in chapter 4. One main school from the projects of each firm (A1, B1 and C1) is described in detail, while the remaining schools are only discussed for their output potentiality. This section presents the detailed analysis of those schools which led to the conclusions concerning the spatial potentiality of each building. This includes detailed analysis of schools A2, A3, A4 by firm A; B2 and B3 by firm B; and C2, C3 and C4 by firm C.

13.2.1 School A2

13.2.1.1 Function Analysis

School A2 is the second building designed by firm A and is described according to the function allocation and design process decisions. A2 is located on a tight site as a compact urban block (figure 13.5). Hence, it has similar design criteria to A1 in terms of multi-levelling (six floors) and function allocation across a vertical organisation. For example, the design elevated the large double-height sports court on level 2 in order to allow for other functionalities to be distributed on level 1. These include administrative offices, services and more importantly the large elongated dining space which was prioritised to be situated parallel to the main corridor and overlooking the main outdoor space. Due to limited space, the school library was not situated on level 1 but moved to level 4 which is not the typical level allocation for school libraries (typically on level 1 or 2). Finally, the roof of the sports court is a large outdoor terrace on level 5, being an extension to play areas of level 1 (figure 13.6).
The allocation of learning spaces is explained through the formal vs informal categorisation of space. The design distributed formal learning spaces (classrooms and studios) across all levels, being mixed with informal functionalities. Yet, they highly concentrate on the upper levels 5 and 6 (figure 13.7). The design maintains consistent areas (and furniture type) for most of formal spaces, except for the peripheral studios of larger size. Formal learning spaces have the highest percentage of school area (36%) and the highest count of 71 spaces (figure 13.8). Contrarily, informal spaces have the lowest count (11 spaces), mainly represented through the play areas, dining hall and library. Their area percentage is uncommonly low (32%), compared to other schools. It is the result of having a small playground which is typically credited to boosting the area of informal spaces in schools. In general, A2 has a low percentage of outdoor spaces (29%), as seen in figure 13.6.

The small site of A2 yields further challenges for circulation design. It had to be designed efficiently, accounting for 19% of total area (figure 13.8). The design integrated a double-loaded, long and consistent-in-width spine to connect the whole school, with minimal branching (except on level 1). The lack of space prevented the implementation of a secondary parallel corridor, although the school spaces are highly compact and might require load distribution over two networks, similar to the case of A1. Furthermore, the high compactness of spaces along both sides of the corridor (resulting from the tight site) contribute to the lack of natural ventilation or sun light in the corridor, especially on the upper levels 4, 5 and 6. Accordingly, the design implements floor shafts in the corridor to allow for the flow of air and light which further reduces the net corridor width. In terms of vertical circulation, the design team distributes three staircases equally allocated along the spine at the centre and peripheries, one northern and two southern to the corridor.

Figure 13.5: A2 Categorisation of School Spaces (Areas and Counts)

13.2.1.2 Configuration Analysis
The design decisions have implications on the spatial configuration of A2, portrayed on the scale of complete floor levels. Partitioning and compartmenting of spaces in the lower two levels (1 and 2) are different from the rest of the levels. The design implemented nesting (layering) on the lower two levels, defined as sub-spaces being accessed through another space or a short corridor branch. It increases the segregation of the sub-spaces and the overall floor as seen on level 1 and 2 (figure 13.9). Contrarily, the design implemented a less-labyrinthic layout on the upper levels. It consists of the corridor spine, directly connected to most of the spaces, which increases the overall accessibility. Consequently, in school A2, segregation does not increase across levels from 1 to 3 (table 13.1) which is not the typical scenario. Even the increase from 4 to 6 is gradual, whereas the difference between the shallowest level 3 (VMD 5.51) and the deepest level 6 (VMD 6.86) is not as the previous multi-levelled school (A1).

Table 13.1: Visual Mean Depth (VMD) of the Whole Building and Each Level (School A2)

<table>
<thead>
<tr>
<th></th>
<th>Grid units Count</th>
<th>Mean VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole building</td>
<td>74222</td>
<td>5.98</td>
<td>4.03</td>
<td>9.08</td>
</tr>
<tr>
<td>Level 1</td>
<td>18954</td>
<td>5.97</td>
<td>4.32</td>
<td>8.66</td>
</tr>
<tr>
<td>Level 2</td>
<td>13842</td>
<td>5.71</td>
<td>4.03</td>
<td>7.88</td>
</tr>
<tr>
<td>Level 3</td>
<td>6899</td>
<td>5.51</td>
<td>4.03</td>
<td>6.99</td>
</tr>
<tr>
<td>Level 4</td>
<td>9976</td>
<td>5.72</td>
<td>4.03</td>
<td>7.02</td>
</tr>
<tr>
<td>Level 5</td>
<td>12904</td>
<td>6.03</td>
<td>4.26</td>
<td>7.79</td>
</tr>
<tr>
<td>Level 6</td>
<td>10030</td>
<td>6.86</td>
<td>4.80</td>
<td>9.08</td>
</tr>
</tbody>
</table>

Further design decisions impact the configuration of individual spaces, illustrated in the aggregated VGA of visual mean depth (figure 13.10). The choice of opening up the dining hall onto the main corridor on level 1 creates a highly accessible space, being the shallowest on level 1 (VMD 5.68). Contrarily, the closed sports court on level 2 is relatively segregated compared to other spaces on the same level, in spite of its large area. The design team had to sacrifice its ground location for other functionalities. Hence, they had to create a closed environment to avoid distractions on level 2 which has the main lecture hall. Finally, the
library space is centralised on level 4, close to the main staircase and directly connected to the corridor, thus, being the most accessible space on its level, following circulation spaces.

13.2.1.3 Configuration of Functions

Configurational properties are investigated for each spatial function (figure 13.11), proving a significant moderate variance in accessibility of different functions (P value <0.0001 and $R^2=0.37$). According to table 13.2, stairs, corridors and seminar rooms are the shallowest in the building (lowest average VMD). Dining spaces, social spaces and play areas are in the mid-range. Classrooms, terraces, studios are the deep spaces (highest average VMD). Yet, studios
have the highest standard deviation, indicating that the average is not very indicative of their true configuration. It is further proven since they have the highest range of values, suggesting their spread over shallow and deep spaces in the plan.

Table 13.2: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School A2

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>6.10</td>
<td>0.49</td>
<td>4.52</td>
<td>7.79</td>
<td>3.28</td>
</tr>
<tr>
<td>Corridor</td>
<td>5.42</td>
<td>0.54</td>
<td>4.34</td>
<td>7.09</td>
<td>2.75</td>
</tr>
<tr>
<td>Dining</td>
<td>5.68</td>
<td>0.09</td>
<td>5.54</td>
<td>5.88</td>
<td>0.34</td>
</tr>
<tr>
<td>Elevator</td>
<td>6.21</td>
<td>0.50</td>
<td>5.41</td>
<td>7.10</td>
<td>1.69</td>
</tr>
<tr>
<td>Hall</td>
<td>5.87</td>
<td>0.47</td>
<td>5.09</td>
<td>6.82</td>
<td>1.73</td>
</tr>
<tr>
<td>Kitchen</td>
<td>5.76</td>
<td>0.36</td>
<td>4.95</td>
<td>6.91</td>
<td>1.96</td>
</tr>
<tr>
<td>Learning service</td>
<td>6.39</td>
<td>0.61</td>
<td>5.17</td>
<td>8.05</td>
<td>2.88</td>
</tr>
<tr>
<td>Library</td>
<td>5.78</td>
<td>0.35</td>
<td>5.34</td>
<td>6.34</td>
<td>1.00</td>
</tr>
<tr>
<td>Office</td>
<td>6.48</td>
<td>0.68</td>
<td>5.01</td>
<td>8.10</td>
<td>3.09</td>
</tr>
<tr>
<td>Playground</td>
<td>5.77</td>
<td>0.36</td>
<td>4.91</td>
<td>6.42</td>
<td>1.51</td>
</tr>
<tr>
<td>Seminar</td>
<td>5.64</td>
<td>0.40</td>
<td>4.99</td>
<td>6.41</td>
<td>1.42</td>
</tr>
<tr>
<td>Service</td>
<td>6.45</td>
<td>0.68</td>
<td>4.96</td>
<td>9.05</td>
<td>4.08</td>
</tr>
<tr>
<td>Social space</td>
<td>5.71</td>
<td>0.36</td>
<td>5.01</td>
<td>6.00</td>
<td>0.98</td>
</tr>
<tr>
<td>Stairs</td>
<td>4.97</td>
<td>0.45</td>
<td>4.03</td>
<td>5.93</td>
<td>1.90</td>
</tr>
<tr>
<td>Studio</td>
<td>6.40</td>
<td>0.68</td>
<td>4.62</td>
<td>9.08</td>
<td>4.46</td>
</tr>
<tr>
<td>Terrace</td>
<td>6.33</td>
<td>0.60</td>
<td>5.60</td>
<td>8.07</td>
<td>2.47</td>
</tr>
<tr>
<td>Toilet</td>
<td>6.06</td>
<td>0.62</td>
<td>4.61</td>
<td>7.55</td>
<td>2.94</td>
</tr>
</tbody>
</table>

The accessibility of formal and informal spaces is illustrated in figure 13.12. Both categories have similar ranges in terms of their shallow-to-deep spectrum. The spectrum is more continuous for formal spaces, unlike the fragmented range of less informal spaces. Furthermore, there are shallower formal space than informal spaces which is a unique occasion where the opposite scenario is more common in all case studies (informal spaces are shallower). Finally, circulation spaces have the widest range which is highly shifted towards the shallow end of the spectrum.
Figure 13.9: A2; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces
13.2.2 School A3

13.2.2.1 Function Analysis

School A3 is the third building designed by firm A. It is a campus environment of five blocks, having two detached buildings and three attached buildings through a courtyard and a corridor loop. The other two buildings are detached. The team of architects followed a design strategy of clustering similar spatial functions together, for example, classrooms in the northern block, offices in the south eastern block and the dining space in the south western block across the courtyard from the seminar halls (figure 13.13). Spaces are distributed in a horizontal manner across the spacious site where each block is perceived to be equivalent to one level in the previous schools (A1 or A2).

The separation of functions yields separation of formalities into distinct buildings which defines the whole block as formal or informal. For example, the northern block is formal teaching spaces, the south eastern block is formal offices, and the south western block is the informal dining space (figure 13.15). The intermediate outdoor spaces (figure 13.14) between blocks form 44.8% of the total area are recognised as informal common spaces. Still, it is
expected that they also function as circulation routes, since the design did not define clear pathways to link the buildings, neither across the east-to-west blocks or from northern-to-southern block. The defined circulation spaces account for 16% of the total area (figure 13.16) which is low compared to the large site, implying high dependency on the intermediate spaces. Finally, the school has a high number of services (58) (figure 13.16), resulting from block division, where each block has to include its own services.

13.2.2.2 Configuration Analysis

<table>
<thead>
<tr>
<th>Category</th>
<th>% of Total area vs. Category</th>
<th>Count of Spaces/ Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circulation</td>
<td>5.3%</td>
<td>16</td>
</tr>
<tr>
<td>Formal</td>
<td>5.6%</td>
<td>9</td>
</tr>
<tr>
<td>Informal</td>
<td>15.7%</td>
<td>19</td>
</tr>
<tr>
<td>Offices</td>
<td>8.3%</td>
<td>16</td>
</tr>
<tr>
<td>Service</td>
<td>65.1%</td>
<td>58</td>
</tr>
</tbody>
</table>

*Figure 13.13: A3 Categorisation of School Spaces (Areas and Counts)*

<table>
<thead>
<tr>
<th>Grid units Count</th>
<th>Mean VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole building (level 1)</td>
<td>133439</td>
<td>3.05</td>
<td>2.19</td>
</tr>
</tbody>
</table>

*Figure 13.14: VGA for the Visual Mean Depth, School A3*

*Table 13.3: Visual Mean Depth (VMD) of the Whole Building (School A3)*
The spatial configuration of A3 is influenced by the design decision of horizontally distributing school spaces in a campus environment which yielded a highly accessible school. The school average visual mean depth (3.05) is the lowest among all case studies (table 13.3). The site has a highly accessible centre, formed of the western and eastern play areas and the southern courtyard (figure 13.17). The accessibility decreases away from the centre towards the interior spaces of each block, for example, the northern formal classrooms, the south western dining and other hall or the western hall. This is repeated on a smaller scale, whereas the south eastern block has an accessible local centre (smaller courtyard) around which the management spaces are organised (less accessible).

The porosity of the whole site is the primary contributor to its accessibility. Nevertheless, there is a hierarchy of how porous the spaces are which renders a hierarchy in the accessibility. Most of the main spaces, for instance, the main corridor of each block, the dining space and other halls have multiple access points (at least two) that directly connect to the most accessible centre, either the play areas or the courtyard. Thus, there is an accessibility hierarchy of three levels, clearly visible on the aggregated VGA of visual mean depth (figure 13.18). It begins from the shallowest centre (e.g. the courtyard VGA 2.61), proceeding to the moderately accessible main space (e.g. the dining area VGA 3.00), towards the relatively less accessible smaller spaces (e.g. dining services 3.60). This is also portrayed in the gradient from the playground (VMD 2.52), towards the main corridor serving the classrooms (VMD 3.17) and reaching any classroom (e.g. VMD 3.82).

13.2.2.3 Configuration of Functions
Studying the configurational properties of spatial functions (figure 13.19) shows a significant strong variance in accessibility of different functions (P value <0.0001 and $R^2=0.72$). The playground, halls, dining spaces and corridor have the lowest average visual mean depth. Social spaces and staircases are in the mid-range, while classrooms and offices are relatively deeper in the plan (table 13.4). The strong variance ($R^2=0.72$) links back to the clustering of spaces of same function in one block. It also links to the hierarchy of accessibility where clusters of spaces (e.g. classrooms) are functionally differentiated from their circulation and from the main centre. This is also proven through studying the standard deviation of visual mean depth for main functions that distribute among multiple spaces (table 13.4). While the standard deviation of the dining (0.13) is expected to be very low because it is a single space, other functions of multiple spaces also have low standard deviation, reflecting low diversity in their accessibility value. The average accessibility is a true indication of the accessibility for all spaces of that function. This applies to the classrooms (std dev =0.30) and school halls (std dev = 0.24), in contrast to other secondary functions, such as the services and toilets which spread across different blocks, yielding higher standard deviation (0.80 and 0.71).

Table 13.4: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School A3

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>4.01</td>
<td>0.30</td>
<td>3.10</td>
<td>4.95</td>
<td>1.85</td>
</tr>
<tr>
<td>Corridor</td>
<td>3.14</td>
<td>0.47</td>
<td>2.34</td>
<td>5.45</td>
<td>3.11</td>
</tr>
<tr>
<td>Dining</td>
<td>3.00</td>
<td>0.13</td>
<td>2.62</td>
<td>3.32</td>
<td>0.70</td>
</tr>
<tr>
<td>Elevator</td>
<td>3.70</td>
<td>0.30</td>
<td>3.25</td>
<td>4.59</td>
<td>1.34</td>
</tr>
<tr>
<td>Hall</td>
<td>2.99</td>
<td>0.24</td>
<td>2.27</td>
<td>4.88</td>
<td>2.61</td>
</tr>
<tr>
<td>Learning service</td>
<td>4.48</td>
<td>0.42</td>
<td>3.83</td>
<td>5.18</td>
<td>1.35</td>
</tr>
<tr>
<td>Office</td>
<td>4.04</td>
<td>0.50</td>
<td>3.06</td>
<td>5.92</td>
<td>2.86</td>
</tr>
<tr>
<td>Playground</td>
<td>2.54</td>
<td>0.22</td>
<td>2.19</td>
<td>3.71</td>
<td>1.52</td>
</tr>
<tr>
<td>Seminar</td>
<td>3.81</td>
<td>0.38</td>
<td>3.39</td>
<td>4.59</td>
<td>1.20</td>
</tr>
<tr>
<td>Service</td>
<td>3.98</td>
<td>0.80</td>
<td>2.36</td>
<td>6.45</td>
<td>4.09</td>
</tr>
<tr>
<td>Social space</td>
<td>3.48</td>
<td>0.33</td>
<td>2.72</td>
<td>4.94</td>
<td>2.23</td>
</tr>
</tbody>
</table>
The accessibility of formal and informal spaces is studied through figure 13.20. Informal spaces are very accessible, being always the centre of the plan or the porous spaces to which smaller formal spaces connect. While the school has a horizontal layout which arguably can support even accessibility especially with no allocation of formal spaces on segregated upper floors, still, the formal spaces are shifted towards the deeper end of the spectrum. Both categories, formal and informal spaces have almost equal ranges, but there is no overlap in the accessibility ranges, except for one informal space in deep configuration. As for circulation spaces, they are considered in the mid-range with the widest variation of accessibility.

![Figure 13.17: A3; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces](image-url)
13.2.3 School A4

13.2.3.1 Function Analysis

School A4 is the fourth and last building from the projects of firm A. The school is part of a multi-grade campus environment, defining a spatial complex where different school stage (primary: year 1-6 and secondary: year 7-11) and other building typologies share the same land plot (Kliment, 2001). For A4, the secondary school is represented through two blocks (figure 13.21), unlike the previous school A3 whose whole campus only included secondary school buildings. The northern block of A4 is the main building (I), comprising three levels, while the smaller block (II) has one level.

A4 buildings are studied through their function allocation which signifies intended insulation of different functions (figure 13.22). The ground level of the main building (I) includes admin and staff offices, in addition to a large lecture hall and a smaller seminar room. Level 2 combines offices and classrooms. While those levels (1 and 2) have mixed allocation of different functions, the design ensured that each function is clustered in its own zone. Functions are separated north and south to the circulation corridors and across the large stepped social space (on level 1) which becomes a large atrium on level 2, providing more separation of functions (classrooms vs offices). Moreover, each zone has its own staircase. This organisation changes on Level 3 which is mainly dominated by classrooms.
The insulation of functionalities is further illustrated through the spatial categorisation of formal and informal spaces (figure 13.24). Not only do functions have their own clusters, but insulation is defined on the scale of the whole floor. The whole ground level is composed of informal spaces (except for few separated offices), mainly the social space and one hall in one block and the dining space and its services (kitchen and toilets) in the second block, beside the outdoor play areas (figure 13.23). They aggregate 57% of the total area (figure 13.25). Formality is switched on the upper levels, comprising formal spaces on level 2. The same formality continues on level 3, aggregating a total area of 18%. Formal spaces are also the highest count in the school (29) apart from services.

Insulation is not only applied to functionalities, but also to separation of indoor and outdoor spaces. Unlike previous schools (by firm A) whose designs blended the indoor and outdoor spaces, school A4 is the opposite scenario. The outdoor playground areas are clearly defined and separated from the buildings (figure 13.23), unlike the design of A1 which had overlapping indoor and outdoor spaces or A3 which included courtyards. Even the double-height social space of A4 has a roof cover, and there are no terraces on the upper floors, unlike A1 or A2. Consequently, A4 is uniquely characterised by its large indoor area, composing 53% of the total area which is the highest of all case studies. Yet, there are two pitches adjacent to the site which are used by the school (outside the focus of this case study).

13.2.3.2 Configuration Analysis
The spatial configuration of A4 is primarily influenced by the design of horizontal circulation routes which yield patterns of accessible or segregated spaces relative to open vs defined pathways (figure 13.26). Firstly, the smaller single-levelled building does not have defined corridors, except at the service area. The spaces are open, only defined by furniture (and a ramp), thus, producing an equally shallow dining platform and slightly less accessible services and toilets. The same porous, highly accessible layout exists in the southern side of the main building on the ground level. Contrarily, the northern side of the same building is more segregated with defined partitioning that separates the block into an insulated compartment and sub-divides it into two main spaces with a clear double-loaded corridor. As for the upper floors, the corridor spaces are clearly defined through the boundaries of the spaces accessed from the circulation (mostly classrooms) which leads to less accessibility.

Table 13.5: Visual Mean Depth (VMD) of the Whole Building and Each Level (School A4)

<table>
<thead>
<tr>
<th>Whole building</th>
<th>Grid units Count</th>
<th>Mean VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>58086</td>
<td>3.73</td>
<td>2.54</td>
<td>7.24</td>
<td></td>
</tr>
<tr>
<td>Level 1</td>
<td>38921</td>
<td>3.23</td>
<td>2.54</td>
<td>6.69</td>
</tr>
<tr>
<td>Level 2</td>
<td>9328</td>
<td>4.05</td>
<td>2.54</td>
<td>6.18</td>
</tr>
<tr>
<td>Level 3</td>
<td>9837</td>
<td>5.45</td>
<td>3.09</td>
<td>7.24</td>
</tr>
</tbody>
</table>

The design of vertical cores also impacts the accessibility of the upper levels. The overall decrease in accessibility from level 1 (VMD 3.23) to level 2 (VMD 4.04) is not as steep as from level 2 to 3 (VMD 5.45) as seen in table 13.5. It is due to the stepped social space allocated as a shallow, central space for student gatherings which connects level 1 to 2 but not 3. Furthermore, the staircase allocation contributes to distinct accessibility patterns, spread across transverse building segments (north, central and south) on the upper levels, as coloured in the aggregated VGA (figure 13.27). On level 2, the inequality in accessibility between the central and southern segments, compared to the northern segment is credited to the central staircase (adjacent to the stepped social space) and the two staircases in the south eastern and western ends. They maintain high accessibility for the central and southern segments, unlike the relatively segregated northern segment, only served through one vertical core. The same inequality in accessibility exist on level 3 but more distinct between
the highly segregated north segment and the relatively accessible south segment, while the centre is missing as an atrium.

Figure 13.24: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School A4

13.2.3.3 Configuration of Functions

School A4 portrays distinct configurational properties of spatial functions (figure 13.28). There is a significant strong variance in accessibility of different functions (P value < 0.0001 and R² = 0.71). This result aligns with the earlier functional allocation which indicated that the design highly insulates spaces of same function is separate clusters. The formed clusters have different configurational properties, following the visual mean depth analysis that revealed pattern of variation in accessibility on the ground floor, relative to the horizontal circulation or across floors and across segments of the upper levels, relative to the vertical core.

Figure 13.25: Correlation of Visual Mean Depth Against Spatial Function (School A4)
allocation. In general, the playground, social and dining spaces have the lowest mean for visual mean depth. Corridors, staircases, seminar rooms and halls are in the mid-range. Classrooms and studios are the deepest spaces (table 13.6).

Table 13.6: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School A4

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>5.25</td>
<td>0.8</td>
<td>3.48</td>
<td>7.18</td>
<td>3.70</td>
</tr>
<tr>
<td>Corridor</td>
<td>4</td>
<td>0.81</td>
<td>2.74</td>
<td>6.25</td>
<td>3.51</td>
</tr>
<tr>
<td>Dining</td>
<td>3.54</td>
<td>0.25</td>
<td>3.17</td>
<td>4.34</td>
<td>1.17</td>
</tr>
<tr>
<td>Elevator</td>
<td>4.19</td>
<td>1.14</td>
<td>3.01</td>
<td>6.63</td>
<td>3.62</td>
</tr>
<tr>
<td>Hall</td>
<td>4.64</td>
<td>0.29</td>
<td>3.47</td>
<td>4.95</td>
<td>1.48</td>
</tr>
<tr>
<td>Kitchen</td>
<td>3.58</td>
<td>0.37</td>
<td>3.05</td>
<td>4.38</td>
<td>1.33</td>
</tr>
<tr>
<td>Learning service</td>
<td>5.06</td>
<td>0.14</td>
<td>4.47</td>
<td>5.11</td>
<td>0.64</td>
</tr>
<tr>
<td>Office</td>
<td>4.55</td>
<td>1.03</td>
<td>3.08</td>
<td>6.69</td>
<td>3.61</td>
</tr>
<tr>
<td>Playground</td>
<td>2.98</td>
<td>0.22</td>
<td>2.55</td>
<td>3.83</td>
<td>1.28</td>
</tr>
<tr>
<td>Seminar</td>
<td>4.56</td>
<td>0.64</td>
<td>3.32</td>
<td>5.69</td>
<td>2.38</td>
</tr>
<tr>
<td>Service</td>
<td>5.18</td>
<td>0.95</td>
<td>3.34</td>
<td>7.24</td>
<td>3.91</td>
</tr>
<tr>
<td>Social space</td>
<td>3</td>
<td>0.1</td>
<td>2.88</td>
<td>3.77</td>
<td>0.89</td>
</tr>
<tr>
<td>Stairs</td>
<td>4.19</td>
<td>0.82</td>
<td>2.54</td>
<td>5.55</td>
<td>3.01</td>
</tr>
<tr>
<td>Studio</td>
<td>5.27</td>
<td>0.84</td>
<td>3.37</td>
<td>6.91</td>
<td>3.55</td>
</tr>
<tr>
<td>Toilet</td>
<td>5.18</td>
<td>0.98</td>
<td>3.56</td>
<td>7.22</td>
<td>3.66</td>
</tr>
</tbody>
</table>

The accessibility of formal and informal spaces is studied through figure 13.29. Whilst the range of accessibility for one spatial category might be discontinued (e.g. no informal spaces from VMD 4.5-5.0), the missing range is usually covered in another category (e.g. formal spaces VMD 4.5-8.0). A4 has unique configuration since it has no spaces in the range of 4.0 to 4.75 visual mean depth. This syntactic characteristic links back to the impact of highly insulated functional categorisation as well as the design of circulation that provides uneven accessibility patterns. It is also unique because the missing range is not along the very shallow or very deep ends of the spectrum, but it is in the mid-range. In general, informal spaces in A4 are very accessible. The same applies to circulation spaces, but they have a wider range from highly accessible to deeper spaces in the plans. Formal spaces are shifted more towards the deeper end of the spectrum.
Figure 13.26: A4; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces
13.2.4 School B2

13.2.4.1 Function Analysis

B2 is the second school designed by firm B. It was designed at the same time as the previous school B1, hence, having multiple similarities in terms of functional allocation. Similar to B1, the ground level of B2 has an open dining space and big closed halls. Still, B2 is different from B1’s where the design integrated more double-height spaces as central piazzas or social spaces (figure 13.30). The second design similarity is B2’s upper floors which are mostly closed formal spaces (figure 13.32) of classrooms and studios. Yet, the difference in B2 is that classrooms (level 2) are separated from studios (level 3), unlike B1 whose formal spaces mix together. Furthermore, B2 library space is allocated on level 2 in a centralised space along the intersection of main corridors, exactly following the criteria of B1. Finally, B2 has a high number of staircases (7) which is also the case for B1 (6 staircases).

The categorisation of formal vs informal spaces reveals certain new design features, not present in B1. For example, the design integrated more informal spaces (than just the library) on the upper floors, portrayed through one social space on level 2 and two large terraces on level 3. This provides some outdoor spaces (figure 13.31) within the highly compact upper floors which was not considered in B1. However, this allocation reduced the total area of formal spaces from 28% in B1 to 23% in B2 (figure 13.33). Still, B2 has a higher count of formal learning spaces (79) than B1 (59). Furthermore, the informal play areas in B2 have more personalisation into zones which, unlike B1’s rectangular playground block. In general, the informal spaces in B2 (54%) have higher percentage than B1 (42%), due to the larger playground, more open piazzas on level 1 and terraces on level 3.
13.2.4.2 Configuration Analysis

The spatial configuration of school B2 is primarily shaped through certain design decisions concerned with the degree of porosity and circulation design, resulting from the school typology as ‘centralised resources with double-loaded classroom clusters (Kliment, 2001). Whilst not following the typical single-levelled layout, B2’s allocation is three-dimensional where learning spaces are clustered on the upper levels, and resources concentrate on the ground level. This allowed the team of architects to create a highly porous ground level where all the spaces are blended, and the corridors are not defined. The configuration yields a highly accessible ground level (figure 13.34). Contrarily, clustering the classrooms (or studios) in a cellular, linear arrangement with defined double-loaded corridors results in higher segregation for the upper floors, as seen in the rise of visual mean depth (table 13.7) from level 1 (3.50) to level 2 (4.91) and level 3 (5.88). Still, the square-shaped closed loop of circulation on level 2 maintains an evenly accessible environment (except one cluster of spaces), unlike the discontinued loop on level 3.

Table 13.7: Visual Mean Depth (VMD) of the Whole Building and Each Level (School B2)

<table>
<thead>
<tr>
<th></th>
<th>Grid units Count</th>
<th>Mean VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole building</td>
<td>126045</td>
<td>4.12</td>
<td>2.83</td>
<td>7.92</td>
</tr>
<tr>
<td>Level 1</td>
<td>83607</td>
<td>3.50</td>
<td>2.83</td>
<td>6.66</td>
</tr>
<tr>
<td>Level 2</td>
<td>23866</td>
<td>4.91</td>
<td>2.83</td>
<td>7.92</td>
</tr>
</tbody>
</table>
The study of visual mean depth through the aggregated VGA (figure 13.35) illustrates the main spaces of the school, being allocated within the most accessible locations in their respective level, thus, reflecting the team of architects’ configurational awareness and their intention to highlight those space. For instance, the main piazzas as social gathering spaces and the dining space are the shallowest locations on level 1. The same applies to the school library on level 2. Finally, the aggregated VGA of the vertical cores reflect the variation in accessibilities of different staircases, such that deeper staircases (on the ground floor) render more segregation for their surrounding spaces on the upper levels.

![Figure 13.32: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School B2](image)

13.2.4.3 Configuration of Functions

![Figure 13.33: Correlation of Visual Mean Depth Against Spatial Function (School B2)](image)
The study of configurational properties for spatial functions in school B2 (figure 13.36) portrays a significant strong variance in accessibility of different functions (P value <0.0001 and $R^2=0.67$). The strong variance is higher than the previous school B1 ($R^2=0.57$), although both schools have similar design strategies and function allocation. This links to the configurational characteristics of B2 having more variation of accessibility between level 1, 2 and 3 while each level has significantly distinguished functionalities. For instance, the dining space, playground and social spaces which are all on level 1 have the lowest average for visual mean depth, and the library (on level 2) is within the mid-range (table 13.8). Even formal spaces do not mix, distributing classrooms on level 2 and studios on level 3, thus, yielding differences in their average visual mean depth (classrooms=5.12 and studios=5.40), in contrast to school B1 which has distinguished configurational characteristics for its wings (departments) of mixed functions.

Table 13.8: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School B2

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>5.12</td>
<td>0.56</td>
<td>3.59</td>
<td>6.40</td>
<td>2.81</td>
</tr>
<tr>
<td>Corridor</td>
<td>4.13</td>
<td>0.85</td>
<td>2.84</td>
<td>6.40</td>
<td>3.56</td>
</tr>
<tr>
<td>Dining</td>
<td>3.28</td>
<td>0.13</td>
<td>3.02</td>
<td>4.08</td>
<td>1.05</td>
</tr>
<tr>
<td>Elevator</td>
<td>4.65</td>
<td>0.38</td>
<td>3.72</td>
<td>5.20</td>
<td>1.48</td>
</tr>
<tr>
<td>Hall</td>
<td>3.58</td>
<td>0.41</td>
<td>2.87</td>
<td>4.19</td>
<td>1.32</td>
</tr>
<tr>
<td>Kitchen</td>
<td>3.47</td>
<td>0.11</td>
<td>3.21</td>
<td>4.10</td>
<td>0.89</td>
</tr>
<tr>
<td>Learning service</td>
<td>5.18</td>
<td>1.32</td>
<td>3.09</td>
<td>7.92</td>
<td>4.83</td>
</tr>
<tr>
<td>Library</td>
<td>3.75</td>
<td>0.24</td>
<td>3.27</td>
<td>4.19</td>
<td>0.91</td>
</tr>
<tr>
<td>Office</td>
<td>5.20</td>
<td>0.94</td>
<td>3.03</td>
<td>7.42</td>
<td>4.39</td>
</tr>
<tr>
<td>Playground</td>
<td>3.30</td>
<td>0.25</td>
<td>2.89</td>
<td>4.16</td>
<td>1.27</td>
</tr>
<tr>
<td>Seminar</td>
<td>6.02</td>
<td>0.91</td>
<td>3.71</td>
<td>7.19</td>
<td>3.48</td>
</tr>
<tr>
<td>Service</td>
<td>4.54</td>
<td>0.78</td>
<td>3.31</td>
<td>7.42</td>
<td>4.11</td>
</tr>
<tr>
<td>Social space</td>
<td>3.32</td>
<td>0.67</td>
<td>2.84</td>
<td>5.43</td>
<td>2.59</td>
</tr>
<tr>
<td>Stairs</td>
<td>4.35</td>
<td>0.78</td>
<td>2.83</td>
<td>6.55</td>
<td>3.72</td>
</tr>
<tr>
<td>Studio</td>
<td>5.40</td>
<td>0.96</td>
<td>2.91</td>
<td>6.99</td>
<td>4.07</td>
</tr>
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<td>Terrace</td>
<td>5.55</td>
<td>0.25</td>
<td>4.42</td>
<td>6.21</td>
<td>1.79</td>
</tr>
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<td>Toilet</td>
<td>5.06</td>
<td>0.96</td>
<td>3.46</td>
<td>7.19</td>
<td>3.73</td>
</tr>
</tbody>
</table>

The accessibility of formal and informal spaces is studied through figure 13.37. Formal spaces have the widest range, courtesy of their distribution over three levels where the relatively shallower classrooms (level 1 and 2) are distinguished from the deeper studios on level 3. Furthermore, the continuity of the range brings in the earlier discussion of multiple staircases of different accessibilities which create variations in accessibility of the spaces (mostly formal) being configured around each staircase. As for informal spaces, they are mostly clustered towards the shallower end of the spectrum, except for a second cluster of three deeper spaces – two terraces on level 3 and a social space on level 2. Finally, circulation spaces maintain their relatively accessible configuration even on the upper levels, that is why their range is not stretched as formal spaces.
Figure 13.34: B2; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces
13.2.5 School B3

13.2.5.1 Function Analysis

B2 is a three-level school designed by firm B, and it has the largest footprint of all case studies. Corresponding to its massive size, B2 is an organisation of multiple arms (spider-like layout). Three arms are described as ‘courtyard with classroom clustering’ (kliment, 2001), where each arm is an insulated cluster. It has its own small courtyard and its surrounding teacher office, services, beside the classrooms or studios (figure 13.38). The same functionalities repeat across levels while the courtyard changes into an atrium. The fourth eastern arm has ‘centralised resources (kliment, 2001) in terms of big double-height halls, beside its studios and other services. The fifth arm (north eastern) changes functions across levels. It accommodates the school library and admin offices on level 1, changing into classrooms and studios on the upper levels. All the arms connect to a large central courtyard and its adjacent dining space, being also part of the centralised resources. Both spaces have a skylight roofing, rendering very limited outdoor spaces within the building boundary (except three small terraces on level 2 and 3). The main outdoor spaces are the sports courts and the pockets between arms (figure 13.39).

Whilst each arm (cluster) hosts multiple functions, the school design indicates isolation of formalities. Four out of five arms are dominated by formal spaces over their span of three levels (figure 13.40), which account for 23% of total area and signify a high count of spaces (122) as seen in figure 13.41. As for the informal spaces, they are never mixed among the adjacent spaces one cluster but represented as the in-between spaces. This refers to the local courtyard between spaces within the same cluster, the large courtyard between all five arms (which also comprises the dining space) or the big outdoor pockets between individual arms. There are also two small terraces on level 2 and 3, still being allocated between clusters (figure 13.39). The only exception of integrating informal spaces within a cluster is the library space on level 1. Yet, its adjacent spaces are offices, So, it does not blend with formal teaching spaces. The total area of informal spaces is 55.4% mostly composed of the outdoor spaces.
they have a low count (22) compared formal spaces (122) (figure 13.41). Finally, the school organisation in the form of separate clusters yield a high number of circulation spaces (43 spaces either corridors or staircases) and a high number of services (98), since each cluster has its own services, beside the ones serving the whole school.

![Figure 13.38: B3 Categorisation of School Spaces (Areas and Counts)](image)

### 13.2.5.2 Configuration Analysis

The design decisions to design the school as a spider-like structure and separate the clusters (each arm) are the primary factors shaping the spatial configuration of the school and accordingly the patterns of accessibility (figure 13.42). This is highlighted on the scale of a single cluster (e.g. north eastern cluster). It switches from a highly accessible cluster on the ground level to become a highly segregated cluster on level 3. The range is the widest among all school designed by firm B and among all schools that have separation of clusters (either as arms or wings). In general, there is a steep decrease of accessibility across levels portrayed in the rise of the visual mean depth (table 13.9), from level 1 (3.99) to level 2 (5.25) and a steeper increase towards level 3 (6.66).

![Figure 13.39: VGA for the Visual Mean Depth, School B3](image)

### Table 13.9: Visual Mean Depth (VMD) of the Whole Building and Each Level (School B3)

<table>
<thead>
<tr>
<th></th>
<th>Grid units Count</th>
<th>Mean VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole building</td>
<td>309888</td>
<td>4.55</td>
<td>2.98</td>
<td>9.06</td>
</tr>
<tr>
<td>Level 1</td>
<td>219321</td>
<td>3.99</td>
<td>2.98</td>
<td>7.59</td>
</tr>
<tr>
<td>Level 2</td>
<td>52586</td>
<td>5.35</td>
<td>3.37</td>
<td>7.67</td>
</tr>
<tr>
<td>Level 3</td>
<td>37981</td>
<td>6.66</td>
<td>4.65</td>
<td>9.06</td>
</tr>
</tbody>
</table>
The study of visual mean depth through the aggregated VGA (figure 13.43) clearly illustrates the hierarchy in accessibility of the building on the holistic scale and the local scale of the cluster. On the holistic scale, the top hierarchy in accessibility is the central courtyard space connecting all the school armed clusters (VMD 3.43), followed by the playground (VMD 3.65), the in-between outdoor pockets (3.81), the common dining space (3.83), before reaching the local accessibility of each arm of clustered spaces. On the local scale within the cluster, there is another hierarchy where the local courtyard centre is the most accessible, followed by the surrounding spaces (mostly classrooms), and the accessibility further decreases for the spaces at the far end of the cluster away from the local courtyard or the larger connecting zone.

Although the local hierarchy of accessibility (within a cluster) applies to all clusters, the aggregated VGA (figure 13.43) reveals that different clusters on the same level exhibit different accessibilities which is a direct impact of vertical circulation design. In other words, accessibility decreases across levels, but the decrease is not even among arms on the same level, relative to the staircase allocation inside each arm. For instance, all clusters are deep on level 3, but the degree of segregation of the north eastern and south arms is relatively high, compared to the north western and western arms. Each cluster has one staircase, however, the differences in the configuration of the vertical core, its relation to the surrounding spaces and relation to spaces from the lower level, either amplify or reduce segregation of the spaces and hence the average of the whole cluster. The same phenomenon of variation in accessibility of different clusters (that functionally look identical within the same level) is a repeated observation in all schools studied from firm B projects, either B1 (differences between wings on level 3) or B2 (differences between linear clusters on level 2).

![Figure 13.40: Visual Mean Depth of Individual Spaces in School B3](image)

13.2.5.3 Configuration of Functions
Figure 13.41: Correlation of Visual Mean Depth Against Spatial Function (School B3)

Configurational analysis for spatial functions (figure 13.44) portrays a significant strong variance in accessibility of different functions (P value <0.0001 and $R^2=0.70$) which is the highest in all the studied schools by firm B. The playground, social spaces and the dining area are always highly accessible in the plan (lowest visual mean depth). The library, corridors, stairs and offices are in the mid-range, while terraces, classrooms and studios are the deepest areas (table 13.10). The strong variance is resulting from specific spatial properties of B3. Firstly, there is standardisation in the functional components of each cluster, and more importantly, each cluster has the same accessibility hierarchy from the shallowest local centre (small courtyard) to the segregated classroom at the far end of the cluster. Additionally, this hierarchy is repeated across 13 clusters, accentuating configurational differences of functions. Furthermore, the variance is high, corresponding to high variation of accessibility of different levels while accessible functionalities of the lower level and do not repeated on the upper deeper levels. For example, halls (VMD 4.07) and social courtyards (VMD 3.71) are very accessible (table 13.10), both being allocated on level 1, while terraces are contrarily highly segregated (VMD 6.67), being situated on level 3.

Table 13.10: Configurational Properties for Each Spatial Function in School B3

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>6.00</td>
<td>0.80</td>
<td>3.84</td>
<td>8.04</td>
<td>4.20</td>
</tr>
<tr>
<td>Corridor</td>
<td>4.80</td>
<td>0.87</td>
<td>3.01</td>
<td>7.31</td>
<td>4.30</td>
</tr>
<tr>
<td>Dining</td>
<td>3.83</td>
<td>0.25</td>
<td>3.49</td>
<td>4.44</td>
<td>0.96</td>
</tr>
<tr>
<td>Elevator</td>
<td>5.18</td>
<td>0.93</td>
<td>3.65</td>
<td>8.31</td>
<td>4.67</td>
</tr>
<tr>
<td>Hall</td>
<td>4.07</td>
<td>0.20</td>
<td>3.23</td>
<td>4.37</td>
<td>1.13</td>
</tr>
<tr>
<td>Kitchen</td>
<td>4.29</td>
<td>0.35</td>
<td>3.31</td>
<td>5.04</td>
<td>1.73</td>
</tr>
<tr>
<td>Learning service</td>
<td>6.12</td>
<td>0.58</td>
<td>5.02</td>
<td>7.43</td>
<td>2.41</td>
</tr>
<tr>
<td>Library</td>
<td>4.54</td>
<td>0.05</td>
<td>4.30</td>
<td>5.29</td>
<td>0.99</td>
</tr>
<tr>
<td>Office</td>
<td>5.45</td>
<td>0.75</td>
<td>3.67</td>
<td>7.74</td>
<td>4.07</td>
</tr>
<tr>
<td>Playground</td>
<td>3.68</td>
<td>0.32</td>
<td>2.98</td>
<td>4.61</td>
<td>1.63</td>
</tr>
</tbody>
</table>
The accessibility of formal and informal spaces is studied through figure 13.45. Informal spaces have the widest range which is not an accurate representation of their true nature. While most informal spaces cluster in the shallow end of the spectrum, there are three terraces that stretch the range to the deep end, being highly segregated on level 2 and 3. Excluding the those outliers from informal spaces, formal spaces are considered the deepest and concentrate in the mid-range and deep end of the spectrum. They have only 7 spaces (out of 122) within the shallow end of the spectrum. Finally, circulation spaces maintain their allocation along the shallow end of the spectrum and mid-range, since they are highly accessible when allocated on level 1 and are relatively accessible within every upper level in respect to other spaces of the level.

![Figure 13.42: B3; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces](image-url)
13.2.6 School C2

13.2.6.1 Function Analysis

C2 is another campus environment (similar to A3) where all the buildings belong to the secondary school. There are four blocks distributed around a central courtyard. On the ground level, two of the four blocks (eastern and southern) are connected through a defined corridor and a linear arrangement of office space. Yet, the design does not define further corridors between the blocks. Accordingly, circulation is dependent on the courtyard. On level 2, the four blocks are completely disconnected. Only the southern block continues to level 3. The play spaces (mainly sport courts) are all clustered towards the northern end of the site. They are the main outdoor area onsite (figure 13.46), beside the courtyard between blocks and 3 small upper levels terraces.

The allocation of functionalities varies between the blocks and according to the floor level (figure 13.48). On the ground level, the design mixed different functionalities within the same block. For example, the western block has the library, a lecture hall, one dining space and a studio. The same mixture was repeated in the southern block, while replacing the library with offices and more studios. As for the northern and eastern blocks, each has studios and halls, in addition to seminar rooms only in the northern block. Contrarily, on level 2, the design did not maintain the same pattern of mixing functions, where each cluster has single functionalities beside the circulation and services. For instance, the southern block is dominated by studios, except one small terrace, and the western and northern blocks are all seminar rooms, except for one office in the western block and a studio space in the northern block. On level 3, the design resumed to mix functionalities through allocation of seminar rooms, studios, offices and terraces in the southern block.

The study of formal and informal spaces in school C2 reveals certain design decisions that are repeated across the blocks. Considering the whole site on the ground level, the design
allocated informal spaces of each block (four halls, one of the two dining spaces and the library) on the outer side of the circulation corridor, towards the courtyard centre, while at the same time, the formal spaces were pushed backward to the opposite side of the corridor, away from the courtyard (figure 13.47). Hence, the team of architects created a hierarchy of formality from the very public (communal) central courtyard, towards the semi-public informal spaces (e.g. one hall in one block), reaching the private formal spaces (e.g. seminar rooms). This strategy is not maintained on the upper levels, being mainly dominated by the formal spaces. Although the earlier discussion showed the mixing functionalities on level 2 or 3 in some blocks, there is no mixing of formalities. All the functionalities (seminar rooms, studios or offices) have the same formal categorisation.

Formal spaces form 21% of the total school area and have a very high count (76 space), being spread among all levels in every block (figure 13.49). Informal spaces have the lowest count (15 spaces), yet the highest area (57%), courtesy of the large playground and courtyard space. The disconnection between blocks, especially on the upper floors render the necessity of multiple services for each block, yielding a high number of services (89 spaces). Circulation spaces are 14% of total area, without accounting for the undefined pathways expected to spread in the courtyard to connect the blocks.

![Figure 13.46: C2 Categorisation of School Spaces (Areas and Counts)](image)

### 13.2.6.2 Configuration Analysis
There accessibility of the school (figure 13.50) corresponds to the design decision of creating a hierarchy of formalities. Firstly, on the ground level, the courtyard as the most public centre is the most accessible space in the school. Secondly, informal spaces allocated towards the outer side of each block are perceived as semi-public spaces (e.g. halls) which are the following layer of accessible spaces, not as shallow as the centre. Finally, there are the less accessible formal spaces deep into each block (e.g. studios). All the blocks have similar accessibilities, except the eastern block which has few segregated spaces even deeper than the upper level spaces. As for the upper floors, accessibility decreases across levels from level 1 (VMD 3.09) towards level 2 (VMD 4.72) and reaching the most segregated level 3 (VMD 5.84) as seen in table 13.11. This is a common configurational pattern in most of the schools.

The aggregated VGA of the visual mean depth (figure 13.51) indicates similarities in accessibilities of different blocks within the same level. It is shown on level 1 where all blocks have the same accessibility range except for the eastern block with few deeper spaces. The similarities are also clearly illustrated on level 2 where the circulation corridor in every block is the shallowest, and there is monotony in accessibility of the surrounding spaces. The same applies to level 3. This brings in the role of the vertical core in each block, being the primary contributor to setting the lowest visual mean depth in the level (threshold of accessibility).
The study of the configurational properties of functionalities through the visual mean depth (figure 13.52) portrays a significant very strong variance in accessibility of different functions (P value <0.0001 and $R^2=0.75$). This is the strongest variance of all case studies which links to one of two design decisions or both of them. It is resulting from the hierarchy of accessibility that correspond to hierarchy of formalities on level 1 spaces. Accessibility patterns within each block on level 1 are repeated across different blocks, where certain informal functions (halls) are always shallower than the formal deeper spaces (seminar rooms), while the courtyard is always the shallowest. Moreover, the variance is impacted by the monotonous of accessibilities on the upper levels. Each block is completely isolated and dominated by a single formal functionality (seminar rooms or studios) – not mixing of functionalities among blocks.
Table 13.12 shows the average visual mean depth of each function. The playground, library, halls and dining spaces have the highest accessibility (lowest visual mean depth). Corridors, stairs and offices are in the mid-range. Social spaces, terraces, studios and seminar rooms are the deepest areas in the plan. The standard deviation of most functions is low (except for services and offices) which reflect how the mean accessibility is a true representation of the actual accessibility. This also links back to the strong variance where spaces of the same function have similar values of accessibility, representing an average with low deviation from that average.

Table 13.12: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School C2

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corridor</td>
<td>3.99</td>
<td>0.86</td>
<td>2.63</td>
<td>8.22</td>
<td>5.60</td>
</tr>
<tr>
<td>Dining</td>
<td>3.32</td>
<td>0.34</td>
<td>2.63</td>
<td>4.05</td>
<td>1.42</td>
</tr>
<tr>
<td>Elevator</td>
<td>4.61</td>
<td>0.88</td>
<td>2.86</td>
<td>6.93</td>
<td>4.07</td>
</tr>
<tr>
<td>Hall</td>
<td>3.25</td>
<td>0.34</td>
<td>2.57</td>
<td>3.89</td>
<td>1.31</td>
</tr>
<tr>
<td>Kitchen</td>
<td>4.27</td>
<td>0.44</td>
<td>3.16</td>
<td>5.07</td>
<td>1.91</td>
</tr>
<tr>
<td>Learning service</td>
<td>4.83</td>
<td>0.92</td>
<td>2.84</td>
<td>7.63</td>
<td>4.78</td>
</tr>
<tr>
<td>Library</td>
<td>3.13</td>
<td>0.26</td>
<td>2.77</td>
<td>3.75</td>
<td>0.98</td>
</tr>
<tr>
<td>Office</td>
<td>4.46</td>
<td>1.04</td>
<td>2.88</td>
<td>7.42</td>
<td>4.55</td>
</tr>
<tr>
<td>Playground</td>
<td>2.59</td>
<td>0.14</td>
<td>2.33</td>
<td>3.48</td>
<td>1.16</td>
</tr>
<tr>
<td>Seminar</td>
<td>4.93</td>
<td>0.64</td>
<td>3.15</td>
<td>7.41</td>
<td>4.27</td>
</tr>
<tr>
<td>Service</td>
<td>4.73</td>
<td>1.41</td>
<td>2.82</td>
<td>10.22</td>
<td>7.40</td>
</tr>
<tr>
<td>Social space</td>
<td>6.25</td>
<td>0.10</td>
<td>5.27</td>
<td>6.27</td>
<td>0.99</td>
</tr>
<tr>
<td>Stairs</td>
<td>4.13</td>
<td>0.82</td>
<td>2.74</td>
<td>6.27</td>
<td>3.53</td>
</tr>
<tr>
<td>Studio</td>
<td>5.00</td>
<td>0.81</td>
<td>3.35</td>
<td>6.93</td>
<td>3.58</td>
</tr>
<tr>
<td>Terrace</td>
<td>5.70</td>
<td>0.98</td>
<td>3.84</td>
<td>7.42</td>
<td>3.58</td>
</tr>
<tr>
<td>Toilet</td>
<td>4.99</td>
<td>0.72</td>
<td>3.17</td>
<td>7.24</td>
<td>4.07</td>
</tr>
</tbody>
</table>

The accessibility of formal and informal spaces is studied through figure 13.53. Informal spaces have a very stretched range of accessibility, but they cluster towards the shallower end of spectrum with five spaces scattered in the midrange and deep end of spectrum. Formal spaces have a relatively compact range, yet, still stretched across the spectrum. The range starts from a deeper position in the spectrum than formal spaces. Circulation spaces also have similar range to formal spaces, yet slightly shallower.
Figure 13.50: C2; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces
13.2.7 School C3

13.2.7.1 Function Analysis

C3 is the third project by firm C. It is a renovation project of an older existing school on site and is composed of a single block of two levels. It is also adjacent to another old school building (not part of the study) which was not renovated (hatched on figure 13.54). Both schools share a common playground. There is also a small courtyard that opens up the ground level in the wester section of the ground level. The school is considered a compact urban block whose circulation is uniquely composed of a mixture of single-loaded and double loaded corridors (not common in other schools), in addition to six main staircases (apart from the small staircases within the halls).

![C3 Plans; Coloured by the Spatial Functions](image)

Although functionalities of B3 are allocated within one block, the design allocated one function to multiple adjacent spaces as portrayed though figure 13.54. This strategy is followed on level 1 and 2, with limited occasions where adjacent spaces have different functions, thus, yielding clusters that reduce mixing of functionalities. This is more highlighted as segments of the circulation corridor are double-loaded with a cluster of mono-functional three or four spaces, such as the cluster of classrooms in the south-west of level 1 or cluster of studios in the same location on level 2. There are other segments of corridor which are single-loaded, and they portray a cluster of linearly arranged spaces of the same function, for instance, the row of halls towards the west of level 1 or the row of offices in the same location on level 2.
The insulation of functionalities in clusters translates into insulation of formalities. In all areas of the floor plans, there is clear differentiation between the formal and informal spaces, each being clustered separately even across a single circulation segment (figure 13.56). The ground level is mostly informal spaces which are limited in number (8 spaces) but account for 52% of the total area (figure 4.57), primarily portrayed in the outdoor spaces of the playground and the courtyard (figure 13.55), in addition to multiple halls including the dining space. As for the formal spaces, they are represented on level 1, but their domination is clear on the upper floor. Formal spaces have the highest count and compose 23% of the school area (figure 13.57). As mentioned before, circulation corridors are uniquely composed of single-loaded and double-loaded segments. They branch of a main spine running north to south and have fluctuations in their width (inherited from the old design). Total circulation, including staircases, is 17% of school area.

13.2.7.2 Configuration Analysis
The accessibility of school C3 on the ground level is mainly influenced by the circulation corridors. The overall northern and middle sections of level 1 are shallower than the south end of the building (figure 13.58). However, the square-loop corridor in the northern section creates uneven degree of accessibility between the left side (closer to the playground) and the opposite right side. Contrarily, the isolation of the south west classroom cluster and its limited connection to the courtyard yield a segregated cluster in comparison to all other spaces. The same segregation applies to the south east toilets which are the most segregated space on level 1. They implement the old design of closed toilets, unlike new open toilets of unpartitioned boundaries, used in new school buildings (seen in most of the three firms’ projects: e.g. A1, B3 and C4).

The accessibility of level 2 is also shaped through the branching of the corridors, but it is mainly impacted by the allocation of staircases. There are five functioning staircases, located in the northern and central sections of the plan. They are distributed evenly distributed between the east and west sides, maintaining a relatively less segregated section of the plan. Contrarily, the southern section has only one functioning staircase, while the south eastern staircase has closed access from level 1. It is used as a fire escape from level 1 towards the outside of the building. Consequently, the far southern section is highly segregated in the plan. This is further amplified since the corridor linking those spaces has only one single gateway from the main spine, and it goes through a zig-zagged turn. The high visual mean depth of the southern section raises the whole average of the floor level (VMD 6.10), contributing to the high variation from level 1 (VMD 3.44) (table 13.13).

Table 13.13: Visual Mean Depth (VMD) of the Whole Building and Each Level (School C3)

<table>
<thead>
<tr>
<th>Grid units Count</th>
<th>Mean VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole building</td>
<td>72508</td>
<td>4.09</td>
<td>2.62</td>
</tr>
<tr>
<td>Level 1</td>
<td>54795</td>
<td>3.44</td>
<td>2.62</td>
</tr>
<tr>
<td>--------</td>
<td>-------</td>
<td>------</td>
<td>------</td>
</tr>
<tr>
<td>Level 2</td>
<td>17713</td>
<td>6.10</td>
<td>2.88</td>
</tr>
</tbody>
</table>

The aggregated VGA of the visual mean depth (figure 13.59) clarifies the configurational differences among different zones of the plan which are not clear on the pixelated VGA. For example, on level 1, one hall in the western cluster (VMD 3.27) is shallower than the courtyard (VMD 3.46) which is not highlighted as a highly accessible space. While it is always expected that courtyards are the shallowest, in this school, the design did not provide multiple access points into the courtyard, keeping it only accessible from one side of the corridor with limited spaces overlooking it, hence, treating it as a typical large room. This configuration of the closed courtyard with limited access points was portrayed before in school B1, but with more access points. Furthermore, the aggerated VGA clarifies the differences in segregation within the southern section of level 2, where the two far eastern spaces are the deepest. In fact, they are credited to the highest recorded maximum visual mean depth value in functioning spaces of all schools (earlier table 13.13), excluding the maximum recorded for a service space in C2.

Figure 13.56: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School C3

13.2.7.3 Configuration of Functions
The study of the configurational properties of spatial functions through the visual mean depth (figure 13.60) portrays a significant strong variance in accessibility of different functions (P value <0.0001 and $R^2=0.62$). The playground, dining space and halls have the lowest average visual mean depth. Seminar rooms, corridors and staircases are in the mid-range. Studios and classrooms are the deepest areas in the plan (table 13.14). This variance is much lower than the last two schools also design by firm C ($C1 R^2=0.73$ and $C2 R^2=0.75$). While the team of architects has created clusters of mono-function (e.g. clustered studios), the cluster was allocated multiple times in zones of different configurations, for instance clustered studios in the accessible northern zone and also in the segregated southern zone of level 2, in addition to another studio in the highly accessible ground level. Hence, the single function has multiple configurational properties. The same pattern applies to classrooms, halls and staircases. This is opposite to previous schools where insulation of functions was accompanied by distinct configurational values for each cluster.

The pattern of allocating the same function in multiple locations of configurational differences is further supported through the values of standard deviation (table 13.14). For instance, the standard deviation of studios (1.10) and is higher than the rest of the school functions as well as being higher than other schools design by firm C (e.g. 0.29 in C1 and 0.81 in C2). The same applies to the standard deviation of halls (1.22) and classrooms (1.63). In other words, there is high variation from the average accessibility value of those functions, being distributed among various locations of fluctuating accessibilities.

Table 13.14: Configurational Properties (Visual Mean Depth – VMD) for Each Spatial Function in School C3

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>6.14</td>
<td>1.63</td>
<td>3.47</td>
<td>8.98</td>
<td>5.51</td>
</tr>
<tr>
<td>Corridor</td>
<td>4.52</td>
<td>1.28</td>
<td>2.79</td>
<td>8.96</td>
<td>6.17</td>
</tr>
<tr>
<td>Dining</td>
<td>3.60</td>
<td>0.12</td>
<td>3.47</td>
<td>4.30</td>
<td>0.83</td>
</tr>
<tr>
<td>Elevator</td>
<td>5.35</td>
<td>0.30</td>
<td>5.09</td>
<td>6.38</td>
<td>1.29</td>
</tr>
<tr>
<td></td>
<td>Hall</td>
<td></td>
<td>Kitchen</td>
<td></td>
<td>Learning service</td>
</tr>
<tr>
<td>--------</td>
<td>------------</td>
<td>------</td>
<td>----------</td>
<td>------</td>
<td>------------------</td>
</tr>
<tr>
<td></td>
<td>4.43</td>
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<td>7.95</td>
<td>5.12</td>
<td>3.55</td>
<td>5.51</td>
<td>1.96</td>
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<tr>
<td></td>
<td>5.12</td>
<td>3.48</td>
<td>5.51</td>
<td>1.96</td>
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<td></td>
<td>3.48</td>
<td>4.45</td>
<td>4.49</td>
<td>0.96</td>
<td>1.96</td>
</tr>
<tr>
<td></td>
<td>4.45</td>
<td>1.96</td>
<td>5.45</td>
<td>4.46</td>
<td>1.96</td>
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<td>4.46</td>
<td>7.08</td>
<td>5.52</td>
<td>5.52</td>
<td>1.96</td>
</tr>
<tr>
<td></td>
<td>7.08</td>
<td>5.52</td>
<td>5.52</td>
<td>1.11</td>
<td>4.46</td>
</tr>
</tbody>
</table>

The accessibility of formal and informal spaces is studied through figure 13.61. Informal spaces concentrate in the shallow end of spectrum with one space in the midrange. Formal spaces are distributed over a very stretched spectrum from shallow spaces (not as shallow as informal spaces) towards the deep end of the spectrum. School C3 is unique for having more formal spaces in the shallower range than the segregated ranges. This is opposite to most of the schools where formal spaces are only allocated in the segregated spaces or at least being concentrated at the deep end of the spectrum than the shallow end. Finally, circulation spaces have a medium-sized range with spaces equally along the shallow and mid-range spectrum, except for one highly segregated staircase (the fire escape in the south east section of level 2).

Figure 13.58: C3; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces
13.2.8 School C4

13.2.8.1 Function Analysis

C1 is the first school from the projects of firm C. The building is part of a multi-grade campus environment (similar to A4). The secondary school is represented through one block (figure 13.62). The school is relatively smaller than all other case studies and has a simple layout, described as a single spine with double loaded classrooms.

The allocation of functionalities follows a linear arrangement along the double-loaded spine across the three levels of the school. The western end of the building has a cluster of defined spaces which are dedicated for the management and teacher offices (figure 13.63). The rest of the building is mainly comprising standardised cellular classrooms, the vertical cores and other services along the spine. There is one social open space on level 3. The overall low number of spaces and limited variation in functionality guarantees direct accessibility from each space towards the main spine, except for subdivision of offices and the toilets.

In spite of the small size of C1 and low number of spaces, spatial formalities in school C1 do not mix, except for one occasion where the western cluster of spaces has a social space, a classroom and an office on level 3 (figure 13.65). The other occasions where offices are
situated among classrooms do not count as mixing formalities, since offices are recognised as formal spaces. Informal spaces are mainly expressed in the outdoor playground, in addition to the single social space. They all comprise 50% of the total area (figure 13.66). As for formal spaces, they have the highest count in the school (29), following their domination over all the levels. Circulation spaces are clearly defined. The main corridor is defined through the boundaries of the classrooms, creating in-between pockets on level 1 and 2 which can be perceived as break out space off the spine. Staircases are also defined, being all of the closed stairwells, except on staircase along the broken segment of the spine.

13.2.8.2 Configuration Analysis

There are minor accessibility variations among the cellular closed spaces (classrooms or offices) of the same level (figure 13.67). This results from the simplicity of the design and standardisation in terms of repeating the same spatial configuration along the linear arrangement within every floor level. The main variation in accessibility is portrayed across levels, such that level 1 is highly accessible (VMD 3.01), compared to the relatively less accessible level 2 (VMD 4.63) or the highly segregated level 3 (VMD 5.51), as seen in table 13.15.

<table>
<thead>
<tr>
<th>Grid units Count</th>
<th>Mean VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
</tr>
</thead>
</table>

Figure 13.63: C4 Categorisation of School Spaces (Areas and Counts)

Figure 13.64: VGA for the Visual Mean Depth, School C4

Table 13.15: Visual Mean Depth (VMD) of the Whole Building and Each Level (School C4)
The aggregated VGA of the visual mean depth (figure 13.68) illustrates the variation in accessibility between different functions while signifying the monotonous of accessibility among the spaces of same function. For example, there is clear distinction between the highly accessible outdoor space vs all indoor spaces. Moreover, there is a degree of accessibility variation between the corridor space, being the shallowest indoor space on every level, and the spaces served through the corridor. There are further configuration variations among offices, the vertical cores, classrooms and the social space. Contrarily, there are similarities in the accessibility of all classrooms. Hence, it is argued that different functions have different configurational clusters in terms of ranges of their visual mean depth values.

**Figure 13.65: Visual Mean Depth of Individual Spaces (Aggregated VGA) in School C4**

**13.2.8.3 Configuration of Functions**

**Figure 13.66: Correlation of Visual Mean Depth Against Spatial Function (School C4)**
Configurational analysis (visual mean depth) of spatial functions (allocated by the team of architects) (figure 13.69) portrays a significant strong variance in accessibility of different functions (P value <0.0001 and $R^2=0.73$). The playground, corridors and staircases are the shallowest spaces, studios are in the mid-range, and classrooms and social spaces are the deepest spaces. The strong variance is due to the limited variation of functionalities in school C1, while those different functions exhibit configurational clusters, as presented in the previous discussion. All spaces of the same function have similar visual mean depth (or small range of values) as seen in the aggregated VGA (figure 13.68). This is also portrayed in the low standard deviation (table 13.16) signifying less variation from the mean value of each function. The only exceptions are classrooms, corridors and staircases, since they spread across three levels, already having diversified accessibility.

<table>
<thead>
<tr>
<th>Space</th>
<th>Mean VMD</th>
<th>Std Dev VMD</th>
<th>Minimum VMD</th>
<th>Maximum VMD</th>
<th>Range VMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classroom</td>
<td>4.85</td>
<td>0.82</td>
<td>3.22</td>
<td>6.92</td>
<td>3.70</td>
</tr>
<tr>
<td>Corridor</td>
<td>3.97</td>
<td>0.86</td>
<td>2.77</td>
<td>5.93</td>
<td>3.15</td>
</tr>
<tr>
<td>Elevator</td>
<td>4.34</td>
<td>0.55</td>
<td>3.64</td>
<td>5.46</td>
<td>1.83</td>
</tr>
<tr>
<td>Office</td>
<td>4.68</td>
<td>0.57</td>
<td>3.61</td>
<td>6.34</td>
<td>2.74</td>
</tr>
<tr>
<td>Playground</td>
<td>2.68</td>
<td>0.19</td>
<td>2.37</td>
<td>3.65</td>
<td>1.28</td>
</tr>
<tr>
<td>Service</td>
<td>4.48</td>
<td>0.59</td>
<td>3.31</td>
<td>6.70</td>
<td>3.39</td>
</tr>
<tr>
<td>Social space</td>
<td>5.55</td>
<td>0.37</td>
<td>5.14</td>
<td>6.12</td>
<td>0.98</td>
</tr>
<tr>
<td>Stairs</td>
<td>4.06</td>
<td>0.81</td>
<td>2.82</td>
<td>6.46</td>
<td>3.64</td>
</tr>
<tr>
<td>Studio</td>
<td>4.45</td>
<td>0.29</td>
<td>3.98</td>
<td>4.96</td>
<td>0.98</td>
</tr>
<tr>
<td>Toilet</td>
<td>4.69</td>
<td>0.69</td>
<td>3.69</td>
<td>6.56</td>
<td>2.87</td>
</tr>
</tbody>
</table>

The accessibility of formal and informal spaces is studied through figure 13.70. Informal spaces are two spaces with completely opposite accessibilities (shallowest playground and deep social space). Formal spaces are clearly illustrated as three clusters in the midrange and deep end of the spectrum. These clusters reflect the similarities in accessibility of formal spaces within each level, across three levels, thus, creating three configurational clusters. Circulation spaces follow the same accessibility clustering of formal spaces. Yet, they are shifted towards the accessible end, due to their shallowness relative to other spaces in their respective upper levels.
Figure 13.67: C4; Average Visual Mean Depth of Individual Formal, Informal and Circulation Spaces
13.3 Ethical Application for Onsite Observations Inside the School

The research has gone through an ethical application #6118/006 in order to start its field observations inside the school buildings. The following section presents this full application (13.4.1) and the approval gained (13.4.2).

13.3.1 Filled Application Document
NOTE TO APPLICANTS: IT IS IMPORTANT FOR YOU TO INCLUDE ALL RELEVANT INFORMATION ABOUT YOUR RESEARCH IN THIS APPLICATION FORM AS YOUR ETHICAL APPROVAL WILL BE BASED ON THIS FORM. THEREFORE ANYTHING NOT INCLUDED WILL NOT BE PART OF ANY ETHICAL APPROVAL.

YOU SHOULD READ THE ETHICS APPLICATION GUIDELINES AND HAVE THEM AVAILABLE AS YOU COMPLETE THIS FORM.

APPLICATION FORM

SECTION A  APPLICATION FOR ETHICAL REVIEW: HIGH RISK

<table>
<thead>
<tr>
<th>A1</th>
<th>Project Title: Implications of the Spatial Design of School Buildings on the Learning Process and Students' Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date of Submission:</td>
<td>30/01/2019</td>
</tr>
<tr>
<td>Proposed Data Collection Start Date:</td>
<td>10/03/2019</td>
</tr>
<tr>
<td>UCL Ethics Project ID Number:</td>
<td>6118/006</td>
</tr>
<tr>
<td>Proposed Data Collection End Date:</td>
<td>01/03/2020</td>
</tr>
<tr>
<td>Is this application for continuation of a research project that already has ethical approval? For example, a preliminary/pilot study has been completed and this is an application for a follow-up project? If yes, please provide the information requested below.</td>
<td></td>
</tr>
<tr>
<td>Project ID for the previous study:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>A2</th>
<th>Principal Researcher</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Name: Kerstin Sailer</td>
<td>Position Held: Reader</td>
</tr>
<tr>
<td>Name and Address of Department: The Bartlett School of Architecture, 22 Gordon Street, WC1H 0QB, London</td>
<td></td>
</tr>
<tr>
<td>Email:</td>
<td>Telephone:</td>
</tr>
<tr>
<td>Fax:</td>
<td></td>
</tr>
</tbody>
</table>

Declaration To be Signed by the Principal Researcher:

- I have met with and advised the student on the ethical aspects of this project design (applicable only if the Principal Researcher is not also the Applicant).
- I understand that it is a UCL requirement for both students & staff researchers to undergo Disclosure and Barring Service (DBS) Checks when working in controlled or regulated activity with children, young people or vulnerable adults. The required DBS Check Disclosure Number(s) is: 001535355194.
- I have obtained approval from the UCL Data Protection Officer stating that the research project is compliant with the General Data Protection Regulation 2018. My Data Protection Registration Number is: N/A.
- I am satisfied that the research complies with current professional, departmental and university guidelines including UCL’s Risk Assessment Procedures and insurance arrangements.
- I undertake to complete and submit the ‘Continuing Review Approval Form’ on an annual basis to the UCL Research Ethics Committee.
- I will ensure that changes in approved research protocols are reported promptly and are not initiated without approval by the UCL Research Ethics Committee, except when necessary to eliminate apparent immediate hazards to the participant.
- I will ensure that all adverse or unforeseen problems arising from the research project are reported in a timely fashion to the UCL Research Ethics Committee.
- I will undertake to provide notification when the study is complete and if it fails to start or is abandoned.
A3 Applicant(s) Details (If Applicant is not the Principal Researcher e.g. student details):

Full Name: Ahmed Tarek Zaky Fouad
Position Held: PhD Candidate – Bartlett School of Architecture
Name and Address of Department: The Bartlett School of Architecture, 22 Gordon Street, WC1H 0QB, London
Email: [removed]
Telephone: [removed]
Fax: [removed]

A4 Sponsor/ Other Organisations Involved and Funding

a) Sponsor: [ ] UCL [ ] Other institution
   If your project is sponsored by an institution other than UCL please provide details:

b) Other Organisations: If your study involves another organisation, please provide details. Evidence that the relevant authority has given permission should be attached or confirmation provided that this will be available upon request. Public Secondary School in Camden-London

c) Funding: What are the sources of funding for this study and will the study result in financial payment or payment in kind to the department or College? If study is funded solely by UCL this should be stated, the section should not be left blank. Self-funded by the researcher

A5 Signature of Head of Department [or Chair of your Departmental Research Ethics Committee]
(This must not be the same signature as the Principal Researcher)

A. I have discussed this project with the principal researcher who is suitably qualified to carry out this research and I approve it.
I am satisfied that [please highlight as appropriate]:

(1) Data Protection registration:
   • has been satisfactorily completed
   • has been initiated
   • is not required

(2) a risk assessment:
   • has been satisfactorily completed
   • has been initiated

(3) appropriate insurance arrangements are in place and appropriate sponsorship [funding] has been approved and is in place to complete the study. [ ] Yes [ ] No

(4) a Disclosure and Barring Service check(s):
   • has been satisfactorily completed
   • has been initiated
   • is not required

Links to details of UCL’s policies on the above can be found at: http://ethics.greif.ucl.ac.uk/procedures.php
"If any of the above checks are not required please clarify why below.

Data Protection is only required (according to UCL regulations) if identifiable data is collected and used as part of the research. In this case, registration will not be required, since the study does not collect any identifiers in the first place. All data collected from questionnaires, interviews and observations excludes personal data. Questionnaires targeting students are online and do not involve any direct contact with the participants. Interviews with the management representative and the teachers do not include any personal data and are based on the role and not the person filling it. Moreover, observation methods such as snapshots and gate counts only include activity types and number of people present or passing through a space. For all the above methods, the data cannot be used to re-engineer the identities of the participants and appropriate protocols will ensure the anonymity of participants.

PRINT NAME:
SIGNATURE: 
DATE:

SECTION B DETAILS OF THE PROJECT

"It is essential that Sections B1 and B2 are completed in simple understandable lay language that a non-expert could understand or you risk your project being rejected

B1

Please provide a brief summary of the project in simple lay person's prose outlining the intended value of the project, giving necessary scientific background. (max 500 words)

The research aims to investigate the relation between the learning process and the school building, in order to understand how the spatial design of the school building impacts the students' learning, their social activity patterns and the use of different spaces. The research analyses the spatial design of multiple school buildings using Space Syntax theories and analytical methods. Two case studies will be explored in-depth including the collection of onsite observation data, which explains the actual patterns of activities in space.

The aim of the project is to:
1) Understand the potential of the school building (through computer-based analysis of the buildings)
2) Investigate how different spaces in the school (corridors, playground, library, etc.) actually function in real life to accommodate the actual students activity patterns (through empirical data collection and observations in the school).
3) Compare the realised architecture of the school building to the potential activities taking place in order to generate design guidelines for future school building projects.

The research is mainly interested in the school building from an architectural perspective and how architectural choices lead to potential activity patterns. Accordingly, the study and all the observations are focused on spaces, furniture layout and types and how they are being occupied, and not on the users themselves.
For the empirical data collection, the research plans to observe usage of various spaces within the school during a period of 6 months and complement this with insights from teachers and the school management. Ideally, the data collection will commence on 15/03/2019. However, the exact day of starting the observations might differ pending ethical approval and detailed consultation with the school.

Empirical data collection is divided into three methods: 1) interviews with teachers and management, 2) student questionnaires and 3) onsite observations.

1) Interviews:

Management Interviews
A representative of the school management of each participating school will be invited for a semi-structured interview, which aims at:
1) Recording and understanding social rules and guidelines in each school.
2) Investigating how student activities are shaped by the school management.

One member of the management team from each school will be interviewed. The interview will be recorded and only the transcript of the interview will be kept as data source.

Teachers’ Interviews
Teachers will be invited to participate in a semi-structured interview, which aims at:
1) Understanding the role of the teacher in the learning process inside the school in order to evaluate how spaces are used.
2) Discovering the teachers’ influence on students’ self-directed learning.
3) Understanding expectations for students’ duties and behaviours on a typical school day.

Three teachers from each school will be interviewed. The interviews will be recorded and only the transcript of the interview will be kept as data source.

2) Student Questionnaire:

An online questionnaire will be shared by the school management and all students in the school are invited to complete it. The sample size is the full student population in a school, which is roughly 830 students.
There is no direct contact with the students in the process. The survey aims at:
1) Understanding the social behaviour and activities of students which take place inside the school building.
2) Finding out the students’ activity preferences and their needs in particular situations.

3) Onsite Observations:

The study uses two different techniques to observe spaces and students’ activities in the building, which are snapshots and gate-counts.

Snapshots capture the basic use pattern of people (standing, sitting, moving, interacting). The data collected is the location and activity taking place in space at a specific moment in time. This will be recorded on a hard copy printed floor plan. There is no recording of personal data or information about the identity of the person in space. Areas observed include shared school spaces including house assembly spaces, canopies, school library, terraces / playground, learning studios and main circulation corridors. These areas are chosen specifically to highlight learning processes initiated by the students outside of structured classrooms.

Gate counts record the number of students crossing an imaginary line, a ‘gate’ in a certain part of the building during a predefined period of time such as 5 minutes. Again, no personal information is collected, just the number of students and their gender. Gates cover the areas observed for snapshots.

For all the above methods of data collection (Interviews, questionnaires and observations) the data cannot be used to re-engineer the identities of the participants and they ensure the anonymity of participants.
### B3. Where will the study take place (please provide name of institution/department)?

If the study is to be carried out overseas, what steps have been taken to secure research and ethical permission in the study country? Is the research compliant with Data Protection legislation in the country concerned or is it compliant with the General Data Protection Regulation 2018?

The data collection will take place inside the premises of the two school buildings.

### B4. Have collaborating departments whose resources will be needed been informed and agreed to participate?

Attach any relevant correspondence.

The main collaborator in this research is the School management which fully supports the research project and has agreed to collaborate and give all necessary support. School teachers are also informed about the details of the study, and they will be collaborating on the project.

A letter of support for the second school will be submitted to the Ethics committee as soon as possible and before data collection commences.

### B5. How will the results be disseminated, including communication of results with research participants?

Results will be written up as case studies within a final PhD thesis, which will be available from UCL repositories. Results will also be published in journal articles or conference proceedings.

In addition, results will be presented to the school’s management in the form of a presentation. Moreover, the school (represented through their management) will be provided with the research to further disseminate the findings, for instance to teachers, parents and students, and the company managing the school facilities. The research (especially the design guidelines as a final objective) is also of concern to contractors and architects, who are interested to understand more about the impact of the spatial design and how to create spaces that accommodate the students’ needs.

### B6. Please outline any ethical issues that might arise from the proposed study and how they are to be addressed.

Please note that all research projects have some ethical considerations so do not leave this section blank.

1) The presence of the researcher as a participant observer in the school’s premises during a school day could be uncomfortable for some of the students. To avoid this situation, the management has agreed to inform the students about the project and the presence of a visiting researcher through announcements in house assemblies in addition to a poster or slide displayed within the school about the researcher and the research taking place. If students have questions, they are kindly asked to discuss these with their teachers. The researcher will be able to answer questions from the teachers who would report back to the students. There is no direct contact between the students and the researcher. This procedure has been adopted for a previous research project (see ethics application 0918/005) and has proved successful.

2) Parents may feel uncomfortable or concerned about the study. We will address this upfront through the normal communication channels that the school provides to interact with parents. The school will inform parents of the study in its regular newsletter. It will reassure parents that the researcher is DBS checked, that no personal data is collected and no impact on the students will occur as a result of the research. The school will manage queries from parents and have assured that they see no serious issues arising from this. Furthermore, for the online students’ questionnaire, there is an opt-out form if the parents do not want their child to participate (see detail sections C6 and C7).

3) The researcher might witness an incident during the observation period that involves unacceptable behaviour from the students (e.g. students fighting or bullying). If this occurs during observation, the researcher will immediately stop the observations and report the incident, to make sure that the situation is dealt with appropriately by the teacher/ supervisor in charge during this period.
4) By coincidence, a student might reveal their identity, e.g., by approaching the researcher and telling their name. If this happens, the researcher will ignore this information and will not take any notes of this.

**SECTION C**

**DETAILS OF PARTICIPANTS**

<table>
<thead>
<tr>
<th>C1</th>
<th>Participants to be studied</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1a. Number of volunteers:</td>
<td>850</td>
</tr>
<tr>
<td>Upper age limit:</td>
<td>18</td>
</tr>
<tr>
<td>Lower age limit:</td>
<td>11</td>
</tr>
</tbody>
</table>

C1b. Please justify the age range and sample size:

The number of participants is assumed to be the total number of students in the school. However, there is no exact information about how many individuals are to be observed. The study does not intend to identify individuals, and it does not aim at observing a specific number of students. The study will not target specific students, but instead, the snapshots and gate-counts will observe random selections of students present in the location of observations. Everyone who uses the school building space (when the researcher happens to be around for observing that area) may be observed.

<table>
<thead>
<tr>
<th>C2</th>
<th>If you are using data or information held by a third party, please explain how you will obtain this. You should confirm that the information has been obtained in accordance with the General Data Protection Regulation 2018.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C3</th>
<th>Will the research include children or vulnerable adults such as individuals with a learning disability or cognitive impairment or individuals in a dependent or unequal relationship?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes □ No □</td>
</tr>
</tbody>
</table>

How will you ensure that participants in these groups are competent to give consent to take part in this study? If you have relevant correspondence, please attach it.

Two phases of the research involve children (students of the school), which are the student’s questionnaires and the onsite observations. Their rights to withdraw from the study and all the informed consent protocols are discussed in section C6 and C7. Secondary school children generally are able to participate in research projects and understand procedures explained to them by their teachers. We will rely on cooperation with the school and the teachers (as well as their parents/guardians) to make sure students are fully informed and able to give consent.
Will payment or any other incentive, such as gift service or free services, be made to any research participant?  
☐ Yes  ☒ No

If yes, please specify the level of payment to be made and/or the source of the funds or free service to be used.

Please justify the payment/incentive you intend to offer.

Recruitment

(i) Describe how potential participants will be identified:

Any student of the school may be observed if they happen to be present in the area watched during hours of observations. However, there is not any process of identifying participants. It is a matter of randomly observing what activities take place in space.

The questionnaires will be issued to every student, who has not been opted out by their parents.

(ii) Describe how potential participants will be approached:

Before the start of the study, the students are informed about the research and the presence of the researcher in the school building through house assembly announcements and displaying information about the study. Participants will not be approached during the observations.

The questionnaire will be distributed to the students via teachers.

(iii) Describe how participants will be recruited:

The observations are based on spot sampling which is a completely random and anonymous process that does not identify any participants. No targeted recruitment of certain students will take place.

Attach recruitment emails/adverts/websites. A data protection disclaimer should be included in the text of such literature.

Will the participants participate on a fully voluntary basis?  
☐ Yes  ☒ No

Will UCL students be involved as participants in the research project?  
☐ Yes  ☒ No

If yes, care must be taken to ensure that they are recruited in such a way that they do not feel any obligation to a teacher or member of staff to participate.

Please state how you will bring to the attention of the participants their right to withdraw from the study without penalty?

In this research, we will use three different forms of consent protocols: 1) full informed consent, where participants take part on a fully voluntary basis (Interviews with management and teachers), 2) informed consent with parental opt-out (student questionnaires) and 3) a waiver of informed consent, where participants do not take part on a fully voluntary basis (space observations).

Each consent procedure is now described.

1) Management and Teachers' Interviews

The research provides an information sheet for the interviewee. It fully explains the research. It also clarifies that it is up to the interviewee to decide whether to take part or not; choosing not to take part will
not disadvantage them in any way. If they do decide to take part, they are still free to withdraw at any time and without giving a reason.

2) Students’ Questionnaires
Before giving the students online access to the questionnaire, the research provides an information sheet that is sent to the parent or the guardian of the child. If they have any further questions about the research, they are kindly asked to contact the school. There is an opt out form for parents (see section C7 - number 2) so that participation is fully voluntary, and children as a potentially vulnerable group are protected.

There is a second information sheet attached at the beginning of the online questionnaire for the students whose parents did not opt out their children. This information sheet describes the research to the student and allows them to proceed or choose not to take part in the questionnaire and exit the online platform, if they wish to.

3) Onsite Observations:
Participants of the study (students) will be fully informed about the study; where and when observations are going to take place, who will be the researcher on site and how to ask questions. The management has agreed to inform the students about the project and the presence of a visiting researcher through announcements in house assemblies in addition to a poster or slide displayed within the school about the researcher and the research taking place. However, their participation will not be on a fully voluntary basis, since by virtue of their presence in the building, students may be observed.

The school buildings are large enough and the researcher will be standing in locations visible to all students. If participants should feel uncomfortable about being observed, they could inform their teacher and accordingly the observations would immediately stop.

Due to the minimal risk involved in this element of the study and the practicality of gathering data, we ask for a waiver of informed consent procedure. More details below (section C7 - number 5).

---

CONSENT

Please describe the process you will use when seeking and obtaining consent.

1) For Management and Teachers’ Interviews
Beside the information sheet, the research provides the interviewee with a consent form to sign if they wish to proceed with the interview.

2) For Students’ Questionnaires
Beside the information sheet to be sent to the parents (or guardians) of the child, there is also an opt out form that is posted to the parents. If they do not want their child to do the online questionnaire, they are kindly asked to sign and send the form back to the school. The school would then filter out those students and only share the questionnaire with the other students.

A copy of your participant information sheet(s) and consent form(s) must be attached to this application. For your convenience, pro formas are provided in Appendix I. These should be filled in and modified as necessary.

In cases where it is not proposed to obtain the participants informed consent, please explain why below.

3) For Onsite Observations:
The study proposes a waiver of informed consent to be considered by the ethics committee for the observations only. Following guidance note 2 provided by the UCL REC, we see that the conditions for a potential waiver of informed consent are fulfilled by this research. The following conditions are mentioned: (1) The research involves no more than minimal risk to the subjects; (2) the waiver will not adversely affect the rights and welfare of the subjects; (3) the research could not practically be carried out without waiver; and (4) whenever appropriate, the subjects will be provided with additional pertinent information after participation.
This part of the study is purely observational and does not include collecting any personal data. The school building is a semi-public space and the observations take place in accessible areas. Students are used to being observed by each other, but also by teachers. An informed consent procedure with both children and parents explicitly giving their consent would create additional undue risks because we do not want to hold and collect personal information (such as names). Managing an opt out policy for observations would make this study element impractical, because we could not manage who not to observe without marking students or limiting their natural behaviours. This would compromise the validity of the study, since the natural behaviour of students to do what they normally do, would not be given. Welfare of students is not going to be affected by our study, as we will not interact with them directly and our additional presence on site is minimal. The researcher on site is DBS checked and the school building spaces are supervised by teachers at all times. Data collection is anonymous and will not identify or single out individual participants.

We will also fully debrief participants and share our results with them, in close collaboration with the senior management team of the school, who are keen to find out how their spaces are used and how they could be improved.

With this procedure we are following the precedent set by an earlier study conducted by us which was granted ethical approval through the UCL Ethics Committee (see application 6118/005) and which went very smoothly.

C8
Will any form of deception be used that raises ethical issues? If so, please explain.
No

C9
Will you provide a full debriefing at the end of the data collection phase?  Yes  No
If No, please explain why below.

C10
Information Sheets And Consent Forms: Appendix I

A poorly written Information Sheet(s) and Consent Form(s) that lack clarity and simplicity frequently delay ethics approval of research projects. The wording and content of the Information Sheet and Consent Form must be appropriate to the age and educational level of the research participants and clearly state in simple non-technical language what the participant is agreeing to. Use the active voice e.g. "we will book" rather than "bookings will be made". Refer to participants as "you" and yourself as "I" or "we". An appropriate translation of the Forms should be provided where the first language of the participants is not English. If you have different participant groups you should provide Information Sheets and Consent Forms as appropriate (e.g. one for children and one for parents/guardians) using the templates provided in Appendix I. Where children are of a reading age, a written Information Sheet should be provided. When participants cannot read or the use of forms would be inappropriate, a description of the verbal information to be provided should be given. Where possible please ensure that you trialed the forms on an age-appropriate person before you submit your application.
### SECTION D: DATA STORAGE AND SECURITY

#### D1
Will the research involve the collection and/or use of personal data?
- [ ] Yes
- [x] No

If yes, is the research collecting or using:
- sensitive personal data as defined by the General Data Protection Regulation 2018 (racial or ethnic origin / political opinions / religious beliefs / trade union membership / physical or mental health / sexual life / commission of offences or alleged offences), and/or
- data which might be considered sensitive in some countries, cultures or contexts?

If yes, state whether explicit consent will be sought for its use and what data management measures are in place to adequately manage and protect the data.

#### D2
**During the Project (including the write up and dissemination period)**

State what types of data will be generated from this project (i.e. transcripts, videos, photos, audio tapes, field notes, etc.).

- The interviews with the management and the teachers: They are being recorded and transcribed into word documents to extract the important information for the writing of the PhD thesis. The transcripts are processed as appendix in the PhD final thesis document.

- The online students’ questionnaires: The responses are automatically organised through the online platform (Google forms), which gives statistics about the responses. The relative information is to be included in the PhD final thesis. The questionnaire template itself will be included in the PhD thesis Appendix.

- The observations phase: The research will record data for snapshots and gate counts (see methodology section) in the form of field notes on paper. These data are digitalised and transferred to QGIS software for data processing.

- How will data be stored, including where and for how long? This includes all hard copy and electronic data on laptops, share drives, USB/mobile devices.

- The interviews with the management and the teachers: The recordings will be deleted as soon as the transcript is made. The word document transcripts of the interviews will be stored on the UCL network and will not be printed or shared on any portable device or laptop.

- The observations snapshots and gate counts: The hard copies of the field notes are stored in document holders within the researcher locker inside the UCL Architecture building (Bartlett). They are being digitised into soft-copies that are stored on the UCL network and are not transferred to any portable hard drives.

- Who will have access to the data, including advisory groups and during transcription?

- The researcher: Ahmed Tarek Zaky Fouad
- The PhD Advisor: Kerstin Sailer
D3 Will personal data be processed or be sent outside of the European Economic Area (EEA)?

If yes, please confirm that there are adequate levels of protection in compliance with the General Data Protection Regulation 2018 and state what arrangements are below.

*Please note that if you store your research data containing identifiable data on UCL systems or equipment (including by using your UCL email account to transfer data), or otherwise carry out work on your research in the UK, the processing will take place within the EEA and will be captured by Data Protection Regulation.

No

D4 After the Project

What data will be stored and how will you keep it secure?

The data stored:
1) For interviews: Transcriptions are stored.
2) For survey: summary statistics are stored
3) For observations: Filled in paper notes and their digital copies are stored

Where will the data be stored and who will have access?
- Hard copies are stored safely in the researcher’s locker in the architecture building.
- Digital data which are all non-confidential will be stored on the UCL network.

Will the data be securely deleted?
If yes, please state when and how this occur.

Hard copies will be shredded and discarded after finalising the final PhD thesis.
Digital data which are all non-confidential will be kept on the UCL network. Due to the low risk inherent in the study we do not see the need to delete data.

D5 Will the data be archived for use by other researchers? ☐ Yes ☒ No

If Yes, please describe provide further details including whether researchers outside the EEA will be given access.

SECTION E: DETAILS OF RISKS AND BENEFITS TO THE RESEARCHER AND THE RESEARCHED

E1 Please state briefly any precautions being taken to protect the health and safety of researchers and others associated with the project (as distinct from the research participants).
1) No entrance to areas with restricted access e.g. technical rooms
2) Having fire, health and safety induction before starting data collection
3) Taking proper precautions to account for bad weather (rain and wind)
4) Knowing how to raise an alarm / ask for help on site (e.g. supervising teachers, reception staff)
| **E2** | Will these participants participate in any activities that may be potentially stressful or harmful in connection with this research? □ Yes ☒ No  
If Yes, please describe the nature of the risk or stress and how you will minimise and monitor it. |
|---|---|
| **E3** | Will group or individual interviews/questionnaires raise any topics or issues that might be sensitive, embarrassing or upsetting for participants?  
If Yes, please explain how you will deal with this.  
No |
| **E4** | Please describe any expected benefits to the participant.  
There is a potential positive long-term benefit for students since the outcome of the study helps understand the students’ needs and provide recommendations on how to improve the usage of school spaces.  
The school management will benefit from the project, as they are able to assess their school building design in relation to actual usage. They could understand the students’ activity patterns in space in order to be more proactive about changes to the space usage rules, the furnishing or other aspects of running the school in response to their pedagogical needs. |
| **E5** | Specify whether the following procedures are involved:  
Any invasive procedure(s) □ Yes ☒ No  
Physical contact □ Yes ☒ No  
Any procedure(s) that may cause mental distress □ Yes ☒ No  
Please state briefly any precautions being taken to protect the health and safety of the research participants  
N/A |
| **E6** | Does the research involve the use of drugs? □ Yes ☒ No  
If Yes, please name the drug/product and its intended use in the research and then complete Appendix II |
<table>
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<tr>
<th>Does the project involve the use of genetically modified materials?</th>
<th>Yes</th>
<th>No</th>
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<td>If Yes, has approval from the Genetic Modification Safety Committee been obtained for work?</td>
<td>Yes</td>
<td>No</td>
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<td>If Yes, please quote the Genetic Modification Reference Number.</td>
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<th>E7</th>
<th>Will any non-ionising radiation be used on the research participant(s)?</th>
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<td>If Yes, please complete Appendix III.</td>
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<th>E8</th>
<th>Are you using a medical device in the UK that is CE-marked and is being used within its product indication?</th>
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<td>If Yes, please complete Appendix IV.</td>
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**CHECKLIST**

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<th>Section B: Details of the Project</th>
<th>Tick if attached</th>
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<tr>
<td>Questionnaire(s) / Psychological Tests</td>
<td>X</td>
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<tr>
<td>Relevant correspondence relating to involvement of collaborating department(s) and agreed participation in the research i.e. approval letters to gatekeepers seeking permission to do research on their premises/ in their company etc.</td>
<td>X</td>
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<th>Section C: Details of Participants</th>
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<td>Parental/guardian consent form for research involving participants under 18</td>
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<td>Participant/s information sheet</td>
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<td>Participant/s consent form/s</td>
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**Appendix I: Information Sheet(s) and Consent Form(s)** | X |
## Appendix II: Research Involving the Use of Drugs

- Relevant correspondence relating to agreed arrangements for dispensing with the pharmacy
- Written confirmation from the manufacturer that the drug/substance has been manufactured to GMP
- Proposed volunteer contract
- Full declaration of financial or direct interest
- Copies of certificates: CTA etc...

## Appendix III: Use of Non-Ionising Radiation

## Appendix IV: Use of Medical Devices
13.3.2 Approved Document

UCL RESEARCH ETHICS COMMITTEE
OFFICE FOR THE VICE PROVOST RESEARCH

13th February 2019

Dr Kerstin Sailer
The Bartlett School of Architecture
UCL

Dear Dr Sailer

Notification of Ethics Approval with Provisos
Project ID/Title: 6118/006: Implications of the Spatial Design of School Buildings on the Learning Process and Students’ Activities

Further to your satisfactory responses to my comments, I am pleased to confirm in my capacity as Chair of the UCL Research Ethics Committee (REC) that I have ethically approved your study until 1st March 2020.

Ethical approval is subject to the following conditions:

Notification of Amendments to the Research
You must seek Chair’s approval for proposed amendments (to include extensions to the duration of the project) to the research for which this approval has been given. Each research project is reviewed separately and if there are significant changes to the research protocol you should seek confirmation of continued ethical approval by completing an ‘Amendment Approval Request Form’
http://ethics.grad.ucl.ac.uk/responsibilities.php

Adverse Event Reporting – Serious and Non-Serious
It is your responsibility to report to the Committee any unanticipated problems or adverse events involving risks to participants or others. The Ethics Committee should be notified of all serious adverse events via the Ethics Committee Administrator (ethics@ucl.ac.uk) immediately the incident occurs. Where the adverse incident is unexpected and serious, the Joint Chairs will decide whether the study should be terminated pending the opinion of an independent expert. For non-serious adverse events the Joint Chairs of the Ethics Committee should again be notified via the Ethics Committee Administrator within ten days of the incident occurring and provide a full written report that should include any amendments to the participant information sheet and study protocol. The Joint Chairs will confirm that the incident is non-serious and report to the Committee at the next meeting. The final view of the Committee will be communicated to you.

Final Report
At the end of the data collection element of your research we ask that you submit a very brief report (1-2 paragraphs will suffice) which includes in particular issues relating to the ethical implications of the research i.e. issues obtaining consent, participants withdrawing from the research, confidentiality, protection of participants from physical and mental harm etc.

Office of the Vice Provost Research, 2 Tavistock Street
University College London
Tel: +44 (0)20 7679 8777
Email: ethics@ucl.ac.uk
http://ethics.grad.ucl.ac.uk/
13.4 Introducing the Researcher to Students of the Observed School Buildings

This information slide/poster of the researcher is displayed for the students at the observed schools, in order to inform them about on-going research and the presence of a visitor.

Visiting Researcher at the School

Zaky is an architect who is currently enrolled as a PhD candidate at the Bartlett School of Architecture - UCL. He is really interested in school buildings and their spatial design. He will be around the premises to observe some spaces inside the school building for his PhD research.

This research project analyses how students use the school various building spaces.

Zaky is interested to understand how the building is being used by the students and how it could be improved from an architecture perspective. He will do this through observations. There is not any personal details of students being recorded or collected.

Once the project is completed, Zaky is happy to provide feedback to the school that could help improve the learning environment for all students, and to make sure that the needs of all students can be met.
13.5 Qualitative Data of School Management Interviews

Interviews with members of the management board of the schools are part of the qualitative data collected within the two observed schools. The Questions are ethically approved as part of the ethical application. This section provides details of the information sheet (13.6.1) and a consent form (13.6.2), handed to the interviewees to participate in the study. It also presents the interview questions (13.6.3) and their transcription (13.6.4).

13.5.1 Information Sheet

For interview with a representative of the school management
You will be given a copy of this information sheet.

Title of Project: Implications of the Spatial Design of School Buildings on Student Interactions and Student Self-Directed Learning Activities
This study has been approved by the UCL Research Ethics Committee (Project ID Number): 6118/006

Name of the researcher/interviewer: Ahmed Tarek Zaky Fouad
Address: The Bartlett School of Architecture, 22 Gordon Street, WC1H 0QB, London
Contact Email: Ahmed.fouad.15@ucl.ac.uk

We would like to invite you to participate in this research project.
Details of the research:
Within this PhD thesis supervised by Dr Kerstin Sailer at the UCL’s Bartlett School of Architecture, the researcher (Ahmed Fouad) aims to investigate the impact of the spatial design of the school building on the learning process and the student activities. The research studies the design of school buildings and performs spatial (computer based) analysis on the floor plans to identify the potential of spaces to accommodate student activities. In order to find out how the users (mainly students) actually utilise the building, the researcher collects data about two case studies. Your school is one of them.

The management implements and maintains guidelines and rules inside the school building. They create one set of parameters that influence the potential of space for learning and other student activities. The aim of this interview is to understand the role of the management and how they deal with the student daily life inside the building.

Procedures:
The interview will last up to 45 minutes and will consist of a series of questions, which you are asked to answer in your role of a member of the school management team. The interview will be recorded and transcribed. There are no personal information asked in the interview.
The identity of the interviewee remains anonymous. Only the transcript will be kept for further reference, which cannot be re-engineered to reveal the identity of the interviewee.

Please discuss the information above with the interviewer before proceeding. If you have any questions, or if any part is unclear, please let the interviewer know. They are willing to provide all information about the research. It is up to you to decide whether to take part or not; choosing not to take part will not disadvantage you in any way. If you do decide to take part you are still free to withdraw at any time and without giving a reason.
13.5.2 Consent Form

Thank you for reading this information sheet and for considering to take part in this research.

Please complete this form after you have read the Information Sheet and listened to an explanation about the research.

Thank you for your interest in taking part in this research. Before you agree to take part, the person organising the research must explain the project to you.

If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you to decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

Interviewee’s Statement
I ........................................
• have read the notes written above and the Information Sheet and understand what the study involves.
• understand that if I decide at any time that I no longer wish to take part in this project, I can notify the researcher involved and withdraw immediately.
• agree that the research project named above has been explained to me to my satisfaction and I agree to take part in this study. Taking part in the project will include being interviewed and recorded (audio).
• Agree that my data, after it has been fully anonymised, could be used in this research project and any subsequent publications.

Signed: Date:
13.5.3 Interview Questions

Section 1: School rules and guidelines
- What is the main ethos of the school?
  Sub-question
  what actions does management team take to support this?

- What are the main rules that the students have to abide by during a school day?
  Sub questions:
  To eat their lunch, are the students restricted to certain spaces?
  During breaks, could the students go anywhere in the building or are they restricted to certain spaces?

- Could you please explain the privileges granted for good behaviour and sanctions issued for inappropriate behaviour?
  Sub-questions
  What students do in academy community service?
  Where do you stay for academy community service?
  What privileges are taken away from students?

Section 2: Activities
- Apart from daily classes or lectures, what are the main activities implemented by the school for the students, and where do they take place?
  Sub-questions
  What are the academic activities?
  What are the social and sports activities?

  Self-directed learning is defined as the process of students taking initiative to do some learning and social activities, which help them in their daily life inside the building, for example, reading a book, solving extra exercises, working in groups, doing homework, group meetings or revisions for exams.
  - In regards of this statement, could you please discuss how the management maximises SDL opportunities for the students?
  Sub-questions
  What are these activities – as far as you know?

  Where do they take place
  How often do they take place?

- During the exam period, where could students revise, solve problems within the school spaces, assuming they do not have classes?
Section 3: Spatial patterns in free time
- Apart from the playground spaces, where could the students hang out during breaks?
- In case students do not have a class (gap times), are there specific school rules that prevent them from hanging out in the specific spaces?
  Sub-questions
  What are these rules?
  Are they valid for the whole school day or for certain times? What are these times?
  Do you witness any patterns of students preferring to hang out in inappropriate places / spaces?

Informal learning spaces are defined as all the spaces where students can perform a social or learning activity, outside the classroom and not during formal, teacher-directed instruction. such as meeting rooms, multi-use labs and libraries, circulation corridors, staircases, assembly spaces and dining areas.
- What do you think about the informal learning spaces in this school?
  Sub-questions
  What could be classified as such in this school?
  How do you picture the students using these spaces? Does it happen?
  What do you think about the furniture types and arrangement in these areas?
  Do you think the school is making the most of these spaces?
  What could be improved from your point of view?

- What do you think of the formal learning spaces: classrooms, lecture hall, labs?
  Sub-questions
  What are the best features of these space?
  What do you think about the furniture types and arrangement?
  What are the problems in these spaces and how could they be improved?

- In your view, what role should a library play in 21st century education? Does your library do that?
  Sub-questions
  Is it successful as a learning space and why? What works in the library?
  What do you think about its furniture types and arrangement?
  What are the drawbacks of the space? What doesn’t work?
  How could it be improved?
13.5.4 Transcription of the Interviews

For each of the two observed schools, there are two interviews for each school, the total is four interviews with members of the management board of the two observed schools. The following sections present the transcription based on the recordings.

13.5.4.1 Interview with the Principal of school A1

Speaker 2: I think it’s vital that we obviously include points of view from everybody.

And having a view from people management or in the group you know in the classrooms and the spaces is really key. I think the risks are that we have unique spaces and sometimes maybe people who are newer to the school or joined um not necessarily as aware of the kind of innovation and the space that we’ve got. Will express concerns around or express opinions around how the space is being used, not always thinking as creatively as they could be about what the solutions are. So, when you've gotten into an innovative building you have to think differently. And there will be some people. Who might think that the solutions are solutions that would actually take the design? That would be counter countering the design and therefore actually take the practice backwards. Does that make sense?

And So, it’s great to have opinions from not just from people but the potential risks are that the context of each of the individual people isn’t fully taken into account So, you might have somebody. Is it that actually deep down is a very very traditional teacher and doesn’t think or want to teach in open spaces?

So, therefore when you're asking them about the problems or the challenges that they face with the corridors they don't think about what the solutions are they think well actually the big solution is to build some walls and create some corridors as opposed to actually thinking we have to we can and we do sometimes make it work really well. And the problems that exist aren’t something fundamental. They’re actually something easy to change. Like the timetable or you know the types of luck at you know sort of nudge their way really. So, one of the really interesting examples is the drama studio.

And for a long period of time because people were saying that because the drama student studio is tucked away and you don't have a staff room there kids were seeing it as a space to go mess around it. So, there is a lot of graffiti and stuff in the drama studio and people saying we're not using it in the dance studio. What that is what I mean.

And the doors were getting pushed open etc. But actually what we found out was that once you've got inside once there's a very simple lock on the release catch inside the drama studio that you can push a button up underneath it and the doors always remain open and the kids had to do that.

So, it meant that they could just flip that lock and the door's always open So, they knew they could go there, and they weren't teachers and they could use the space and be silly in it as opposed to now. We've worked that out we put a very simple screamer over that lock. So, it's a plastic lid that when you pick it up it sounds like the fire alarms going off. So, the kids put it down. They don't release the lock the doors now stay locked the drama studio the dance studio is now being used much more properly.

People don't think there's a design issue with the dance studio and that there's a behaviour issue it's actually we've just had to change a tiny little bit of practice that has completely shifted how the space...
is being used. If that makes. Does that make sense. And that's where I think the kind of big concept design alongside what’s actually a very simple solution that we could we could use

Speaker 1:
If you don't mind, I think I would take you a step backward, and ask you what is the main ethos of the school?
Speaker 2:
Okay.
The main ethos of the school is to provide our students with a curriculum and a school experience that will allow them to transform their lives and improve their lives to learn how to be good citizens to learn how to work together to learn how to achieve to experience a curriculum that prepares them for the modern world. If we talk about the rules in the school? what are the main rules that the students have to abide by?
I mean that there are hundreds of rules. We want our students to look after each other, to listen to staff to respect each other. We've started to use three words in the last 18 months in the last year that we're increasingly used to summing up.

We want the students to be ready. We want them to be respectful, and we want them to be safe. And it's there's always a risk I think in just listing all the rules because you missed something out and then somebody says well, I didn't do that because that's not on the list of rules. So, you write to say what the main rules are rules is a funny word actually you know you can have expectations and things that you can't do. You know we never want students to push each other and that's a rule.

But sometimes students push each other. Yeah. And I don't throw out a child for pushing another child. You know that you know that learning. Um yeah. They've got to wear a tie. That's a rule they've got to wear trousers, or you know there's lots and lots of rules. So, actually, rules are kind of sub points really to what you want the school to achieve and we want our children to be engaged.

We want them. We don't want. We're not running a school where the discipline is you march around in silence and you sit in rows and you don't talk.

You know it's not a horrendously strict approach. We're not shouting at the students all the time. Some people might experience that but that is not the that's not that's not what we expect.

Speaker 1:
And during lunch breaks or the students are allowed to go everywhere in the school? Or are they just allowed to be in the playground?
Speaker 2:
The expectation is that the students are outside. Um there are sometimes that they've also got the canteens. There are sometimes when staff may run a lunch club and that's what I mean is about rules if you say absolutely hard and fast rules about everything. So, are the students that the students should not be inside the building and less they are going to meet somebody or they're working with the teacher.

Do we want them on the top floor? No. Sometimes they go up to the top floor. Terraces? learning terraces So, they shouldn't be on the higher terraces but sometimes students will go up to the terraces with a member of staff. And there will be sometimes students running around the back of terraces and things like that and they'll go to the wrong place and we have to go and tell them not to.

Speaker 1:
Could you explain the Academy community service?

Speaker 2:
The idea the ACS, is that students receive a punishment or a sanction when they do something wrong. Mm hmm. And when we want it to be about something for them to reflect on the ideals that they’re doing something to repay the academy it is really now a name that we use for sanctions. Sometimes it's used properly in terms of community service but sometimes it is just you are staying after school and it is a detention.

Speaker 1:
Are there any privileges for good behaviours?

Speaker 2:
um you get house points house points you get you know we’re starting to get um you know you get letters home for lots of house points, phone calls, postcards you get recognised we're starting to introduce the idea of rewards trips. Okay. But there's also um a question about do you should you reward good behaviour or is that what you should expect. because if you’re constantly rewarding it what happens when you stop rewarding it. Are you saying it's okay if you don't behave well anymore So, good behaviour is what we expect everybody today we shouldn't be behave. You know I'm not going congratulate a kid for coming to school on time. Okay. If I've got a student that has never missed a day school, or a student is above and beyond the others you want to reward them. But in the main good behaviour is what we expect.

Speaker 1:
Are there other activities other than the classes that the students do in the school?

Speaker 2:
So, we’ve got a self-directed learning Okay So, that's a huge amount of extra-curricular that kids do. We have lots of trips and visits connect and reflect we've got their whole broad curriculum.

Speaker 1:
If you don't mind reading this part about self-directed learning.

Speaker 2:
Where did you get this definition from?

Speaker 1:
Uh different scholars.

Speaker 2:
Oh, fine okay. So, I don’t I wouldn’t say that that's self-directed learning here. I wouldn’t say that fits in with that definition per say. But the idea of self-directed learning here is to give all students whatever their background and culture explicit opportunities to do something outside of the normal curriculum.

But the difference here is that it’s expected that every child does it as opposed to it’s something that you choose an option to. So, traditionally. And where possible we offer students choice and opportunities to choose the source and we try and direct them to do something that they've not done before.

Speaker 1:
So, it's more initiated by the teachers?

Speaker 2:
It's the offer is given by the teacher. Students are expected to do it. And some students will choose one two or three a week.
Speaker 1:
And where do they take place?

Speaker 2:
All around the school. So, they'll take place at the end of the traditional school day. So, they might be in the computer room. They might be at lunchtime they might be in the on the sports fields and the pitches.

Speaker 1:
During exam period, are there specific places where students could revise? or they can do it all over the school?

Speaker 2:
There are specific places because we've got the whole school is full. So, we can't just let the kid you know the library is always available for the sixth formers they've got study spaces available. We have canteens or you know the five canteens available okay.

Speaker 1:
If you don't mind reading this part about informal learning spaces ?

Speaker 2:
So, the reality of using informal learning spaces is different to the theory. Informal learning spaces where you've got enough provision worked really well. And you've also got to have the trust that the students can use it properly. When the school is absolutely full there are very few. You know we if we were if we had half the number of students we have at the school it would be very easy for us to use lots more informal learning spaces. So, the design of the school has got you know areas for couches or this that and the other but actually once were full we thought we have to cram the kids in. So, there aren't really that many spaces available for informal learning.

Speaker 1:
But if you could picture like some spaces in the school to be informal learning spaces what are these.

Speaker 2:
I don't understand.

Speaker 1:
For example, would you consider the super-studios as informal learning space?

Speaker 2:
The super studio is a large learning area. The way they use it on the sixth floor I think the way that the sixth form use the spaces you've got good examples of informal learning. Okay um. Informal learning is a is a phrase you have to be careful about. It sounds a little bit soft. Okay um I don't know what it means really. I mean informal learning is learning outside of the traditional teaching time. But actually you might have. Students leading independent learning during their own classes. So, the super-studio is not an informal learning space it might occur you know it might be used as an informal learning space at the end of the day or during lunch times or recess. So, when there aren't classes being taught we've got a huge amount of space for people to use. And when you watch the sixth form on the top floor using the spaces you can see it being used informally.

Speaker 1:
And what do you think about the furniture. How the students use Furniture in the in the lunch in houses.?

Speaker 2:
What do you mean by how they use it?

Speaker 1:
For example, I have seen them moving furniture which should be a good behaviour because they customise it in the way they want to sit. Does the school agree with this?

Speaker 2:
Yeah I mean. We don't want kids moving too much stuff that's gonna be dangerous but also we don't have things nailed down to the floor So, we want students to be able to have some informal ways of working or speaking together or um using space um the furniture at the school is relatively movable unlike in other schools and kids do move in.

Speaker 1:
And in the library. What do you think about the spaces? how it's being used.

Speaker 2:
What do you mean by What do I think about it?

Speaker 1:
Because you know the library is very important in the 21st century education and how students use it to read or socialise or interact is very important although it's not part of the formal learning. It's not a class. So, how do how does the school help this to flourish?

Speaker 2:
We resource it we keep it but it does it. There are schools which are limited for space that don't have libraries. So, actually you know some people would say that the library is a bit of a luxury okay. And I think we can use the library better. I think we can use it. It's a large space that is underused. Many kids you know a small I think a small group of students use it really well. I think it's a lovely space to have had. How was the question? How well do we use it?

Speaker 1:
Yes. How can it be improved?

Speaker 2:
I think it could be busier. I think you could have more students in there more often. I think it's always now. I mean it wasn't always the way but it was is always now pretty calm and peaceful. And generally quiet for the space that we've got quite underused.

Speaker 1:
Talking about the corridors because from my observations you have the outdoor corridors and the indoor spaces you don't consider as corridors, and students are asked to go from outside. Do you think this is successful till now? this system?

Speaker 2:
I think it's successful. I think that's a bit black or. I think it's do we have challenges with kids using the indoor spaces as corridors. Yes. Is it better than it's been before. Yes. I think we haven't properly solved it because it's very difficult to resolve. The kids do you. They do not not use the outdoor corridor. But if given the option and if it's easy they'll use the indoor corridors. And for some staff they find it very disruptive. Yes, they were. The solution is to think more carefully about the timetable. But also, to look at some tools I go back to the designers and say What can we do with things like locks on doors. How do we use the furniture where do we put the furniture.

So, the super-studios and it's mainly the super-studios that we're talking about actually and predominantly the super studios on the fourth floor. So, when you have a math lesson at the end of 'valor' followed by a Mandarin lesson at the end of Orion unless it is completely ingrained with the staff and the students everyone will walk through the central corridor. So, I think it is a big it. It's not telling it's unsuccessful because that's too black or white. You know it does need to improve and we've got, and it is a tough challenge and I think we've got to think carefully. But we've just got to think carefully about how we make it better.
Speaker 1:
I think that's it. That's exactly what I wanted to ask. Do you have any comments any thoughts?

Speaker 2:
I'm interested in what you feel the kind of outcome will be and what sort of output will be coming out from space you know from all these from the questions and at all you know what it would do you watching. Yeah what's going to be produced?

Speaker 1:
I'm using this questionnaire. Sometimes I don't know what is allowed and what's not allowed. So, for example like uh the terraces I see student patterns of using it. So, there is a potential of changing the space into a nice activity space. But if the students are not allowed to be there in the first place why would you change it into an activity. So, like patterns emerge but they don't have to abide by the rules. So, if I don't do it if I don't get the rules of the management, I'll not be able to put suggestions.

Speaker 2:
So, Okay that's really helpful. So, there's also the original design. You know when you've got such a complex and original design there are no sets of rules that you can take from somewhere else to use here. And when you're committed to doing things in a slightly different way you have to let some things go a bit. Okay. But also scope you know Jerry always used to say is that students are like water. You know they get through every gap. So, you know unless you have a fence there and if you tell the kids never go out there will be some kids who go up there and if they're not making a big scene and they get away with it they'll keep going up there and teachers don't go and check it. And then something happens and then you go up and check it or a window breaks or there's some rubbish left in the main we don't want students up on the terraces but you're completely right if they're being underused. Then. What could you do to maximise it.

So, I mean I think about this space a lot it's just it's gradually becoming just a bed big patch of mud.

And unless I do something about it it's just going to keep becoming a big patch of mountain the kids would just come here and walk around with it as opposed if we got it all turfed everything cut back benches round the chair you know suddenly it becomes a zone for kids to come and hang out and spend some quiet time and not run around being loud and in the office.

Yeah. Same with the Orion garden.

Speaker 1:
If you think of doing this, you need supervision?

Speaker 2:
Exactly. Exactly. So, do. But at the moment we don't really supervise it much because it's not really being used as if we set it up for being used and we didn't have people going around the back yard on patrol.

But you know I put a couple more CCTV cameras here and monitor those carefully and every time you know then that is in itself being supervised.

Speaker 1:
But honestly, I think the problem with CCTV is that they will not prevent unwanted behaviour. It would just make sure that you know what is happening later on.
Speaker 2:
I don't know. I think I semi disagree. I don't think it's the absolute solution. But at the moment. We've got one camera that only comes from the side and it doesn't actually cover it. Now I do think that if we read it this time and had benches and things like that and made it much nicer and we had a couple more CCTV cameras and some friendly signs saying This area is covered by CCTV and we check in occasionally and we do monitor it you know if you see great you know the pattern of work that you guys I see groups of students being idiots you can go and check it and then sanction them for it and show it to them.

Yeah yeah.

So, for example I tell you a good example is the bike shed by the thing. So, we had a spate of thefts from the bike shed and we put a camera in and the next time there was a theft we caught the person. We haven't had any theft since then. We don't monitor it. So, I think as long as the communication is there and there's follow up to it. I do think CCTV you can have a different.
13.5.4.2 Interview with the Assistant Principal of school A1

Speaker 1 (00:00):
If you want to start giving general comments about what you do?

Speaker 2:
So, yeah, my role is I’m assistant principal, uh, responsible for inclusion. Um, in the past there’s been inclusion and pastoral care. So, most of my team are non-teachers actually and are involved in the support side of the school. Um, and some of that involves, you know, academic support, behavioural support, and normally their work with external people. So, yeah.

Speaker 1:
We’ve talked about the guidelines a little bit. So, what is the main ethos of the school?

Speaker 2:
Um, I think the, the things that would jump out straight would be our curriculum. Um, we don’t do national curriculum in the lower school, uh, which would some schools would say key stage three. year, seven to nine. Um, it’s, uh, it’s based on what was called the, IMYC international middle years curriculum and now it’s called the connected curriculum. But the reason why that’s quite important I think in relation to what you’re studying as well is because it does affect the space. Um, the idea of having open spaces and that kind of fluidity to move from one space to the other is based on how different subject areas probably should be working together and have worked together, um, when teaching their disciplines. So, English and humanities classes as an example, if they’re on at the same time, if it’s the same year group, there’s a way of delivering a session which isn’t actually about your subject. It’s more about what we call the big idea. There’s always a central theme to what you’re studying and that should come first before your subject. That was the original thought anyway and the original process.

Speaker 1:
Social rules or rules in general affect how spaces are being used?

Speaker 2:
I mean, in terms of rules and spaces, I would say the main thing is though, uh, the students do struggle with it is using outdoor corridors for travel across the building. Um, the only reason you should ever be walking in the super-studio from one end to the other would be to go from one class here to another space that you’ve been directed to use within the super-studio itself. Um, not to travel from one end of the building to the other. So, your movement in a super studio should technically all be about the learning.

Speaker 1:
Why do you think students move within the super-studio rather than the outdoor?

Speaker 2:
Um, I think there’s three things that contribute towards you. I think the first thing is they spend their time here and the first one you think of when you want to go from one space to the other isn’t to come out of that space to go around it. So, I think naturally that’s the original thing. Um, original trigger. I think, um, another factor will be how we’ve timetabled. I think as the school has become full, it’s been less possible to pull off the ideal, which is to have, um, I don not know, a curriculum that’s based on the two subjects planning together have to deliver something for that half term. So, you could have humanities over here, you could have, you know, um, English over her same year group. It’s become a little bit more difficult. You’re more likely to see maybe a sixth-form lesson in the classroom, next door and a sub seven lesson right in front of them in the super studio. And then it’s less likely to be on the other side or another Super-studio and then natural thing to do is to walk
through here. And if you’re a student on the other side and you see someone coming on the left walking through, you might not be thinking, Oh, they’re using the closest exit. It’s gonna make an assumption that is for travel. So, it’s got long story short, I think high timetable and our capacity of the school has made it almost impossible to make it ideal for every department, for every year group at all times. Whereas in our first year, we’ve only one-year group in the school in that anything was possible in that way. And I think the other thing that contributes towards it as well is, um, I wouldn’t say access to the outdoor corridors, but where teachers let them out through their door, they sometimes run into problems. There is a back door for all of the classrooms over there as an example. And some teachers don't always consistently let them out through those back doors. They let them out from the front doors. And then they set him up to have issues.

Speaker 1: I will talk a bit about the lunch break. So, the students are restricted to be in the playground during lunch or they can be anywhere?

Speaker 2: Yeah, they have to be in the playground. They're canteen. Yeah. Yeah. Sorry. The only times they should be in a or should be then too, they can be as if they're seeing a teacher. I'm there with a teacher for something or there been rooms that we've allocated to things like prayer and some students have used it

Speaker 1: What about the terraces?
Speaker 2: Uh, there is a sixth-floor terrace that I know at break time is a duty spot. I'm not aware of it being a duty spot for lunchtime. So, I'd say no at lunchtime.

Speaker 1: Can you explain a bit detention, here at school, it is called community service?

Speaker 2: Yeah, I think um, probably a little bit like a few school concepts like I just described the, the super-studio space. Um, there's things or even the curriculum, there's things that the original thought behind it was based on, I guess a value or something that you were trying to install in the students. And as the school's grown, whether it be culture with staff or sustainability, there's been some kind of block. So, community service in any sense of the word is about people putting back into their micro community. Um, to, I guess, right a wrong in some way. And the ideal is if a student does anything wrong, rather than having them sit in, they're still reading the book, you would put something back into that situation and maybe learn from it, learn from why it wasn't okay. But the reality is there's been times where students have done detentions, we've called it ACS Academy community service. They've gone to ACS, but they have sat down still and read a book or had to be there in silence. So, it's almost that say, well, can we describe, you know, just make a decision. Is it a detention or is it community service? I think the reality is now we do both.

Speaker 1: Where does it take place?
Speaker 2: Uh, So, there was a whole school one that takes place in the vela canteen. Um, and that's X number of days a week. I think it's three times. Um, there are, there is a co-principal one that takes place fortnightly at the end of the week and that's in the main hall. Um, but if a teacher does their own for an issue, it will be wherever you want it to be. And that's more likely to be a community service if I'm
honest, if you, than like to go back to the science department and help tidy up as opposed to go to a room and sit down and find out.

Speaker 1 (07:12):
What about the privileges?

Speaker 2:
Yeah rewards, I mean rewards is also something that’s constantly in development in the school. And I know today as an example, there was a rewards lunch for students that have got lots of house points and done well in their year groups. So, they have that rewards lunch with the principal, and they get food for them. And that was in, I believe the boardroom downstairs. That’s a fairly recent development in the school’s history. Um, other than that, certificates were given out in assemblies this week. Um, for their rewards points and their totals. And I think we have trips. Departments sometimes have rewards trips, So, if you’re doing well in Mandarin, I know they definitely have a rewards trip and I think it’s something that’s still growing and evolving. I think rewards, there’s always more that you can do. Rewards trips for the whole school or even just in department.

Speaker 1:
What extra activities students do, apart from classes and sports?

Speaker 2 (08:16):
So, do you know about our self-directed learning? So, we have something called self-directed learning on the timetable and it’s 4A after their last lesson and it’s on Monday, Wednesday and Thursday, three times a week. Used to be every day. But again, sustainability as the school grew, had to be a bit more realistic about that. And there’s an offer for the students that runs for a whole term. The only time it doesn’t run is the first week of a term, a whole term and last week of a whole term. Um, because they need time to make their choices and things like that. So, teachers offer everything from chess to sports. we have external people come in and live and dance classes, we have rock climbing at times it’s never the same. So, self-directed learning is what we call it. Some schools might just call it extra-curricular, but the whole idea behind it originally was students pick something from the categories, heart, body, mind and spirit. And again, it was up to them how to define that. But typically, sports would be under body. You know, you might have chess on the mind. Some people say it’s their heart and the kids were trying to build profile to keep in tabs of all of that and make a selection and choices. So, that still runs. Now we also have something called try something new day, which the festival week and that is coming up actually it companies once a year at the festival week, June. So, when we come back after half term, I believe it’s the second week, um, a festival week, there’s a range of things that happen when some people would try something new day and then try something new day. It’s like a whole day of self-directed learning and the students pick different activities up to three and I’m going to be writing one myself. So, I love films. I will be doing like a movie making one, um, kids going to be offsite doing horse riding. We’ve had, we’ve had all sorts. So, it’s almost like a, a more glamoured up version of a normal SDL slot. But for a whole day.

Speaker 1:
I have a different definition of self-directed learning. I would love you to have a look at it. And then tell me what do you think about it? It’s very different than what’s in the school

Speaker 2:
Yeah. So, what I would say would be if, if we were to say that’s what we did, the problem would be choices, what we offer, if that makes sense. So, in our first year range was massive. We had more teachers available. It has a teacher choice ratio. It would take maybe even 12 teachers to put like a range of projects out. As we’ve grown, even though there's more teachers, there's more students take care of and the ratio changes and it’s well how many teachers can run projects in the spaces that we
have on the days that we have. So, all of a sudden self-directed learning is, well I am picking this, but there's two factors. Am I going to get my first choice? That's one. And the second one is I'm only as good as what you've offered me on the day. Yeah. So, I guess there's, you know, you could question how much of that choice is illusion or reality. Um, but I would say learning social activities. Um, the if I look at a range of projects, of course a week, they definitely can tap into all of those, whether it be physical or not, and they have to study period as well, which I guess is about them doing their own learning.

Speaker 1 (12:24):
Apart from the playground spaces, where could the students hang out in general if they have a break, if they want to revise?
Speaker 2 (12:39):
The only other choices, realistically it would be your school library and your house canteen. Any other space that I would say would be a classroom that you've got permission to be in? I'd say if I was sitting here right now and maybe it wouldn't happen, there's this next door when I can't see it, but is it okay for me to work there? I'd say yes because I, I'm there, you know, they're not an unsupervised space. And then the only other areas above the library, which is a more of an area that my team use for a more small group intervention, which is our mezzanine area. That'd be it.

Speaker 1 (13:14):
In the school, you have two breaks?

Speaker 2:
Uh, the first break, um, is after the tutor time? After, sorry. Yeah, after two time. Now it's recently changed. Uh, and the break, which we have two for the age groups, one first lunch and second lunch. Yes. Yeah.

Speaker 1:
And sometimes like I see a teacher with a student or two students like a tutorial in the library or other spaces. can you comment on that?
Speaker 2:
If there is a member of staff with a handful of students, normally it could be support staff. Okay. So, we have learning support assistants, sometimes running interventions. Um, again, there's also people in my team, that run interventions but they're normally more fixed rather than being out and about with them. So, that's one thing. Teachers, too academic coaches, we have academic coaches that are running small group sessions and can be on their way to somewhere like the library for a session. Um,

Speaker 1 (14:19):
Could you elaborate more on interventions? What are they?
Speaker 2 (14:24):
So, I mean we've got a range in the school in terms of interventions. I would say there are statutory interventions for special education needed students, um, which have to happen because they have paper that says it has to happen to have funding that comes with it. That could be anything from a speech and language therapy to something like impulse control for behaviour, um, Lego therapy for autistic and that stuff that has to happen. They have to have support that helps them with a need rather than the intervention being defined. Then there's more responsive interventions. So, there are students that don't have a special educational need, but students who, uh, may be falling behind in maths and it could be affecting, um, their wellbeing. It could get to the point where what's going on in the classroom isn't enough. So, we can have academic coaches for math, English and science. You don't just run it for sessions for them. They get to learn how they learn, help them with their own, um,
issues with behind the subject, but also cover the material as well. Okay. So, that's just an example of the two extremes. You also have mentoring that goes on in the school mental, yeah. And that's, it's different than the, than the coaching. Yeah, I would say the coaching lot, half mentoring, half academic, whereas the mentoring is literally just about them and their own targets. Normally behavioural, I mean there's a lot, there's a lot of interventions. There's a lot of things to describe. Um, So, I don't know if you want all of them or not, but there's definitely behavioural and academic are the two things, the categorise within the two, the ones that I'm normally associated with either non SEN ones and the ones that aren't, uh, based on the students coming in with funding and need because of how we organise in the school. I used to, I used to manage it and then we've just restructured things. But at the moment it's purely the, I would say the responsive side, the side that responds to students need would be counselling. Um, whether it be, uh, again the mentoring, the academic coaching, wellbeing. We do cognitive behaviour therapy for one of my staff that there's a range of things.

Speaker 1:
Could you read this part about informal learning spaces? do you agree, or do you have any comments?

Speaker 2 (17:01):
It's hard. I would say with this school to call anything informal learning space. Okay. Unless you are referring to the library because I'd say everywhere else pretty much. It's is a formal learning space. I'd say like our super studios, our forum area. Some people might look at that and think it's informal. It's not, it depends how you want to use it. It becomes formal. Second the teacher puts their group there and has a discussion is a formal learning space. Um, So, I would say the library is probably our only informal learning space.

Speaker 1:
What about the canteens?

Speaker 2:
Um, interesting. They are used for classes at times. Study periods for sure happen for a time, but also when we have exams and we have to, you know, put um, classes in there last minute. And I would say I, I'd even say when they change function from eating place to sit down, I'd even call that formal. The only time that's informal is for six formers. Six formers decide in non-lesson time. But they want to go to the canteen and sit down there, which they never really do. But if they did, that's when I'd say it's an informal learning space for them. And maybe the top floor. Now we're saying at the top floor where the six formers are there. Super-studio doesn't function like this. That's I guess more informal as well. But everywhere else in the school for every other year group, they don't have a lot of choice within formal.

Speaker 1:
And what do you think about the furniture in the library and um, for the canteens?

Speaker 2:
For the canteens, they serve the purpose of a canteen. Um, I wouldn't necessarily say, I mean they're not bad for learning. You know, you've got tables that's basically good group work actually when we had computers in the back as well. So, not bad for learning actually. Um, but I would say, uh, yeah, I've actually quite liked, I mean the library furniture is good for its purpose as well. Again, you have enough, you have a good balance of workspace and group space. It could be bigger to accommodate more, but for what you've got, I don't think it's bad.
Um, either of those areas? Yeah, I would say with the canteens for what we do, it'd be good to go back to having, you know, a good row of, uh, operating computers for students to access a bit like an internet cafe type field. So, they get to research and do things, but that would take more manpower in terms of Manning it and, and maintenance. Maybe library if you're more computers as well.

Speaker 1:
What about the formal learning?

Speaker 2:
Yeah, So, I think it depends on where you look at it. If I taught my lesson in the open space consistently, I feel like my lessons would be, uh, based on that space, if that makes sense. Um, I think where it doesn't work is if you don't register where you're working, I'll be using that forum and let's face, and if no one was using the forum even better, like I would literally be using everything as a classroom teacher. I work in a science lab and I'm a PE teacher as well. Um, and I think I just adapt to, you know, where I am. So, open learning spaces, typical problems will be that disruption and people walking through that. A lot of people talk about if it's going to happen, how the sound carries from one end to the other. A lot of people don't realize but best machine here um, which is up is emitting white noise to, not muffle but kind of this restore, the, the, the focus from one end to the other in the super studios. Other than that, you haven't got any physical barrier to isolate your class. And I think you have to think about how much you want your group to have open discussions and you know, do we use the forum for discussions, get it done and then come back here to do the work. There's lots of things that you can do to make it more efficient and to make use of its real purpose actually. And I think we've probably lost sight of that as the years have gone on and new staff have come in and things have evolved. It's an easy space to lose sight of. But I do know there have been a lot of working parties and areas one now actually on super studio lessons and super studio teaching because it's something that the school doesn't want to lose sight of.

Speaker 1 (21:45):
So, you're talking about the furniture. Do you think that they could be changed or improved or you're happy with what you have in the super studio?

Speaker 2 (21:58):
I'd only question if there wasn't enough space and I think, you know that's, that's like obvious stuff. So, if you've got a class of 30 and you're meant to have 24 you need an extra table. That's all I would say, me as a teacher, if I've got enough space in a Super-studio, I'm good with it, I'm fine. I don't think anyone uncomfortable. I think the tables, the tables are meant to accommodate a person, you know, I don't think you can get better than that. It's not like they're, you know, there isn't a space for a person in a group is designed to fit in sets of six. The problem will be where there isn't enough of it to accommodate a class because someone hasn't thought about the size of the class would have ruined had been timetable then I, because I, and I think timetabling is more a problem than furniture. I know just from my own patrols walking around, there'll be a teacher that will be in a class at times where as a tight squeeze there will be another room that makes more sense and it will be well who is that person I can swap with and it might take a while to work out but it's more about space rather than the actual furniture.

Speaker 1 (23:01):
What about the typical classes? the furniture and arrangement

Speaker 2 (23:08):
Um, I would say um, I would like to probably see either the same tables reflected in there. Or, I know it's a bit old fashioned moving tables around, but I think if people owned their own areas a bit more. Like I had my own classroom and teacher has their own classroom. I think you can set it up in a way that you want for all your classes consistently. Anything on the problems we have is because multiple, you people use the same spaces. I think you've changed it. Yeah. You get movement and then if you
don’t keep moving, you're settled and if you settle, you're not actually having what you want for your own class. And it’s something that we take for granted here, but actually in another school where people do have their own rooms, um, it’s a very different feel. Like you see your environment, you’ve, you know, you’ve got a style that you want, and your style compliments your teaching and the way you want to do things. I think we probably lose something with that more in the traditional classes than the actual Super-studio is actually, um, based on the idea of, you know, this isn’t really mine or if I move it I might disruptive for the next person.

Speaker 1 (24:18):
Now I'll talk a bit about the library because it has a lot of potential, being the main space the main spot where students hang out and revise. So, if we compare the furniture here or in the superstore and the classes to the, yes, they have different furniture, but how they are differently serving the purpose?

Speaker 2 (24:54):
Just trying to visualize all parts of the library. I know we've got the tables in the middle. Oh yeah. As you come in. I think that I would like to see, again, it could be a restriction of space, but I think these kinds of areas around and the study bit the table, I think I'd like to see more of this available in the library. So, if you could replicate that side of the library where you've got these, um, soft groupie areas and the simple, yeah. If you duplicate more of that, yeah, I'd have more choice than yeah. I would say that would be better. A better layout.

Speaker 1:
And in terms of, uh, allowing students to go there more. Any like management ideas?

Speaker 2:
Yeah. Um, So, I know that at break and lunch students go down there and the English classes use it as well or it did for reading lessons. I think the sixth form was, should probably use it more than they do. I know they are many floors away. But I think that they could probably use it more. But again, um, I think it's about everyone's first sort of interaction when you go in there. If you go in there and there's another class, do you walk away or if there's another year group that you feel like your space shouldn't be there. I think there's sometimes are factors.

Speaker 1 (26:40):
I have some general comments, not about the library, uh, you see a lot of students walking in the corridors during classes. Do you think this shouldn't be stopped? Do spaces influence this? Is it part of the learning process?

Speaker 2 (27:00):
The space is definitely influencing this. I mean that's a hundred percent. In fact, they do the spaces force students to believe that that kind of fluidity is okay. But problem is sometimes it is okay, but no one’s going to know unless it’s made explicit. So, this again, if I go back to year one and year two, it used to look like a market of learning. You know you could have English or humanities and I pick on those two subjects because they use substitute as where I was quite a lot. And you would see students having their launch in the forum. They all sit down a half a year group, maybe 90 kids sitting in the forum and then they'd go to their actual individual classes and get on with their task. It could be script writing; it could be anything right in speeches. And then they might be planning their speeches in groups and you might have some students on soft soft seats by the window talking in the group, some on the table, some going back to the forum to perform and rehearse. And there was nothing wrong. Matter of fact, I saw students taking their iPads and filming on the staircase just to get the angle right and you know, all sorts was going on. And I guess that kind of fluidity, the question would have been can we sustain this or what is the impact of that? Now, if another student sees that and they don’t know or even teacher sees that and they don’t know what the play is, what's going on, you could argue what's going on here. Too much movement. And I loved it. I loved it. I saw it at its best. I think a lot of
the time if there's a fountain and a student says, can I get some water or can I go to the toilet, which
was around the corner, it's too easy to say, yeah, So, before you know, if everyone's doing that, you've
got mass movement So, it's not always about learning. Um, or someone goes to, you know, go and get
those colours from the super studio and you know, it's, and someone walks from there to there in a
normal school with the kind of boundaries, corridors and classrooms, the teachers probably less likely
to say, yes you can. Or can you go and get this? You just don't want to do it. You can see the barriers
say restricts your thinking because your views are restricted

Speaker 1 (29:03):  
From your own point of view, where do students like to hang out?  
Speaker 2 (29:07):  
where, uh, in their free time, in their free time? I think, I mean you've got two extremes. You have a
lot of students that literally want to be out and about in that playground and around, or you got
students that want to be inside the building. Literally the students that go to the canteen outside of
eating, I would say very few of them want to actually stay there outside of eating. They actually want
to be indoors, and you can encourage them to take us off seat in those canteens. But if it was too
much of a bug's plates and all the rest of it, it's not really for them. And he actually wants to be sitting
in the forum area quietly of a friend or sometimes not quietly, but literally being indoors, you know,
So, yeah. Um, you've got those two camps, I think outside of being sport you're running around and
then let this drama that's going on. I would say, yeah, it's one or the other if they don't do it like a
basketball club or something.

Speaker 1:  
What about the terraces?  
Speaker 2:  
Um, I feel that with the terraces is you do get a few there, but I feel sometimes with a terrace is, it's
more because they kind of want to be inside but they don’t allow loud inside. Some students I've just
been kicked out So, they go to a terrace. That makes sense. Terraces in the sixth-floor terrace, which
originally was for foundations year 7. You'd have the top floor in the corner. Um, I think would have
been nice if it was made as a formal spot problem is you essentially have students going down to the
ground floor and having another snack and then going up to the top floor after that break. By the time
they've done that, it's time to go back to lesson if it's break time. So, you've probably got some of the
terraces are too far away from where the kids are actually allowed to get snacks and eat once they've
queued up. It makes no sense.

Speaker 1:  
But there are two more terraces: one on the fourth floor and one on the fifth?  
Speaker 2:  
Yeah, the art one. With the art one. Um, I don't feel that art ones ever been a matter of fact before
from the fifth. I've never really been deliberate open access. The only one that ever has been as a sixth
floor. The fifth one has been, I know art lessons have happened, maybe not recently, but they've done
things, they've done lessons out there, they want a sink out there. Um, same again with the fourth.
Uh, it's never really been formal for students to be able to go and sit there and um,

Speaker 1:  
What is the purpose of the one on the fourth?  
Speaker 2:  
I Couldn't tell you. Really. I cannot you. Um, I can't remember if there's ever been furniture there. I
know science have on the fifth, you can't even really call it a terrace, but you know where they got
their outdoor bit. But um, with the fourth, again, some of these areas become redundant if you can't
have people, um, patrol them or man them.
Speaker 1:
On the fifth you have this, the art. Then you have three and on the fourth you also have a big one, which is opposite. So, this one is left, yeah, this one is on the right. This is like, I see a lot of students here during break, but I don't know what was the main purpose of this terrace?

Speaker 2 (32:40):
So, I've taken a class out there when we're doing an ecology lesson. Yeah. Part of that was to see the plants. Actually, we've had discussions there and again, I couldn't tell you that that was the purpose, but you know, that's how far you have used it. I would say in free time. No, I don't remember ever being a spot where it wasn't, it was never a spot that people can actually go to formally. I think one of the things well is if you see a student in a spot that's quietly reading the book, you want to leave them, you know, tell them to move. Um, it's only when these things become a problem. Yeah. Yeah. You tell them to move.

Speaker 1 (33:16):
I think that's all my questions. Do you have any general comments about the school?

Speaker 2:
I would just say, I mean, the space thing is very interested in the school like this. Um, I think that the open space is, uh, again, I said earlier, as we've evolved, as time has gone on, we've had to think long and hard about, you know, why is it open? Reminding people why we have open spaces in the first place. And it was all about the curriculum. It was never about just having an open space. So, I think that's the only thing really. I'd say that it was about the curriculum and then it was about, well, how strong is that message that helps us to do it. And then the next thing is, is whatever it is sustainable, can you, can you pull it off with a number of students in this school and teachers in this school and subjects run at the same time? Can you pull it off? And that was always going to be the question. Really. So, yeah, lots of things that test the work against it. Yeah.

Speaker 1:
Thank you for your time.
Speaker 2:
That's all right. Thank you. Thank you.
Speaker 1 (00:04):
Okay. I would start by asking you like to talk a bit about the school in general as a place you working.

Speaker 2 (00:13):
Yeah. Yeah. So, uh, I, this is my 11th year here. Um, So, I started as an English teacher. Uh, I still teach English, but I'm also now deputy head teacher, So, I don't teach as much as I used to, but I am also responsible for, um, uh, curriculum and teaching and learning and, uh, key stage four, which is GCSE is year 10 and 11. Um, and up until Christmas I'm also Cenko So, responsible for students with special educational needs and disabilities.

Speaker 1 (00:45):
Okay. And the location where you teach, does it?

Speaker 2 (00:49):
Yes. So, I teach in, um, five different classrooms across the week.

Speaker 1 (00:57):
Okay. And could you please describe the VACCA typical classroom?

Speaker 2 (01:03):
A typical class from here? Well, there's quite a difference in the size of classrooms. So, some classrooms are bigger than others. Um, but a typical classroom, uh, would have a desk at the front for the teacher, um, with the whiteboard and things and then desks typically in rows, but it's up to the teacher who in inverted commas owns that classroom, um, to decide how they want to lay it out. So, the teacher that is sort of based in that classroom, So, sometimes teachers have their um, uh, seating and tables like in groups or they might have them in kind of U shape tables. So, it's depends on the teacher that is primarily based in the class

Speaker 1 (01:43):
and the teachers change it according to that. Yeah. Okay. And is it like a lecture format or like a group?

Speaker 2 (01:52):
It depends on the teacher really. Um, and on the subject and on the individual lesson, what seating do you prefer? Um, I, if I had my own classroom, I used to prefer tables, like groups of tables. Um, primarily because I teach English and there's a lot of discussion in English. But the problem with that is if you have 30 in a class, you need to have a very big classroom in order to have a situation where you don't have people with their back to the boards or back to each other. Um, it can also be challenging if, um, you have students that might not, uh, that might want to talk to each other rather than listen to the teacher. Um, So, typically most teachers teach in rows because then everyone's facing the front. I don't mind teaching rows. Um, but it, in order to promote discussion, uh, I'd rather have groups.

Speaker 1 (02:45):
Okay. And now I take it one step backwards. What's the typical schedule for a student?

Speaker 2 (02:52):
in a day? In a day? Yeah. So, they have to be in school by eight 15. Um, they can arrive anytime from seven and seven 30 to eight 15. They primarily remained downstairs or outside. They can go to some places like the library or some classrooms, but primarily they're downstairs. And then at eight 25, they
go to their first lesson and then they have five lessons over the course of the day with a 15-minute break and a 30 minute lunch. And then they have a 25-minute tutorial at the end of the day.

Speaker 1 (03:24):
Okay. [inaudible]

Speaker 2 (03:27):
an hour, but there's five minutes, what we call movement time in between.

Speaker 1 (03:34):
And how do you find black students interacting in the circulation in the circulation time between the curves?

Speaker 2 (03:42):
Um, So, it's interesting because we, we have some rules about it, and we have some not rules about it. So, there are some rules like they have to walk on the left up the stairs or there's some stairs that you can only go up or some says you can only go down because there are some rules. Um, but other than that, it's pretty free flow. Um, So, I know some schools have like silent Cory doors. Um, students have to walk in silence around the building and we don't have that. Um, So, I would say generally the majority of students go to their lesson. I would say there are a number of students that would, you know, try and go and chat to their friends or go to the loo or go and do something else. Um, but generally most students go to their lesson.

Speaker 1 (04:26):
Okay. And what do you think about like, uh, they use the scoop but like one direction staircase?

Speaker 2 (04:34):
Um, I think it has pros and cons. I think, um, it can cause, um, kind of bunching in certain areas. I think when the school first opened, there were only 150 students in each year and now there's 210 in each year. Um, So, it's grown, um, in terms of numbers of students and you know, we're building the new building there. That will help because at the moment, if you were in a lesson here and your next lesson is, you know, round where geography is, you have to walk a significant way around the school to get there, which causes issues with, with sort of crowds. Um, that will help with that. And the stairs is something that we've talked about quite a few times about whether they should all just be up and down, um, because it does cause some issues. But then if it's kind of pros and cons, I would say,

Speaker 1 (05:21):
okay, uh, what are the after-hours activities in there?

Speaker 2 (05:29):
So, the library is open every day after school for anyone to go to. And then we have a program called above and beyond, which is extracurricular clubs after school, which is, you know, things like sport. Um, there's uh, like animal clubs, uh, computing clubs. There are different activities that run off to school, but they're all voluntary. The only thing that's not voluntary is we have what we call study club, which is for GCSE students, um, on a Tuesday, Wednesday, Thursday who haven't done the work that they should be doing. So, like if you don't do your homework, you get put in study club for an hour and you don't do your homework in the study club that is down this corridor. The end C2 10 in the classroom. Yeah.

Speaker 1 (06:12):
Okay. And the above and beyond,
Speaker 2 (06:16):
that's in lots of different places. So, some moves in classrooms, some is in, um, the sports facilities, the library's open every day. Um, but that's for students who want to go and do some work, do some homework, um, get some help with homework, those sorts of things.

Speaker 1 (06:32):
Okay. Could you read this? You don't have to do it for algae, but that's about self-directed know.

Speaker 2 (06:37):
Just read it to myself. Yeah. Yeah. Okay. So, that's kind of the bit that I was, I'm saying So, the library's open before and after school every day. Um, and that sort of, the idea with that, the study clubs that I was talking about, you have to go to it, but students can go to it. So, we have some students that choose to go to it, um, because they want a bit of extra help with their homework or, um, they just want somewhere quiet to go to lower down the school. So, when you're seven, eight and nine, they have, um, homework clubs as well, which is a similar thing. Some students have to go to it, some students choose to go to it.

Speaker 1 (07:17):
And when students, I go to the library to work apart from all of these activities, how do you find this going? Is it a new woman pattern or you don't see much of students going to work by themselves in the library during the break or,

Speaker 2 (07:35):
I would say some students do. I would say there's a, there's a number of students that do and there's a number of students that, that don't. So, I would say some, some students regularly go, some students don't want to, they just want to come in and do their lessons, go home again. Um, So, I would say that it would be the same students that you would see there. [inaudible] as a species,

Speaker 1 (07:57):
I think to achieve this score.

Speaker 2 (08:03):
Um, yes and no. I mean the library is very open, um, which is positive in some ways, but also it can feel quite noisy in there when you're in there. The classrooms, um, I think are better, but it's, I suppose it's hard, you know, I would, if I, if I'm working, I, I need it to be really silent. Um, but other people don't like that. And So, it's hard to always meet everyone's needs in those sorts of ways. Um, but students have a choice I suppose. So, if I was a student here, I think I would probably choose to go home and work at home. Um, but then if I think about other people, I know who like to be in kind of collaborative situations, they might like that better.

Speaker 1 (08:45):
You can stay in an empty classroom to study?

Speaker 2 (08:48):
No. Okay. Um, they can ask her like if I had a classroom and I used to have a classroom, if a student wanted to come and do some, they could come and sit in there and do some work while I was there. But they have to be supervised.
And what do you think about the format, the learning spaces defined as the classrooms, the lecture halls, the theatre you have? What do you think about it?

Speaker 2 (09:09):
Uh, that's functional. Um,

Speaker 2 (09:13):
I think some classrooms here are very good. Um, some of the larger classrooms here are very good. Some of the classrooms, one of the classrooms I teach in is really small and I teach about 28 year-tens. Um, So, they're 14, 15, and it feels really cramped and sometimes it's hard to get to all of them. Um, I think that the, um, the drama studio is interesting because it has a lot of facilities but it's also quite small. So, when we do productions in there, it's great cause they have all the light and the sound and everything, but actually you can only get a very small audience in there. Um, which is interesting. Um, and the same with the main hall. The issue that, that the way the main hall is designed is there's no stage. Um, and then you have like the raised seating, but then say we use the sports hall for things where we have a bigger audience like our presentation evening, which is like our prize giving and that's all flat. So, then we build a stage, but then you have an issue with students who can't access the stage. Like students with disabilities, you can't access the stage, which can be a bit awkward. Um, So, I don't think any of it's perfect.

Speaker 1 (10:26):
Okay.

Speaker 1 (10:27):
It also, can you read this about informal learning spaces?

Speaker 2 (10:40):
Yeah, I think that, I think that things like that happen, but it's not necessarily done by teachers. So, I think it's, I think students talk to each other, but I think it's, it's not, um, led by staff. What I mean.

Speaker 1 (10:58):
So, could you, what in the school could be classified as informal space?

Speaker 2 (11:04):
So, I think it's more about how students talk to each other rather than anything that's actually been designed

Speaker 1 (11:11):
okay. With that intention. Okay. But you don't consider that device as an informal space?

Speaker 2 (11:19):
I suppose it can be, but it tends to be quite structured in there. So, Mel who runs it in the morning and after school, she has like things that they can and can't do, um, and the same at break and lunch times. So, I don't know how informal it is. I suppose there is, but I think that's, like I said, I think that's more about, um, individual students and their conversations rather than, um,

Speaker 2 (11:43):
uh,

Speaker 2 (11:43):
something that we've kind of structured for them. Yeah,
Speaker 1 (11:46):
that makes sense. Yeah. When do you consider the corridors as like a Ganga?

Speaker 2 (11:54):
I suppose it depends when you think about learning, like, like you're part of the reason I don't like silent Curry doors, which I've seen in some schools is that part of school for me is about learning to be a person and have socialization and those sorts of things. And if you have to walk in silence, you're not learning those things, you're just sort of, you know, like marching in the army. So, I think that those things happen. And we have, um, a system of yellow cards and green cards. I don't know if you've seen those. So, yellow cards are where students do something outside of lessons that they shouldn't be doing, like loitering or dropping litter, those sorts of things and green cards or when they do something positive like pick up litter or a whole door open and those sorts of things. I suppose there's that, there's sort of an element of, of teaching in that. Um, I don't think that they're their talk necessarily. There's an element of teaching about the curriculum there, but I think there's sort of learning about how to be a person.

Speaker 1 (12:52):
Okay. And what do you think about the furniture,

Speaker 2 (12:56):
the furniture? Um, as you can see from my office, uh, I'm, I'm not, I think when I joined all the chairs but like this, which are really nice, like comfy chairs, but as they started to break, you know, over wear and tear, we then got different chairs, which were like kind of blue and green plastic chairs. And then as they started to break, we then got different chairs and now I feel like it's a bit haphazard. I feel like some classrooms I've got five different types of chairs and that annoys me.

Speaker 1 (13:28):
They can take booze or like a,

Speaker 2 (13:31):
um, the tables are all right. Oh, there are a lot better. The folding up ones, they're a lot better. Um, a couple of years ago we had these sorts of big tables and they were ridiculous because the students, there was like, you know, it was like further away than we are now. And then as a teacher you couldn't get around them to kind of, you know, talk to them or tell them to tidy up or whatever. I think the furniture in the restaurant area is better than it was. Um, I like the new chairs that we have, which are the types of chairs that the students can't tip on, you know, they can't tip back on. Um, and it'd be nice if they were uniform across the school. Um, but at the moment where there's haphazard different types of chairs in the classroom, I think it looks messy.

Speaker 1 (14:19):
Okay. Uh, if you don't mind, if you have more 10 minutes, I have some questions about management, not as a teacher. Yeah. So, what would you define as the main eaters of the school?

Speaker 2 (14:31):
at this school? Um, for us it's about being ambitious for our students, being aspirational for our students, um, giving them opportunities but also giving them aspirations. So, um, our community, there's often, um, uh, students might be the first ones going to, um, the first one's going to, um, kind of, uh, um, Oxford U type universities. And So, it's about raising their aspirations, whatever they want to be. It might not be going to university, it might be running their own business, but it's about raising their aspirations.
Speaker 1 (15:05):
Okay. And what are the main news correct to abide by in the school?

Speaker 2 (15:10):
We're very strict. There's lots of rules. Um, So, we're very strict about uniform. So, I don't know if you've ever seen on the front door there's always staff checking the uniform. Um, we have, uh, systems for behaviour in lessons. Um, So, they get strikes and then if they continue to disrupt or if they do kind of a big act, like they are rude to the teacher, then they take to the back on track room. I do see in that room. Um, So, back on track room is a room where they sit in silence for the whole day. Um, if they've been removed from a lesson, um, and they sit in sort of pods, you should go and see it. Um, and they just work in silence all day, including break and lunch time and then they do detention after school. Um, So, we are very strict and like I said, we have the yellow cards and the green cards, it's social time. So, there's a lot of rules.

Speaker 1 (16:02):
Oh yeah, on green or right.

Speaker 2 (16:04):
So, the yellow card is if you do something that social time that you shouldn't be doing. So, it's like a sanction at social time and a green card is if you do something that is, um, kind of going above and beyond, like you helping someone picking up lifter, um, uh, sort of doing something that isn't just the norm.

Speaker 1 (16:22):
and for students to eat their lunch or lunch break or they stick to the dining space,

Speaker 2 (16:28):
They can go outside, and they can go to the library. Um, but that's pretty much it at the moment. Um, as you would have seen, we have two breaks and lunches. Yeah. So, while one year groups on lunch and other groups in lessons, which is, which is tricky, um, because if they want to go and see a teacher or whatever that teacher might be teaching, um, the plan is when the new build opens to have one social time that we can't do at the moment, cause we just don't have enough space for the whole school to be out at the same time. Um, but that's the plan.

Speaker 1 (16:58):
But can students stay in the corridors during constraint?

Speaker 2 (17:01):
No, because of the lessons going on. They can go in the Cory door, you know, like if they need to go to their locker or whatever, but they can't hang around in the current doors. And if they did that would be loitering and that would be a yellow card.

Speaker 1 (17:15):
Okay. And during the exam period, do you have

Speaker 2 (17:21):
sure

Speaker 1 (17:22):
during example they have spaces like specific for studying or advising?
Speaker 2 (17:27):
No, we don’t. We, well we do when it's the real exams. Um, but it's, uh, it's interesting because, you know, a few years ago when I first started teaching, students went on study leave, So, they would finish kind of may, sort of early may and be on study leave and you don’t do that anymore. So, they have to be in school all the way up to their final exam. So, what we do is we run, um, uh, what we call revision rooms. So, say if I was, uh, teaching year 11, I would have some year Eleven’s in the room, and they would be revising. Um, but it is something that we've talked about because say the six form is have study room and we have talked about something like that for, uh, for the exam groups. Um, but it's not something that we've done yet.

Speaker 1 (18:08):
Okay. So, you, you've mentioned that during the break, students can be in the playground, the library and the dining space anyway?

Speaker 2 (18:20):
Um, well, when I'm in the playground, I sort of in the outside space, So, there's the courtyard space as well. Um, and pretty much, yeah.

Speaker 1 (18:30):
Okay. I think that's [inaudible].

Speaker 2 (18:36):
Yeah. Oh, that was easy. Oh, thank you. Thank you So, much. Good luck. I like the way it looks like her.
13.5.4.4 Interview with Facility Manager of School B1

Speaker 1 (00:01):
Hi. Can you define your role in this school?
Speaker 2:
I'm the facilities manager at the school. Okay.

Speaker 1:
Can you walk me through the plan of the school? Like different zones?
Speaker 2:
So, we have four zones in the school is built up in blocks of a, B, C and D. A is very much like an E shape: block A, block B block C and Block D.

Speaker 1:
On the upper floors it's the same?
Speaker 2:
Exactly the same yea.

Speaker 1:
These areas on level 3, they are not connected.
Speaker 2:
They're connected as such, but they're not free flow. So, you on the second floor, you can't get from block C to block D. You have to go downstairs.

Speaker 1:
Was that in the original design?
Speaker 2:
I believe so. Yeah.

Speaker 1:
Can you discuss like the informal learning spaces in the school? By informal learning spaces? I mean like spaces where the students can study but not the classrooms.
Speaker 2:
So, timetabling is almost 95% of the classrooms is in use all the time. So, um, the only sort of study space that they can do is in the canteen area, and the cube, sorry.

Speaker 1:
Can they study outside?
Speaker 2:
They can study outside wherever, but not, uh, not in the winter months and definitely in the library. Uh, that's timetabled. Um, a lot of the time. But yeah, if it's free they can study in there.

Speaker 1:
There are certain staircases that have like one direction of flow?
Speaker 2:
There are, but that’s currently being reviewed because, obviously, for fire you need to be able to use it up and down specifically. But yeah, we’ve tried to decrease the flow by having, um, the staircases on the outer layer, being up only, and they these are down only.

Speaker 1:
But this one staircase is up and down, right?
Speaker 2:
Sorry. Yes, this one is up and down and this.

Speaker 1:
When was this implemented?
Speaker 2:
It’s before my time here. I’m not 100 percent sure that kids, the students they follow that. There are signs there, but I am not sure that it’s enforced on the students.

Speaker 1:
So, it was not in the original design?

Speaker 2:
No, no. That is something we put in place to increase the flow and stop any congestion that areas.

Speaker 1 (03:04):
And do you expect when this new building to be added, the current circulation will be continued?
Speaker 2 (03:11):
Uh, yeah. So, that once a new building is sort of completed, there’ll be a much sort of easier circulation, especially on the first-floor cause that’d be complete circle.

Speaker 1 (03:23):
Have you considered the fact that, you know, now you have a dead end, So, you have less circulation, but when you connect, you double, like two directions circulation?

Speaker 2:
Yeah correct. So, it will improve the flow.

Speaker 1:
You think it could improve different?
Speaker 2 (03:42):
I’ll tell you because if your, um, if you’re on the end of C block and you want to get to the end of D, you’ve got to cross through the LRC and vice versa. So, we have this bottleneck effect where students are coming, uh, head on at each other. So, you potentially got possibly 300 students all um, walking in the same direction towards each other. So, if you’re in the end of the block C and saying you’ve got a lesson at the end of block D, you just walk through the new building rather than coming around.

Speaker 1 (04:13):
And when this (extension) is going to happen, do you think you’d have one direction (circulation)?
Speaker 2 (04:19):
uh, It is something we could consider, maybe you could come back for us and, uh, um, uh, do another survey for us.

Speaker 1:
That would be great. Okay. And what's the situation with the dining spaces?
Speaker 2:
Uh, So, currently the dining space is, uh, we have two breaks and two lunches, but we are considering going to one lunch. So, increasingly, um, uh, the lunch becoming 50 minutes, uh, So, currently there are 25-minute lunch breaks. So, um, if we increase it to 50 minutes, we trying to get a 1000 students through in one sitting. And the idea is to use the restaurant area, the temporary atrium area and the cube as well for Dining

Speaker 1:
This area was in the original design a dining area or not?
Speaker 2:
No, it was an atrium. So, uh, an open space for, uh, could be activities or um, you know, art, but because of too many students, you had to increase and use the atrium as a temporary dining. So, the tables go up and down for break and lunch.

Speaker 1:
And you decided to have to go for 2 lunches?
Speaker 2:
The school they didn't want to commit to one lunch. Cause I suppose because there's such a small kitchen that they struggled getting a thousand students served, but we've got a much better service now and uh, okay.

Speaker 1:
And this queue like it was in the original design? like students would queue here to get in the kitchen?
Speaker 2: Um, I believe So, but it is ever since I've been here, four years now, it's been like that. But, um, it's something that we're going to have to look at when we go to one lunch because, uh, 50 minutes to get a thousand students for is going to be challenging.

Speaker 1:
And when So, you want to implement one lunch?

Speaker 2:
September 2020 one lunch we want to go to. So, it'd be an interesting to study to do afterward. Uh, sort of, um, yeah, no, we're potentially looking at two queues. queue this side as well. So, having the queues till the gate into into the dining room and crossover.

Speaker 1:
You can keep this queue for the younger group and the other for the rest?

Speaker 2:
Correct. Yeah.
So, in terms of circulation in the whole building, are there any rules to abide by? I see like signs "stay on the left"?

Speaker 2 (06:54):
Yeah. Stay on the left. And uh, the kids are encouraged to hold the door open for visitors and stuff like that. So, they are not slamming doors, just be mindful and caring really.

Speaker 1 (07:05):
But the direction of circulation is not a single direction?

Speaker 2 (07:11):
Uh, no, no. We have to, we have to because of the geographic of the school I suppose you've got dead ends on either say and day. So, you have to go either way.

Speaker 1:
And again, on the second floor the two wings are not connected. Do you have a reason why was that?

Speaker 2:
It's a good question. And it is definitely a design flaw with the architect, um, they should have been some link corridor, um, second floor to avoid going down cause we have, you can get from C to D in the ground and the first, but in the third, you can't, you need to come down. So, yeah, I definitely see it is a design flaw here.

Speaker 1:
Do you have anything to add, general comments about the school?

Speaker 2:
No, I mean I suppose when the building was built, it was built for it year seven. So, if we go back to the ground floor, yeah. Uh, So, when, when the building was actually completed, we're only a one-year group. Okay. So, we had year seven, So, block a was the only block that was open. So, block C, D and B wasn't really used. We just use these for classrooms. Um, So, obviously as a school developed and established in age and we got more and more year groves, that's when they started noticing flow problems. And So, um, I think it would have been different if, uh, the school was built and then we had a full picture in terms of year 7, 8, 9, 10, 11, and six form. Um, I think it would have been a different issue. Maybe red flags would have been, uh, established earlier on

Speaker 1 (09:00):
And for the playground, like, uh, you have one access to the courts?

Speaker 2:
Correct? Yeah. Yeah

Speaker 1:
And this area, why there's no access from here?

Speaker 2:
It is a good question. It's something that's been brought up, but I think mainly due to the levels. So, the level, uh, from the, um, block area from this building is probably 500 meters higher than the mugger. So, it wouldn’t be DDA compliant. Okay. So, that would have been why that’s there?

Speaker 1 (09:35): Because you know, students, mainly girls who want to sit here, yeah. They do not get in here because the long walk and the other students playing here.

Speaker 2 (09:47): Yes. This arrangement is temporary because we used to have all of this where the new building now this used to be social space with benches. A lot of the girls or females would, um, sit in and eat their lunch in this area. Because this is taken away, this is a temporary measure. So, these were always three football courts. Three Free five side football courts. So, once we get this new building back that all be reestablished as three football courts.

Speaker 1 (10:17): Yeah. And you have like the common spaces here?

Speaker 2 (10:20): Yeah. So, under the craft here, this is all under benches, table tennis tables. Uh, we're even looking at outside sort of a resistance gym. Yeah. So, yeah. So, exciting stuff

Speaker 1 (10:37): In the early mornings, you always have like this area very full of children or kids.

Speaker 2 (10:43): I say in the morning, the atrium is always clear because of the, uh, the, just the volume of steam.

Speaker 1 (10:48): So, students have to stay in the court before going off to classes,

Speaker 2 (10:52): Uh, they're not allowed into the bounds. I have to stay in the restaurant area. In the morning.

Speaker 1:
So, it is like an assembly?

Speaker 2:
It's a holding point for them. So, they come in a breakfast club. Some of them do have a before school club. So, we have gymnastics in the morning that go on in the gym, um, before, uh, quarter past seven. That starts. Uh, but yeah, generally the students come in the main reception and they're, they're held in this atrium restaurant area.

Speaker 1 (11:22):

Speaker 2:
13.6 Qualitative Data of School Teacher Interviews

Interviews with the schoolteachers are part of the qualitative data collected within the two observed schools. The Questions are ethically approved as part of the ethical application. This section provides details of the information sheet (13.7.1) and a consent form (13.7.2), handed to the interviewees to participate in the study. It also presents the interview questions (13.7.3) and their transcription (13.7.4).

13.6.1 Information Sheet

For interview with a teacher in the school
You will be given a copy of this information sheet.

Title of Project: Implications of the Spatial Design of School Buildings on Student Interactions and Student Self-Directed Learning Activities
This study has been approved by the UCL Research Ethics Committee (Project ID Number): 6118/006

Name of the researcher/interviewer: Ahmed Tarek Zaky Fouad
Address: The Bartlett School of Architecture, 22 Gordon Street, WC1H 0QB, London
Contact Email: Ahmed.TarekZaky@ucl.ac.uk

We would like to invite you to participate in this research project.
Details of the research:
Within this PhD thesis supervised by Dr Kerstin Sailer at the UCL’s Bartlett School of Architecture, the researcher (Ahmed Fouad) aims to investigate the impact of the spatial design of the school building on the learning process and the student activities. The research studies the design of school buildings and performs spatial (computer based) analysis on the floor plans to identify the potential of spaces to accommodate student activities. In order to find out how the users (mainly students) actually utilise the building, the researcher collects data about two case studies. Your school is one of them.

Teachers influence the learning process and student activities through their method of teaching. The aim of the teacher’s interview is to:
1. Understand the role of the teacher in the learning process inside the school
2. Understand the student duties on a school day

Procedures:
The interview will last up to 45 minutes and will consist of a series of questions, which you are asked to answer in your role as a teacher in the school. The interview will be recorded and transcribed. There are no personal information asked in the interview. The identity of the
interviewee remains anonymous. Only the transcript will be kept for further reference, which cannot be re-engineered to reveal the identity of the interviewee.

Please discuss the information above with the interviewer before proceeding. If you have any questions, or if any part is unclear, please let the interviewer know. They are willing to provide all information about the research. It is up to you to decide whether to take part or not; choosing not to take part will not disadvantage you in any way. If you do decide to take part you are still free to withdraw at any time and without giving a reason.

Thank you for reading this information sheet and for considering taking part in this research.
13.6.2 Consent Form

Please complete this form after you have read the Information Sheet and listened to an explanation about the research.

Thank you for your interest in taking part in this research. Before you agree to take part, the person organising the research must explain the project to you.

If you have any questions arising from the Information Sheet or explanation already given to you, please ask the researcher before you to decide whether to join in. You will be given a copy of this Consent Form to keep and refer to at any time.

**Interviewee’s Statement**

I ........................................

• have read the notes written above and the Information Sheet, and understand what the study involves.
• understand that if I decide at any time that I no longer wish to take part in this project, I can notify the researcher involved and withdraw immediately.
• agree that the research project named above has been explained to me to my satisfaction and I agree to take part in this study. Taking part in the project will include being interviewed and recorded (audio).
• Agree that my data, after it has been fully anonymised, could be used in this research project and subsequent publications.

Signed: ..................................................  Date:
13.6.3 Interview Questions

Section 1

- What subject do you teach? Where does the class normally take place?

Sub-questions
- Does the location change and why?

- Could you please describe a typical class you teach?

Sub-questions
- Class Duration

<table>
<thead>
<tr>
<th>Number of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>What are the learning formats implemented (discussion/lecture/exercise/problem solving. Etc.)?</td>
</tr>
<tr>
<td>What is the seating format? Does it change?</td>
</tr>
</tbody>
</table>

Section 2

- Could you please describe the typical daily schedule of most of the students?

Sub-questions
- Class Duration

| How many classes, average hours spent by student in school? |
| How many breaks? |
| Are there any gaps? |
| Other than classes, what activities do students do? |
| What are the after-hours activities? If applicable? |
| What differences are there for older students (sixth form)? |

Self-directed learning is defined as the process of students taking initiative to do some learning and social activities, which help them in their daily life inside the building, for example, reading a book, solving extra exercises, working in groups, doing homework, group meetings or revisions for exams.

- Could you elaborate on the SDL opportunities offered by the school?

Sub-questions
- What are these activities?

| Where do they take place |
| How often do they take place? |

Section 3
Informal learning spaces are defined as all the spaces where students can perform a social or learning activity, outside the classroom and not during formal, teacher-directed instruction. such as meeting rooms, multi-use labs and libraries, circulation corridors, staircases, assembly spaces and dining areas.

- **What do you think about the informal learning spaces in this school?**
  
  **Sub-questions**
  
  What could be classified as such in this school?
  
  How do you picture the students using these spaces? Does it happen?
  
  What do you think about the furniture types and arrangement in these areas?
  
  Do you think the school is making the maximum benefit out of these spaces?
  
  What could be improved?

- **What do you think about the formal learning spaces: classrooms, studios, laboratories?**
  
  **Sub-questions**
  
  What are the best features of these space?
  
  What do you think about the furniture types and arrangement?
  
  What are the problems in these spaces and how could it be improved?
  
  Is it successful as a learning space and why?
13.6.4 Transcription of the Interviews

For each of the two observed schools, there are two interviews for each school. The total is four interviews with teachers of the two observed schools. The following sections present the transcription based on the recordings.

13.6.4.1 Interview with Teacher 1 From School A1

Speaker 1 (00:04):
What subject do you teach and where does the class normally take place?

Speaker 2:
Um, I teach English to students with special needs and it takes place at all of my teaching is in room 413, which is a very small room.

Speaker 1:
If you have any comments about the room?

Speaker 2:
Yeah, the room is, um, uh, I think it was originally designed as a breakout room for very small groups, like maybe three, four students with a table in the middle. We got up to 13 with three adults. And um, the crowded, how crowded it is impacting the behaviour and the learning that's able to take place. It's tricky.

Speaker 1 (00:55):
And the location doesn't change?
Speaker 2: No.

Speaker 1:
Could you please describe a typical class of yours?

Speaker 2:
Of mine? Um, I teach just the year sevens and eights and uh, we have three tables with an adult on each table. My, um, I'm on one and then I'm two LSAs on the others and we do it very prescriptive, uh, program that lets us, uh, observe their reading, writing, and behaviours So, that we can remediate on the spot. Yeah.

Speaker 1:
Do you use lectures or discussions?
Speaker 2:
We do very little talking at them. It's very much about them reading, discussing and writing. So, it's very student centered.

Speaker 1:
And what seating format do you use?
Speaker 2 (01:48):
We use three tables in kind of a butterfly format with two, two students on either end and then a teacher in the middle. And that seems to work the best in the room. But we could use more rooms.

Speaker 1:
Would you change the format if the room changes?

Speaker 2:
Um, what actually probably not. Uh, I would still probably stick with three tables, but, um, the students would just have more room to spread their things out. And we do quite a lot of art and drama and things. So, we would just be able to use the space better. We have to get the move. If we do art, we have to put everything away and it's, it's time consuming. And I think if we had bigger tables it would be more seamless and uh, we could probably stay in a bigger classroom to do the drama activities as well.

Speaker 1:
How many students in general?

Speaker 2 (02:42):
Well, we're supposed to have 12 students and three adults. And then we, we, when they're ready to be reintegrated into the mainstream classes, they leave our class. So, every half term essentially, we should have kids leaving. Sometimes others come in but mainly they leave, and they just are sort of back in mainstream. Okay. Yeah. So, this, the class size should get smaller as the year goes on. Okay. Right now, I've got 13 and two classes. So, those two have not been, I don't want to say they haven't been successful, but we haven't been able to let, let those students leave at any students in those classes leave because they haven't been quite ready, um, to go. They haven't made the progress that we expect. But the other two classes are much smaller.

Speaker 1 (03:36):
How different is it from typical class?

Speaker 2:
Um, it varies. We, right now I think to save space and rooming, cause we, we have, we have a rooming issue. What the school is divided into two sides. So, there is no, there are 90 students on either side of the year, A side and B side. And um, right now a side has three classes in English, three very large classes in English plus my small one and beside has four classes and my small one, So, they're smaller classes. Um, and that was purely because of rooming. They would rather have the smaller classes. That was one of the main advantages of teaching and learning in this building was that we had no more than 24 students in a room. Um, and now we have up to 30, uh, on the one side, um, which changes the, the behaviour management and the amount of personalized attention the kids get.

Speaker 1 (04:42):
Could you describe a typical daily school scheduling, of your students?

Speaker 2 (04:48):
Um, they have, uh, the lower school students have, um, six periods of teaching plus an SDL. So, they have two usually, well it's either two separate classes or a double and then break and then double or two separate classes and then lunch and then two, two classes at the end of the day. So, it's two, two and two. And um, and then an SDL, which is self-directed learning. And then, uh, the older years have an additional hour and their lunches and hour late. So, they do two, three and two.

Speaker 1 (05:23):
Okay. And other than the morning and lunch break, are there any other gaps?

Speaker 2 (05:29):
No, but I give my special needs kids who are doing doubles, they have to have a break in the middle. So, we tend to take ours out onto the mezzanine in Orion, the purple, purple super-studio uh, and they run around usually like chickens with their heads cut off because they just need to get some energy out of them. We also feed them during the doubles. We give them cracker; we buy these in
bulk because their blood sugar gets really low. So, the combination of feeding them and running them means that they're teachable for the whole double.

Speaker 1 (06:06):
Other than classes, what activities do the students do?
Speaker 2 (06:12):
Um, other than academic classes? Like, uh, I think they do SDL. So, self-directed learning. Some kids do three a week, some kids do one or two a week. Um, depending on parental desire for them to have clubs. Some, some, some kids are exhausted, and they need to go home. Um, I would, I would argue most of them are day is longer than most school days. Um, and especially the SEN kids are exhausted by the end of the day. Um, So, there are few kids who have no SDL because the day's too long already for them. Um, but they do anything from juggling to poetry to record music lessons, whatever. And then they have break time. You know, they play during break time. You've seen what they do during break time.

Speaker 1 (07:05):
I see some students during classes, they're not in a class. What are the reasons for that?
Speaker 2 (07:12):
Um, I am really strict about you have to stay in class. Okay. My kids need to be with me. Um, and we have a, in the English department we have a policy of students are allowed to use the forum as a, as a reward for really good work and really good behaviour. So, you shouldn't see students being dumped into the, the forums, um, because they're misbehaving. That's, that's, that's a strict, no, no. In the English department. I don't know. I don't, I'm not sure cause I'm not over here. I'm in the other, the other super studio, I'm not sure how well that that goes, but there are, the SEN department has given lots of kids the right to learning breaks and the students think that they can get them whatever they want. Um, but in my class, in the extreme cases of kids who are autistic or who have ADHD, they can have a learning break after they've demonstrated that learning has taken place. So, they, they're not allowed to leave. They can leave with their LSA. Um, only if learning has taken place. There's one student who leaves the classroom. Um, he's, he's, uh, finding this year extremely difficult for a lot of different reasons. So, he will often just spontaneously run out of the classroom. And a teacher, one of the LSAs who works with me will go in and have to find him usually somewhere in the building, cause he's very fast. And So, that, that's one student who might be out and about unattended, but he's, there's someone in hot, there should be someone in pursuit of him, if that makes any sense. I know I see a lot of students outside of classrooms as well and I'm not quite sure how that happens, to be honest.

Speaker 1 (08:56):
Cold you elaborate on self-directed learning a bit?
Speaker 2 (08:59):
Um, I currently don't do a self-directed learning. I'm, I'm, I'm supposed to be doing this thing called the big brain club, which is for very able dyslexics who need just an hour of support. So, my, that I usually run that two or three terms a year. Um, that's about to start up in the next couple of weeks for the rest of the term. But, So, that's an academic one that, that's not a selected one. That's an appointed one, um, where I have to contact the parents and say this is what I want to do if their consent. Um, and then we do very specific strategies around high, um, ability dyslexia. But I have taught juggling for SDL. Um, people in here do, um, recorder like the quarter. It's the variety of SDLs is massive. Um, we have people come in from the outside to do, to do drama workshops or rap, like a poetry slam workshops, that kind of thing. I'm not, I'm not because I'm not doing one right now and haven't had to do a sort of nonacademic one this year. I'm not quite sure what's on offer cause I'm
not really that involved with it. But every teacher theoretically supposed to be doing something once. I think we; I think we have to do it two terms, two of three terms

Speaker 1 (10:25):
The research is interested in informing spaces. Can you read this sentence which defines informal spaces?

Speaker 2:
Because we have such a problem with space, there was a time when I first was here that there were spare rooms and like my classroom was a breakout room. So, students with, um, like ASD or ADHD could go in there and have a like sit in a beanbag read, maybe even play a little video game for 15 minutes with their LSA. Uh, just have a kind of a place they could just unwind and refocus. Those rooms are gone now. So, we don't have that provision for those kids anymore, which has had a big impact on behaviour. I think of those kids. Forums are, are good places for informal learning when they're not being used to introduce a topic or a new book. Um, but yeah, they just have to be the, the, the right mix of students and they have to have, um, they have to have a very clear task in order for them to even the most self reliant and trustworthy students to actually get the learning objectives accomplished. So, I mean, there's a lot of outdoor space. I use the outdoors a lot when I'm, when the weather's nice and even when we're doing, we had an amazing, um, serendipitous occurrence, uh, situation where we were, we were looking at, um, a short story that involved snow in a blizzard and it started snowing. So, we went right outside and the kids, because a lot of them, I made them just without their coats on. I wanted them to be cold and I wanted them to kind of put their face into it and really feel, cause they were doing some creative sensory writing and they came back in after maybe just five minutes outside and they were able to, the writing was a million times better. I mean it was So, much better with So, much more vivid. Um, but you know, that just is luck of the draw that's going to happen or not. But I, I do take them out quite a lot. Um, once the behaviours kind of when I, once I trust them and I know that I can, it's like taking a puppy at once. They are you can recall them without too much bus then then they can go outside to learn. I like taking them out a lot in the nice weather. So, I would say that's a good feature of the school. There's a lot of outdoor places we can work.

Speaker 1 (13:18):
And what do you think about the furniture? In the school?

Speaker 2:
Um, there are some issues with the furniture. The best tables we've been told are too expensive, So, we have to get, like there were these really nice big round tables. Um, they're too big for my classrooms, but they would have been good for the larger learning spaces. And prior to this year I taught mainstream classes as well as the SEN classes. So, the furniture in my room right now is fine. I'm very picky about the kids sitting in green chairs and the adults sitting in gray chairs because it just sets the tone and the, the expectations of where they're supposed to sit. So, I have four of green chairs. Um, and they're nice chairs. They're the ones that I like those ones. They're, they're kinda you know, the green ones. Have you seen the green ones? Yeah. That, that shaped chair works where I think it's comfortable and it works in the room really well. They fit under the tables really well. Um, and I liked the fact that we have different colours cause that does, it's a small thing, but it makes a big difference because chairs are, chairs are such a big issue for a lot of SEN kids. They all want to be in the, in the the, the chairs that turn and a lot of them shouldn't be in turning chairs cause some of our students need to move in order to learn to open up their neurological pathways. They have to be in motion. And, um, and when I taught mainstream, there were kids, I would make sure they had twisty chair. They weren't allowed to spin it, but they would sit in a twisty chair because they, um, they needed to, or they would stand at a ledge and be able to move around a bit when they were doing their writing or they would have basketball under their under the table So, they could roll it with their
foot. So, all of that stuff, um, as long as they understand that they’re not to play with the ball and they’re not just throw the ball and they’re not to spin around on attends, all those kinds of things that were just about classroom management. But those, those are, um, really fundamental to my teaching is that they’re comfortable and they're, then they're physically in a state that they can actually learn or open to learn and the furniture helps with that.

Speaker 1 (15:35):
Back to the learning spaces or the influence of learning spaces, the learning terraces, you were talking that you take the students out there. Do you have in mind any other use for the learning terraces?

Speaker 2 (15:50):
Drama activities we do out there. Uh, we do drama. We do, we do, we’ll do writing out there. If it’s a nice day, they can take their books out and we can, we can use them. I like the location of my room because it’s close to that space. And that outdoor space just works really well for my kids. They, they’re pretty good at, depending if it’s a break, they know that they can run around, and they do run around. But if we’re out there to learn, then they'll, they'll, they'll do their work then they won’t just, you know, they don't associate just with running around and acting like, you know, little puppy dogs. So, it's, yeah, I like that space. That's a really, that's a good feature. And I like to get them outside as much as possible just because it's nice to not be in the room. Our room is So, small and it's, it's hot and it's, sometimes it's too light and sometimes, well it's never too dark, but it's just not ideal. Um, yeah, I think that's all I have to say about that.

Speaker 1 (16:51):
During the breaks like morning and lunch break. Are the students allowed to stay in the terraces?

Speaker 2 (16:57):
They're supposed to all be downstairs, but my duty during break is on Thursdays is on one of the terraces and kids, our kids are there. They've always been allowed to be out on outside. Um, I think that's changed, but I'm not, I do you guys know, are they allowed there? They are supposed to be downstairs, aren't they?

Speaker 3 (17:19):
It's a question I've had since September. Yeah, when I see someone, I tell them you should go, and they say but no I am allowed.

Speaker 2 (17:32):
If there is someone, but I mean, I, my duty is on the terrace outside on a Thursday, someone’s always supposed to be there during break. I think. I wonder six formers. I think six forms don't need to be supervised, but um, yeah, it's, it seems like it's, it's a rule that isn't enforced properly. So, I try to chase kids down if they're just, especially if it's a nice day, I just, I just tell them to go get some fresh air, you know, just run around outside. If they're running around doing things like, then they should just be outside. Some kids, if they're sitting reading, I don't have the heart to tell them that they have to go outside to read, you know. I mean, I feel like that's their space. That's their choice to, to relax. But technically they should not be unsupervised. So, um, but I have, you know, you could spend your whole, all your free time getting kids to leave the spaces and there should be other people patrolling, uh, without a higher pay grade than, than I, than I have to be blunt to get to enforce those rules. I think there's always a patrol, there's an SLT (senior leadership team) patrol. I think that's, that's probably their function. But I try to help out when I can. And, um, the other thing is to say that the prayer room is on the fourth floor and um, sometimes the kids can't get in it. We were told a prayer room was going to be established on the fifth floor and it was going to be the prayer room during break times. That never happened. So, the default prayer room is over in Orion over there. And I often opened the door for the kids who are going into the room. Uh, it's a 408 is the one that most of the kids go to now they've taken to the ones who are really devout and don't just muck about in there. Cause there are, there's some, some, some, most of them I say are really take, they take it seriously, but the ones who take it super seriously will pray anywhere. They'll pray in the hallway; they'll just
make sure they do their prayers and go back to doing whatever they wanted to do. There are kids who just use it as an excuse to be in a room and, and to have some fun and they'll, it'll be a mixture of those kids. And the kids who are really devout and are praying, but there’s no supervision of that room. And I think that’s probably a problem. Like that might be some sort of a like there should, I think there should be someone on on duty in that room possibly. But what do I know?

Speaker 1 (20:16):
Talking about the corridors, can you discuss indoor and outdoor corridors, where kids are supposed to be?

Speaker 2:
They’re only supposed to use the outdoor, the indoor corridor if their classroom is, it’s one of these two, or maybe this one on a different floor. Like I think we might have a couple of classrooms, like my classroom is, is one of the little rooms. But, So, if it’s, if it’s impossible to get to, obviously they have to use the indoor corridor, but everyone else should be using the outdoor corridors. It’s, it’s very, um, it’s patchy in terms of their enforcement of that. We try, because ours is the main thoroughfare. The English department tries really hard to keep it clear, especially when there, there’s turnover and there’s GCSE or any classes going on because there's So, much disruption. I taught in that I taught in vela last year. And it was just a constant battle to get kids to follow the rules of flow. Um, they're gonna, they're gonna push against that constantly.

Speaker 1:
There are like five houses? each house has a floor or how does that work?

Speaker 2 (21:39):
Each house has a super studio except for Equuleus. My house sixth form pretty much has taken ours, So, we don’t really have a home and it, it definitely affects the cohesion in the, in the house and where we can meet. We rarely meet as a house because we don’t have a super studio anymore. So, that, that kind of, it’s really unfortunate that we don't, we don’t have that meeting place, but, um, all the others have a super-studio, So, Lyra they've got the red carpet there, the red house, then there's the steel coloured carpet that's vela and Orion's purple and Cygnus is upstairs and they're, um, green and we're on the sixth floor. So, it's, it's like a T, but the sixth floor is not ours anymore. So, there’s these six months. Yeah, it is. It’s really, it has an impact, definitely hasn’t it?

Speaker 1 (22:37):
Do you have any more comments about corridors?

Speaker 2:
Um, I worry about, I mean, there there’ve been, I, I, I worry that we’re going to have a tragedy someday with the after corridors because there’s a lot of rough housing and, um, we’ve had kids like, you know, try to jump up and it just, it scares me a little bit. Mostly it's fine and I'm not afraid of heights and I'm not a neurotic person, but I just do you worry about the safety of the kids and because of the behaviour? Um, otherwise I think these, these indoor, these spaces need, need a corridor. They need a proper corridor if they could build a build a like a, you know, build a corridor across, that would be really helpful. But I know that that's probably never going to happen.

Speaker 1:
Are they very noisy? Like those spaces?

Speaker 2:
They’re noisy. Um, they're regularly disruptive. Uh, yeah, it's not great teaching in that space. I mean, to give you an example, I had, I had a class last year that was really, really difficult class and but they would, they were So, much easier to teach in a classroom than they, I had them in a classroom for, for one double and their reading session and then I had them in the open space and the open space learning was much, much, much trickier to manage. Yeah. They’re singles in the English department,
they're the, they get five hours of English a week in lower school, six in upper school. I mean in a, in case stage four. Yes. So, we do two doubles and a single and the single, as opposed to be either a lie, I always take mine to the library. They do silent reading, I read with them, we do, um, book reviews, that kind of thing. So, it's just to boost literacy. I don't, I don't, I sometimes if I need to, I'll, I'll with my, I'll swap a reading session because my kids, especially on a Friday, towards the end of the week, my SEN kids, they lose that ability to have a double session and have it be productive. So, while I might do the first session and then take them to the library for the second session and use their reading session as a normal English lesson to make sense. So, yeah, it's pretty much, I can be flexible. Like they let, they let us be flexible with those like. Every week, every week I try to take them what for one session, one maybe like maybe even if it's just a half hour, just that they get into the habit of sitting quietly and reading and actually enjoying that time.

Speaker 1 (25:45):
Do you have any general comments about the school, spaces or students?

Speaker 2:
I just wish we had; I think that one of two things should have happened in the design phase. Um, not design phase, but when it was brought to the learning, the local education authority, it should have been 150 per year group or we needed more rooms because we have 180. Um, and they're like, my, my daughter's school is down the road and she's at Camden school as well and they're 150 school, So, it's possible to have a 150 school. But I think they looked at this building and the size of this building and I thought this has to be a 180 school. Um, but it just doesn't physically work. We've got English lessons going, going on in canteens without the right resources. And it's, again, it's hard to manage a class in a canteen situation. Um, they, they didn't, we have 180 per year group your group for five, five, five, five years of one 80. And then the sixth form is, what's the class size up there? Is it like 150 maybe for the two years?150 and each, somewhere around there. It's not too, it's not too much. Less than one. I mean it's not 180, that's for sure. I think they have maybe 120 to 150 places available. Five years, five years at 180/year groups. what I'd heard when, when the squeeze started happening, cause I was here when it was just the third year group here. Okay. So, it wasn't a full school. we had heard that they, they didn't, the architect didn't understand that all members of staff needed a desk. They, they thought only teachers needed desks. So, all the learning support assistants like you're sitting in my learning, not my learning, but the English department's learning support assistance desk. She clearly needs a desk. So, all of the, when we first got here, the staff room was a really nice lounge kind of space. Although it's So, far away that we're, we're just too busy to spend the time to. I occasionally I'll go down there, just the vibrancy and people who are, that have that office, or a need really need to microwave something. that used to be more of a social space and now it's a workspace for mostly learning support systems, but also teachers. Um, they just didn't account for the number of adults that were going to be in the building. Okay. And that's why this used to be a classroom. Um, the one above used to be a classroom, uh, room 409 used to be, uh, an office, um, so, things kind of over the years have got squeezed and what we need. What I'm, what I would love to see is because I know that it's not possible to have any building works done in such a short period of time. If we could get like two nice Porta-cabins on the playground somewhere, whether they're, uh, whatever space they could be put in. Maybe even the mezzanine or, I don't know if it's load bearing, but, um, we need space for, for special needs kids to be taught and have interventions to be done because there's no way for it. Um, the library is not a quiet space. It's, it's a, lots of people do work with kids in there and do intervention. So, it's, it's difficult train the kids to read silently and, and expect quiet in a library when the mezzanine is loud. I don't know if you've been down there, but the mezzanine that overlooks the, the library means that the library is never quiet cause they're doing interventions or chats with kids up there. Um, and vice versa if they're trying to do work up there. That used to be an office space, uh, they can't do work up there because the noise from the library is, is distracting and there should be a place for kids to go to be quiet and we don't have that in this building really. Um, yeah. So, I would love a couple of, or even three spaces that we could turn into nice classrooms. Even if they're like
small tables with like maybe one to two, one teacher to two kids or even the, even the, the, you know, I wouldn't mind teaching in a larger one instead of the room I'm in. Um, departments? Um, humanities, science, English, engineering, art, PE, languages, math, music, I guess that's, I think that's Sen is another department. So, I guess that's 10 departments. Um, engineering has massive amounts of space. Art has massive amounts of space. Music has, is perfectly provided for um, Oh, drama, drama as well. Since 11. How many more I'm forgetting. I mean they're considered, I guess, performance that that faculty, I guess there, there's departments in those faculties. Um, but uh, some departments have really good provision, and some don't make it to the house, you know? Yeah. Well, well, I mean this is now our super studio English is super studio and that's maths and that ones over there is modern foreign languages and science is above them. Science is really well provided for to, well I say that, but they don't have enough labs So, they, um, they don't have the same provision as other local secondary schools and I think that does affect some people's choice of whether they're going to come here or not. Um, So, yeah, science, science considering where STEM school is isn't, they don't have, I don't think they have enough space. Some people have, some schools have like a whole block for, for sciences. Um, yeah. I don't think that they, I don't, I don't, I don't, I'd love to see like to see the, the way that, um, the brief was put together and all the consultation was done in the initial stages because it doesn't feel like all of the right questions were asked at that time. Please don't tell me your boss is, uh, or the professor's the one who designed the building.

Speaker 1:
I see two staircases, one in front of their super-studio, actually three and two on the sides. They are not used at all. one in the middle.

Speaker 2:
Yeah. They're, they're not supposed to use those because they come and burst into the learning spaces. Okay. But they have to do, you use them to get to drama. You can't get to drama any other way. So, it's like they have to go down to the bottom floor. The kids have to go from here down to the bottom and then up vela sorry up lyra get to drama, which is on the second floor. Um, there's a couple of constraints like that, like computer science is on two and you have to kind of, you can't go through the library to get there cause the Staff room is in the way. So, the kids, initially, when I teach the foundation kids, especially the SEN kids, how to get around, I just tell them to, I colour code their, we colour code their, um, their timetables with the nearest staircase and then they just go to that staircase and go up that staircase to get to that room. And that helps them hugely to, to, to actually not be completely overwhelmed by the place. But at this time of year, it's hard to remember that phase of the development of the foundation kids because they're, they're So, used to that they can find all the hiding places and they know exactly how to run away from teachers and, and you know, scoot through, um, by this time of the year. Yeah. Um, I can't think of anything else. The lifts are a nightmare because I'm sounding complaining, but they, uh, they don't go. Uh, it doesn't seem like they'd been programmed in the most logical way. So, if you are waiting on the second floor, but someone has on, it's down on one and someone's hit six before you've hit four, it bypasses you instead of kind of taking into account all the floors that are going up. If you, maybe, maybe there needs to be an up and a down, I don't know how it works, but it's, it's, there are times when I have a, I have a knee that flares up and sometimes I try to use the stairs, but if I'm going from one to six and I have to get there quickly and my knee is really sore, then I try to, and then I use the lift. Um, you wait 15 minutes to get on the lift, lift passes. Some kids have lifted passes and some kids have kind of like figured out how to get into the lifts without lift passes. And So, it's, that's all typical kind of behaviour management stuff. But it does seem like the, maybe, I don't know, it's all about adult presence mitigating these kinds of design issues. And if the adults aren't around to and aren't listened to, then you know, then it's a minefield, I guess.

Speaker 1 (36:15):
Detention in school is called community service?

Speaker 2:
Yeah. So, there's two different strands. If something happens in your classroom, you deal with it in your department. So, we have a departmental ACS every day. And, um, if the kids don't show up to that, then they go to head of department. And then if the kids don't show up to that, the head of department put it, puts them into a whole school. ACS, Academy, community service, ACS, you'll hear that word all the time. ACS, I don't know if any other school that uses that term, but um, So, that's how our department works at. The system is only as good as as the department's enforcement of it and we're, we're pretty good at it. So, I feel like our, um, it helps our behaviour management across the board and new people can, can pin their hat on something. Um, if, if, if things happen in the corridors during non-teaching time, then that's supposed to be dealt with through. This has changed so, many times. It used to be head of house, the heads of house would have ACS is, um, if something happens out in the corridor, I'll put it on SIM, I'll email the head of house and their tutor and I just hope something happens. Um, the whole school ACS is supposed to be seen as a, uh, like, uh, only if they haven't served another less serious ACS for my, for my money. And I know a lot of other schools have a whole school ACS that's manned by SL senior leadership and anyone, any infraction goes there. My daughter passed a note to her friend in English class to meet for a certain place at lunchtime and she was given a Friday whole school ACS for that. Can you imagine? I mean it was, and I would, she was all worried and nervous about that and I was like, I'd love to just have that as my only behavioural problem in the school. But um, the teacher doesn't have to spend their time doing ACS. His department doesn't do it. It's a whole school ACS. And there's a lot of kids who go to those and it's probably in a, in a, in the main hall or somewhere and it's, and it's just dealt with that way very cleanly. Um, we seem to have, like we have a lot of layers and strands and I've been here five years and I still am not a hundred percent clear on the, what happens in the corridors. So, generally I take matters into my own hands because I cannot abide, disrespect or unsafe behaviour. So, I'll just make them, if I have a three period, I'll find that kid and I'll make them serve ACS with me and just get to know them, have a chat to develop some sort of relationship So, it doesn't happen again. But that's, that takes a lot of time and a lot of effort. And it would be nice if we could just say whole-school ACS, no matter what you know, I think we overcomplicate things a little bit here.

Speaker 1:
Do you want to add anything?

Speaker 2:
I can't think of anything.

Speaker 1:
Oh good. I got to know more about what's going on.

Speaker 2:
Yeah, yeah, yeah, yeah, yeah. Well any if you have any followup questions, let me know. How much more time do you have with this?

Speaker 1:
a month maybe?

Speaker 2:
Speaker 2 (00:03):
Yeah. So, as a school, I mean we haven't at the minute while in these discussions about, So, we're not, we're concerned how these, these big open plan learning spaces are being used. Um, and the biggest, the biggest drawback that people are saying about why they're not these spaces, why it's difficult to teach in these spaces is the movement of students around the school. So, I think your project would align nicely with our outcomes from what the discussions around these big large learning spaces cause open learning space essentially being disrupted by kids walking through not using the outside corridor. Yeah. So, it's a sorts of space thing, partly a space spacing, the infrastructure of the school, but also a curriculum design thing. And it's also a timetable design thing. So, my thoughts on this is when I really innovate a school building, we need to have an innovative curriculum, innovative, um, timetable to work in these spaces. That's my honest thoughts on that.

Speaker 1 (01:09):
Do you have any idea how this can be resolved from your experience as a teacher who teaches in these spaces?

Speaker 2:
Um, well where the current timetable works, you have, um, sorry, I'm talking through like, So, So, this fifth door where I teach the humanities department, um, I mean the way the timetable works, we still have quite traditional subjects. Um, So, you have your home to your science, your history, your geography and So, on. I think we can think thing. I think on a school school level, I think about timetable and curriculums just to reduce the amount of movement from students going from place to place. Now from what used to happen many years ago, each suit, each super studio space would have had a year group there rather than, but now then the change that towards having more of a subject out there. So, there's sort of this fifth-floor plan we're looking out here for this, this, this space here is predominantly humanities lessons. So, history, geography and ARE predominantly in those spaces. So, by subject, So, because, because each, each Super-studio is done by subject. So, the fourth floor you got the vela super-studio, which is maths and the Lyra super studio, which is English. And the orion which is languages. And obviously you've got your specialist space, like the science. The science has to be up to have the labs and artists. That's the heart space and engineering an engineer's space. But by doing that leads to more movement around the school. So, actually you could in theory have less movement around the school if the super studio space was owned by a year group. So, in fifth floor you might have your, um, level one and level one plus students who, who own, who will, who it stays in that space. So, you've got foundation, which is a seven level one level one plus, which is year eight and nine. And he got level two and two plus, which is the GCSE years. And he got the level three and facilities got seven, seven year-groups. Currently level three are the only year group who have their own, who have their own space, their own super studio, which is the sixth floor. So, they don't move around as much. Yeah. The sixth form. Yeah. Yeah. So, they're on the sixth floor. So, they, they've got all the right, they're all in that space on the sixth floor. Okay. Yeah. But the way that the curriculum, the timetable works, um, it's almost like a square peg in a round hole. Let's say we've got quite a standard timetable, which doesn't fit this, this the model of the infrastructure of the school. Yeah. So, previously when we had year seven on one floor, there'd be less movement. Yes. It moved to, um, engineering and science spaces. But the predominately upper lessons on, on, on one floor. Um, I think it was more pushback from curriculum leaders. So, they wanted to, their specialised space. They were in classrooms that can have displays of their work and So, on and from, from their subject. But you know, if you had a, it's hardest. It's just, you know, in future you could think in terms of future curriculum design, you got to have more cross discipline, interdisciplinary learning. So, you might have a, a maths and a geography lesson going on in the super studio. They'll know in theory, a mass and a
geography teacher. Good. So, if you had, let's say for instance the idea of seven on one floor, the teachers would move to them rather than the students moving around. Okay. Yeah. So, teachers do have like portable laptops and things, So, that, that, that, that would reduce the amount of movement. I think we'd have to think more carefully about actually how you designed the curriculum. So, you might have more cross curricular stuff going on and So, on. So, it's quite a difficult thing to do actually in a school of this size. And they might have students there are, yeah. It takes a lot of thinking about the be honest and how that would work. Yeah.

Speaker 1:
I will take a step backward and ask more general questions. So, what subject do you teach and where does it normally take place?
Speaker 2:
So, I teach geography and I'll be on the fifth floor. So, when this plan here, and they'll have them in predominately in the super studio space, but sometimes in these, these three classrooms.

Speaker 1 (05:37):
Could you describe a typical class in terms of formatting? Seating?

Speaker 2:
Yeah. So, a typical class will be split into, either, a 30 or a class size of 24 and there'll be split of a class size of 30. It'll be six, six groups of, of um, So, five groups of six. So, split into learning sets and their space here. So, the learning set is six students. Yeah. Yeah, yeah. So, the, the learning will be designed around the learning set and how the students collaborate across those though that could be a six. They're all from the same house. There are from the same house. each learning set. Yes. You will have mixed houses in the class.
Speaker 1:
Do you change the seating format?
Speaker 2:
No, you know, I just have them just have them in, I mean, the consistent approach. If we all did this across of school, if we all use the learning set and it would work a lot more effectively, I think. So, I never tried. I never try. I never go from, I never divert, um, divert from that. Always stick the kids in the learning set of you.

Speaker 1:
Could you please describe a typical daily schedule of a student?
Speaker 2:
Of a student? Um, well this could have two hours of geography in the morning, then they might go and have two hours of, of science and they might go and have an hour of PE and then they might go and have an engineering lesson. That's all. It could be all over the place. Basically. It could be traveling up and down five flights of stairs, which also eats in the learning time as well. Yeah. And it's that, that, that movement around the school that causes the disruption of learning spaces and disruption of learning generally. Yeah. So, I think reduce the movement. It improves the learning.

Speaker 1:
And what about the breaks? They have two breaks per day?
Speaker 2:
Yeah. They have a break from, um, let's change now they have a break from, um, 10:45 till 11:10. Okay. Um, and So, that's, that's, that's all the school. Yeah. At 10:45, 11:10. Um, and then they have a lunchtime. So, the lower schools as you see a seven, eight and nine foundation level one and level one plus have their lunch from 01:00 to 01:45. And then this level two and two plus three, three plus have
their lunch from 01:50 till 02:40. So, it's quite a long time. Those lunches actually. And that's when he gets to know from the space outside of their quite a contained space.

Speaker 1:
And like what other activities do the students have that other than the typical classes?
Speaker 2 (08:07):
So, they have a level two plus and to have a study period every two mornings a week. So, that's a sort of self-directed study period where they'll get on with the revision or, um, homework activities. It's like that's, that's above and beyond the core curriculum. Um, and their day will last till quite often until 04:30. The younger students, um, finish their lessons at three 35 and then they have an option to do a self-directed learning program. So, they'll do that on a Monday or Wednesday and a Thursday. Um, and the, they have to do at least one, there's three SDL cycles across the year, um, in, in the three and three different terms that I think they have to opt in at least one of those SDL where they got a choice of it, you know, 20 to 25 different activities that could, they can opt into after school until 04:30 on a Monday, Wednesday and a Thursday. Um, this a whole range of different activities to do for that.

Speaker 1:
And there are any gaps between classes or just the circulation gaps?
Speaker 2:
Just, just, just the gap from getting from A to B. So, you might have a student who's all the way down on the, um, second floor and computer science might have to go all the way to the other side of the building to the orion super studio for four languages lesson that that could potentially happen.

Speaker 1:
The gaps are five minutes in the schedule?
Speaker 2:
There's no, there's no gap between lessons to account for movement. So, the lesson. So, say for instance, um, most lessons will be designed to be double periods anyway, but there are, there are single lessons. So, they might have, um, So, they start at 08:30. Yeah. And then our first lesson last, some eight 30 till nine 25. So, say that lesson ends at 09:25 and computer science and the lab, the lesson starts at 09:25 for that, for the next lesson. So, there isn't actually any timetabled time for students to get from one lesson to the next. Okay. So, let's just, let's just down to the sort of teacher informally. So, the teacher will know like more students if more students are getting there on like at half past nine or 09:27. Um, they will know that they've got like the class of come out slightly late on the previous lesson though they all come from quite a long distance. So, it's not that the teachers really to sort of judge that. Um, and if a student's like, So, say to other students who haven't come to the rest of them and, or significantly lays behind them or you know, actually those students, um, uh, probably playing a game.

Speaker 1 (10:50):
So, let's talk about self-directed learning now. Uh, how does the school implement it?
Speaker 2:
So, we have, um, a member of staff who's in charge of the administration of it. Um, they have three self-directed learning cycles per year, which lasts, which was on a Monday and Wednesday and a Thursday. Um, essentially all members of staff have to offer, um, uh, um, an STL and two and two of those cycles. And then one, they don't have to do anything stuff you're doing, offer an SDL that might, might be put on a patrol or duty where they go around the school and check for truancy and things like that. Um, So, then students got a list of options and then they opt in from the first, second, third choice, and then the member of staff iron will go through that and she'll, she'll allocate students to each SDL. Okay. Yeah. So, I've got quite a big range of different self-directed options. Yeah.
Speaker 1:
How does it take place, when and where?
Speaker 2:
So, that time of day, um, the space and the school's quite free, apart from my level two level two plus lessons are going on. So, you'll have lots of sports activities down in the PE area like basketball and football and things like that. Um, there'll be activities, it depends on what the activity is. Some activities require outdoor space some of them require to be in a computer suite. Most activities will take place in free classrooms and classrooms. So, I'll be part of the timetable, um, an I and a lot those, those rooms as well too, but also depend on the size of the group as well.

Speaker 1:
How do you think this is different from the typical definition of self-directed?
Speaker 2 (12:33):
Um, well I guess we use the word self-directed means that students would lead and organize and their own learning. Some not, not all. SDLs are like that. I mean, you might have an SDL on parkour or for instance, where you'd have a, uh, uh, a trained Parkour expert that come in and teach the students on that park or is, but it's, it's, it's self-directed in terms of the choice. I've got quite a range of choice and the activities they want to do. So, the students choose what to do and yeah, but not how to do it. Depends on the SDL. So, some SDLs we want students to lead and you know, we want students as you suggest their own SDL activities that they want to do and So, on. Okay. But you know, we have outside experts from UCL, from the local community who come in and deliver SDL programs for them. Um, So, it's just given them that rich cultural experience that, um, like many of our students on free school meals for instance, wouldn't have though that experience at home. So, we've got this has got all these extra experiences that we're offering as a school for that, for those students.

Speaker 1 (13:43):
Can you read this sentence about informal learning spaces? Because I have some comments on it
Speaker 2:
I don't think there is enough informal spaces in the school. Okay. Well that'd be my first hunch. I mean, if you take, um, I mean it's just, it's a trust thing as well, isn't that, I mean like let's take engineering space for instance. It'd be nice to have, you know, students coming in there and making and experimenting and doing things they're interested in and they will in self-directed format. But I think often within those sorts of spaces, if you've got health and safety and things to think about, and often it would be directed by a teacher as well, don't they? Um, okay. The house canteens, which, which are probably the biggest informal spaces and the out the outside areas. But again, as a trust thing, we wouldn't want students, um, I mean you could, you could argue that the super studio spaces could be informal between lessons and lunchtimes and things, but things do tend to get vandalised while, So, it becomes a trust thing.

Speaker 1 (15:04):
How do you picture students using these spaces? Like the super-studio in an informal sense?
Speaker 2:
In an informal, um, well in the ideal world, you want it to be like educational rather than just them just running around and being silly. You'd like them to be leading their own, they want activities. Possibly. It could be watching a film or a reading area or it could be a, an area where they're informally helping each other understand their work, but that those sorts of things need to be sort of directed quite a bit more by, by adults.

Speaker 1:
And what do you think about the furniture?
Speaker 2:
Um, the furniture is designed for the learning set, So, we've got these round tables, a fit 6 people. Um, and that works well for teachers who are comfortable in that form of those form of pedagogies who have got, who are very much about inquiry learning and, um, collaborative group learning. But I don't think it actually suits all teachers. I still think there are a lot of teachers in their school who don't teach and that don't have the confidence to teach with, with collaborative learning. The learning sites was quite complicated. Um, way of teaching. So, a lot of teachers who come from more traditional settings might prefer the students to be in rules, but with the furniture doesn't actually allow that, allow that to happen. Um, for more, I guess. But we do have the forum area in the middle of the super studio. So, So, one thing that, you know, we've, we've, we've messed about with changing the, the out the layout of these super studio areas actually to make this more of a Corridor actually, but actually it's, it's, it's, I think it's a totally wrong thing to do. I think we need to be designing our lessons, um, around the use of the actual super studio. So, you might have, um, So, in humanities for instance, certainly in year seven, you have four geography lessons going on at exactly the same time. Okay. So, but I don't think all of those teachers aren't comfortable teaching in a collaborative manner. So, a lot, many teachers prefer to just be in their own classroom space teacher, and they will in class and will in style. But actually, we need to become a bit more collaborative in that. You could use the forum space to do a lecture or a debate and they could break up this form space and be working in different groups with different students. So, it could be a bit more nuanced. The actual planning should be planning, or it's called called choreography. You should be doing a lot more on the choreography of learning in these, in these super studio spaces rather than just teaching our own little silos because it doesn't work here. We got two different classes doing two different things actually as a competition for the sound actually. So, if that's not that side of the watching a film or on another lecture and that side of the doing a sort of louder collaborative task, you got, it doesn't, it doesn't quite work. It's quite difficult for teachers to, you know, use questioning and question and answers with the students if there's not, especially if there's noise on that side. So, actually if you use the Super-studio space, when you've got more team teaching, you could actually like actually actually work out a lot better for the students and for them, for the staff. And then he got the, uh, the idea of, you know, experience. You might have more experienced staff who are more confident at their, their subject who can work alongside less experienced staff. Or you might have some staff who are more knowledgeable about different areas of geography than other, other, other staffs. A good to sort of needs to be more of a collaborative effort to use these, these super studio spaces.

Speaker 1 (18:43):
And what do you think about the learning terraces? The outdoor spaces?
Speaker 2:
I'm not sure how art use them or science, they might use them but, but I think, I think it's a bit, a bit of a dead space to be honest. Yeah, we've got the sixth floor, So, we've got like a terrace on the sixth floor and sometimes it becomes, becomes the nature of the school building. It becomes a problem with truancy and the students to hide. But actually, we should be thinking a lot more about how these outside spaces could be used for teaching learning and project work and things like that. So, your subjects like geography, science and engineering for instance, could be using these outside learning spaces to develop products, learning products and So, on. I think one of these is like there's like a garden, isn't there? There's a lot of soil. Yeah. I think, I don't know if Julianna does her project or garden club project there, but yeah, I guess we could think more creatively how these outside spaces are used because for, for, for, for teaching and learning, if anything actually, because at the moment they're just use the, just to just encourage a bit of silliness from the students to be honest. Okay. Yeah. Is that these, these spaces are a bit more purpose to them. There could be a living laboratory for biologists. Couldn't that for instance, sorts. All sorts of clever things we can do certainly from science and engineering subjects or geography, sustainability stuff, all sorts of clever stuff.
Speaker 1:
Do you ever think about having like lectures or classes there if the weather allows?

Speaker 2:
Well in geography, we'll take them out into like studies of the school, the microclimates. But that's, that's like literally two lessons of year. Okay. If you think about the longterm use of these spaces in terms of it could be longer term self-directed learning projects. I'm just thinking off the top of my head and geography now with teaching them about in a classroom about irrigation and hydroponics and aeroponics where I could actually be a really interesting project to do alongside science and engineering or use that space as well as a long term thing. So, we could think a lot more carefully about the outside space, particularly around, um, concept of sustainable development as well, I think. Okay. In terms of curriculum design, both the core curriculum and the, um, the self-directed learning

and in terms of furniture for these terraces. What do you think could fit them?

Speaker 2:
Furniture for the outside spaces. Also, if you, if you want to become informal areas, informal areas for students to go to. But the problem with opening up the, all these areas to informal, um, again, it goes back that, that, that trust thing. Um, So, when they have their lunch time, because of the, the number of staff you need to supervise them, we have them what we want them all down on the uh, on the playground downstairs. Just, just in terms of health and safety. You wouldn't, we wouldn't have enough staff to patrol and to patrol these spaces as well. Cause cause you know, students have to be supervised essentially. Um, but yeah, what would, I wouldn't, I wouldn't say possibly use these as informal spaces. It's just some of the things about isn't it? But yeah. Yeah. So, certainly some of the things about in terms of, you know, on the top about learning choreography and the Super-studio when you think about actually the whole school about, but then that builds into our curriculum plans of how we can use these spaces and a bit, a bit more detail, a bit more thought out of how we might use these spaces. Well, it goes back down to curriculum design and you know, moving learning beyond the walls of the classroom. There's lots of cover things dealing with your spaces. Yeah. I mean probably possibly getting like, um, an expert from UCL and sustainability. I've met a guy before I can use, he's talking about using these spaces is um, green cover doors to create, you know, you think about the outside environment around the school in terms of the pollution and So, on. So, lots of projects around that isn't there around sustainability of how we could use those spaces to, um, monitor and absorb air pollution for instance.

Speaker 1 (23:31):
Speaking about the corridors again, what do you think is the main differences between the indoor and outdoors?

Speaker 2:
Well, the indoor isn't a corridor, it's a, it's a space that is not just become a corridor, like an informal corridor. Yeah, that's, that's, that's essentially one big classroom learning space. The outside is a corridor, but because of the movements and you know it's, it's, I mean this was some school of thought like we should just say a kid actually every time you walk through a super serious you got detention. Like your behaviour support, you will actually know it's, it's gotta be a bit, it's a bit more complex than just giving out detentions. Yeah. Yeah.

Speaker 1:
But some of the staircases, like if you look on these side ones, they only open on the inside corridor. So, one, two, three staircases, they open on the inside.

Speaker 2 (24:30):
I don’t know fully, I should know this, but actually they’re there. Our school, it's really hard to monitor that actually. So, the go up that it shouldn’t be going up in the middle stairs essentially. Cause I’m going to come out of the, in the Super-studio but actually, but actually these, these ones here come out and then go on the outsides and go from there. The outside cover door. But if they come out here, they would be in another class in the art. I'll see. Also don't use that one, So, we need to come up this one. Then that's where they can use it in the, like in the science lab, this is as a staircase, not as this staircase. It’s the only options are this one. So, only the need to be coming up. Little staircases to use to go out to do that way. Yeah, yeah, yeah.

Speaker 1:
These are the main circulation cores in the school. Although there are like five staircases.

Speaker 2:
Yeah. Someone's to think about you actually around around movement. I mean my option would it be to redesign the whole timetable and the curriculum to be honest, but that's a massive, massive project. There's also some of the things about around circulation and movement isn't there, but how? How do you change student behaviour? I't is just anyone's behaviour isn't that? Well, how do you change people's behaviour to actually just same thing like I think the tube people just follow the same direction, don't they? Everyone else goes, then why doesn't that happen? How does it not happen here? Where you have students. Some students walk, it'll come up these stairs and walk through a studio. How does it become a psychological thing? How do you change your behaviour? Just naturally doing that without becoming sort of a draconian toddy off type of thing. There's a certain staircase that could be closed at certain times a day blocked off or, I dunno,

Speaker 1:
I think this one is actually not working right now. There's an exam in here, right? Taking place here, an art exam. So, this is, So, this staircase is not functioning.

Speaker 2:
Yeah. The other thing I'll be used to, they'll be useful area for your research Zaky. In terms of how you'd, how could you make movement better based on the current curriculum model? Current timetable. Yeah. How do you change student behaviour around that cause I guess I guess by human nature that's going to, this is going to do the shortest route, aren't they? To get to get where they need to be or in some cases students take the longest route, So, it takes longer to get to the next lesson So, that can have a bit more time to relax.

Speaker 1:
You're just trying to; do you know something other than what's asking?

Speaker 2:
Yeah, yeah, yeah, yeah, yeah. I ask you to pull in public spaces. Do you see that as much like that as I say that you, That's interesting. Yeah. I mean I've tried to try things like there are set of rules and guidelines what stairs students need to go up. And I'm on the senior leaders that senior members of staff and I don't know that fully actually. So, if I don't know it, part of the students know it. How do other staff know that? But, just having a set of rules doesn't mean that they're going to follow those rules and directions isn't it? So, we need to really complex project list in terms of what do we want to achieve. We want to have less students disturbing super studios and you know, take an agent’s going to get from me to be sort of, So, it's a big, big thing, isn’t it? A huge complicated project for what we want is in terms of what we think is quite a simple outcome, but it's not.

Speaker 1:
Do you have any comments about the formal learning spaces, like the classes super studios in terms of furniture arrangement size?

Speaker 2 (28:31):
Um, we, we're not, I like them. I like teaching a super studio. I prefer, I prefer teaching in an open learning space, and I do in a classroom and I prefer, I've gotten more collaborative. I'd rather teach alongside other people and be on my own classroom. But it depends on who you're teaching with as well, how, how, how enthusiastic they are. I mean I do like the space, but I've got quite big ideas around curriculum and lesson design and cardiography and things like that, which not everyone agrees with.

Speaker 1:
Do you have any comments about the building in general?
Speaker 2 (29:15):
I think there's a bit, I think the building can be, could, could be a really, I think that the infrastructure of the building could lead to really strong outcomes for our students if our curriculum and pedagogy would get that right. I mean there's lots of lots of conversation with members of staff about, well this doesn't work. This doesn't work about the actual change in the infrastructure, like locking doors for instance or you know, building walls and super studio. So, that's the totally that totally the wrong wrong approach to have. I think you actually, you've got the infrastructure to keep it as it is and then you change the other stuff around it. That to fit to fit that, I mean it's been that the school's being designed for a purpose.

Speaker 1 (29:56):
What's your favorite spot in the school?
Speaker 2:
Favorite spot? Um, quite like the library cause it's quite like, I quite like the live because it's quiet, but that's just what I need some us to do with my own wellbeing and stuff. Um, but my home is that, is that, that area that, that last fifth floor sickness super studio. I like teaching and in that space there and outside that super studio space there, um, I, one

Speaker 1:
Anything could be improved about this space?
Speaker 2:
The curriculum that goes in this space, not, not the space itself. I think the space itself as a Daily infrastructure is fine. I think it's; I think it's how we, how he designed the curriculum to fit that space. I think, I think the wrong conversations, about the actual building. I mean there are little things, you know, that design floors like not having staff targets and things like that, but that they're not impacting learning as such. I mean, we're fairly lucky to have these sorts of spaces. That's just how, how the people who are using these spaces or the adults who are using these spaces in particular, um, and making them work essentially

Speaker 1:
What's the Academy community services?
Speaker 2:
Um, the same as the detention. So, if a child's done something wrong, they'll stay behind. And in theory that have to pay back the Academy in some way, like litter picking or tidying a super studio space. In theory. Yeah. we have a warning system. So, it might be misbehaviour in class. So, you have a yellow Amber, red warning might get to a red warning. Um, first like minor things like talking, talking out to and things like that. Or it could be something major and I'll get an ACS or might be, I've not done the homework then stay behind and do the homework. It's all, all sorts of things. \\
Yes. Yeah. They sit on the table so, that the reception runners, so, um, they'll do things like take letters up to teachers or they'll go and take students who need to come down for an appointment and things like that. So, it's like, yeah, two students, I'll do that per day. Um, across the foundation level one, and then they'll be on rotation. So, they'll do like something to do their receptions you like once a year or something like that? It depends what it is, just depends. It's, I have every single lesson that I've went up to resection when has to do to do things. Yeah. Okay. Yeah. I'm gonna have to support the administration of the school. Yeah. Okay.

Speaker 1:
And back to Academy community, if a kid goes to this scholarship, do they get detention or no?
Speaker 2 (32:57):
No, you just said just be on sustainable to just stick to, to tell every child walks through at attention. It just doesn't, that just wouldn't work. I mean some teachers get really upset about it and then have conflicts with children, when they push past and so, on, but just need to be told to move on. I mean it's the right, it's the wrong move to go down given detentions for that cause even even some of the best kids will walk through the, the, the, the quickest route is just unsustainable. The staff just to have to teach your lesson and give out detentions as well. It's a small complex and just like when schools go down there, we have just given detention after detention. Actually, some kids will get to the point where they've got like 10 detentions when they're going to do them all and it's just totally, it's just a silly way of doing it. It's kind of unethical as well. It's a more complex issue than that around curriculum and space and movement and behaviour insights and things like that.

Speaker 1:
That was actually, these are all my questions. Do you have anything you'd like to add? Do you have a better way of doing? It might be. I don't know too, actually. I don't know. I don't know. It's hard. Nothing else to say really any. It's just, it's just, it's just, it's just a really complicated thing to think about that involves lots of different factors and lots of different people to be involved in the process. But ultimately the infrastructure's there. You don't want me; do you want to change it or be too costly to change it? It's the pedagogy and the curriculum that needs, and people's, um, opinions and mindsets need to be changed first and then the rest, the rest will follow.

Speaker 1 (34:39):
That's it thanks you
Speaker 2 (34:39):
All right. Thank you.
13.6.4.3 Interview with Teacher 1 from School B1

Speaker 1 (00:04):
Okay. Yeah, we can start now. Can you give me a brief introduction about the school in general?

Speaker 2 (00:13):
I suppose school has been here, 13 years ago. I've been here for the last 12 years. Um, the school when it opened, when I started, only had two year-groups. And it says some things that you’re seeing now, probably very different to what I sort of saw previously. Um, previously the school was at previously was a very old design school. So, there were different things that are here that I've never have considered being at my old school. It's like where down the corridors you've got the ventilation systems that stick out, um, would never work at my old school because students would have dropped things from them, etc. on a higher basis than they do here, etc. Um, So, when coming here for me, I just thought it was a disaster waiting to happen but didn’t end up by being quite So, but it is interesting with the design of the building, um, every year students always want to move those away. They always never see the point of them in a corridor as well.

Speaker 1:
What subject do you teach?
Speaker 2:
I teach called cultural studies. There’s a combination of RE (religious education), Citizenship and PSHE (personal social heath and economics)

Speaker 1:
Where does that take place?
Speaker 2:
Um, I'm nomadic, So, I'm all over the school. So, the three classrooms that we have a down this corridor, um, the C2 corridor, but I don't have a classroom So, I'm all over the place, which is why we randomly keep running into each other because I'm all over the place. Yeah.

Speaker 1 (01:37):
And could you describe a typical classroom?
Speaker 2 (01:42):
Oh, blowing. Um, most classrooms have got space for 30 students to be able to sit in. Um, obviously there's two different sized classrooms, particularly forget the computer rooms here. The larger rooms I would say are designed very well. The smaller rooms, they used to be planned on the wall, um, of the smaller rooms and it used to show space for 30 students, but the, all the tables hit both of the walls and was no break in between. So, that's obviously how people expected the students to come in.

Speaker 1:
And do students sit in your class?
Speaker 2:
Um, most of the classes I teach in, they are in rows. Yeah. If I had a choice I would go with rows.

Speaker 1 (02:24):
Can you describe like a typical schedule for your students?
Speaker 2 (02:29):
So, um, generally students would come in, stand behind their chairs, grab out their things, um, do the register, then sit down. Most of my lessons would be sort of sat in the same place and not moving around a huge amount and then packing away some behind their chairs at the end. And leaving
Speaker 1:
Any breaks during class?

Speaker 2:
During class, no. Nope, I'm not a very fun person.

Speaker 1 (02:53):
You can read this part. You don't have to read loud, just because I'm going to speak about a bit. Okay. So, can you elaborate on self-directed learning?

Speaker 2 (03:14):
So, I'm, I would probably say with regards to sort of moving around to go to those different activities that you've got listed, I probably wouldn't have them say if they were doing extra things, I'd probably have it already on their tables. So, they don't need to be moving around because any student moves around in a costume or out just extracts by the people. Sorry,

Speaker 1 (03:36):
So, outside the time of the classroom?

Speaker 2 (03:39):
So, for sort of, do you mean during the day? Okay. So, with regards to sort of, obviously you've got, um, you've got the LRC. I because I don't have one sort of place, I wouldn't necessarily say that I'm giving them activities to do outside of essence other than homework, but they would take away with them. Um, most of our students, we used to have a policy that I don't think is fallen quite So, much about not doing homework, etc, at lunchtime that it is only done after school sort of at homes. Um, we would have, I'd probably use classrooms afterschool for revision for exams. That would probably be where I would. Yeah, use some of them. You've probably walked down corridors at the end of the day that there's still So, many people around the end of the day. Yeah. Yeah. Revision or after school activities as well. Yeah.

Speaker 1 (04:38):
And what do you think about the furniture in the classrooms?

Speaker 2 (04:43):
I don't have to sit on the blue chairs very often, So, they're all right. I know that the students don't overly like them. They used to have, when we opened, they had the chairs that you're sitting on at the moment. Um, they worked out I think at about the same sort of price, but they problems is when you give students stuff like that that you can pick holes in and take out. That's exactly what the students do. Um, they also, those ones are designed that are very hard to swing back on the blue ones, whereas you could swing back on those very easily, which meant that they broke. And that's why there's very few of those around still.

Speaker 1 (05:18):
Okay. And what about the table?

Speaker 2 (05:22):
I've never really thought about it. I'll be honest. The rectangle tables are the ones that are the best. The ones that have got a slight curve on them are just a bit pointless.

Speaker 1 (05:32):
What are the best features of space for a classroom? Like what, what do you think of as being used the most?

Speaker 2 (05:42):
To be honest, if I go into a classroom that doesn't have a lot of stuff everywhere, um, tables laid out very nicely. Um, if So, some of them have cupboard sort of at the back of them. That's a handy thing. Um, ventilation, windows that open or windows that close. Simple things to be honest, it's sort of, you
can teach in a lot of different spaces, but there are some things that help with some things that hinder having a larger classroom, having the rectangle desks, windows that open or closed blinds that go up and down. Then things put in.

Speaker 1:
What would hinder?
Speaker 2:
So, not having a window that would open and close, whether it's too hot or too cold. Um, air conditioning would help in the summer when they will come in and tell you how cold it is. A blind that doesn't come down. So, you can't see the board or the Saudis in student eyes. And then if you've got a class of 30 students or 32 students just having space for 32 students. Okay. Because it gets hot and smelly and horrible and classroom.

Speaker 1:
Can you read this about informal learning spaces?
Speaker 2 (06:52):
I think that they, as our school has grown, they are probably too small for our students at times. Um, So, we've got 118 each year group except for your seven that's got 210 in it. Um, yeah, it's 118, So, 118 for four-year groups and then plus the sixth formers. But they don't often always use the space downstairs. Um, I think I think are compared to other schools, I think they're nice and open and light and airy in comparison to other ones that I've been into. Um, it's just space sometimes if it's a wet but isn't break like today where you can go outside is fine. Wet brake is a nightmare at times.

Speaker 1:
So, apart from the classrooms, where could the students sit to work after school and during break time?
Speaker 2:
So, after school and a break, they can only go into the LRC or downstairs and work during the break. If they're in the LRC, yes. Downstairs. Sometimes we've stopped them. Sometimes we haven't. Yeah. Yeah, I don't, I think we used to have a policy that was a no to working, but I think that that sort of has been relaxed. Yeah, that's it. But they're doing it sometime then.

Speaker 1:
How can we improve the spaces? if you have ideas?
Speaker 2:
I laugh because it's that whole, I don't know if you can improve what's already there sort of thing as in it would take having to wipe out and start to gain to improve it because you need more physical space, but you don't want more classrooms to used because you have to man them. Um, and yeah, I don't know because it's just the amount of space. That needs change. And even if you use the sports hall one that PE then can't use it. And two, it's not, you don't have that airiness that you actually have downstairs, which is quite nice.

Speaker 1 (09:17):
Have you ever been to the library? what do you like about it?
Speaker 2 (09:22):
So, what I like about it is I like that it's in the centre of school, um, that you can, this is what I like. It's probably the opposite to what librarian likes by like the fact that you can sort of pass through it. It shows if you're trying to tell students that learn, um, reading, um, is important than it shows that actually reading is at the heart of the school in the library as well. Um, the acoustics in there are good. There are certain spots, if you sit in you only need to talk very quietly, but as a teacher it echoes around.
Speaker 1 (10:00):
You're satisfied with the furniture in the library?

Speaker 2 (10:04):
Yes, because it's the same as everywhere else. So, I'm satisfied with that as I am with everywhere.
Yeah.

Speaker 1 (10:12):
Okay. Like I'm done with the questions about the teaching. I have few questions about management if you don't mind. So, what are the main rules the students have to abide by?

Speaker 2 (10:26):
Oh, blow me. Um, So, they should be sensible all times not running around. Um, because we have, if we, um, if there is a situation, sort of like a, either a build up to a fight or a fight that happens. We don't have them very often, but we use joint enterprise a lot. That element of if you are standing not trying to stop it, yours equally responsible as those taking part in it.

Speaker 1:
Any rules about sitting in groups?

Speaker 2:
They have different rules, different times about not sitting in groups of more than six depending on which tables you're at. So, like outside, So, outside, although that's eight because there you've got four sides sort of outside. we are trying to use it sensibly basically that they're not all shoved onto one chair and that they can't sit down the chain tables that have got four chairs around them. You can't have any more than four chairs around those tables So, you can't drag one from somewhere else.

Speaker 1 (11:31):
And I see signs like these staircases are only down?

Speaker 2 (11:36):
Yes. So, there are other than the staircase on the end of this corridor, all of them are either up or down. This one at the end you can have both up and down, but all the others are just up or down and students you have to and 98% of the time would say that they do.

Speaker 1:
walking on the left side of the corridor?

Yes. I think that is hard. That what I would say that we all don't do as well at. Yes. Yeah, we have queues in front of classes. yeah. Um, and much harder. If you come out of a classroom on this side and you're supposed to be walking on the left-hand side, you've then got to cut across the traffic to be able to get there. Whereas if you come out and just turn right, yeah. Then it's easy just to walk down, wider corridors. But again, you can't change that once school has been built.

Speaker 1 (12:27):
What privileges do the students get, if they do something good?

Speaker 2 (12:31):
They get green cards, which sort of gives them prizes, but essentially, they don't get into trouble. That sounds really mean and horrible. But you know, like actually just doing the right thing is what we expect sort of thing. So, there isn't, there's the, there's the green cards for students do over and above the right thing. But you don't get prizes just for doing the right thing because we should all do the right thing.

Speaker 1 (12:55):
Yeah. And doing exams. Do they have to study at school even if they don't have classes?

Speaker 2 (13:03):
During these mock exams they have to, um, during the real exams for most of them they have to be in still. Yes. Because some of our students struggle to study at home on their own. So, at least by being in, in front of a teacher, they're more likely to study than at home and they can ask the teacher questions as well.

Speaker 1 (13:22):
Are there any rules about not hanging out in corridors?

Speaker 2 (13:27):
During break time Um, in theory, during break time. They shouldn't be, other than if they're going into their lockers, they should go to the lockers and then leave that particular area. And they're not allowed to stand out in coders during lesson times either. I felt like this is a good test of what I can remember from the school policy here.

Speaker 1 (13:47):
I am trying to see how students are using the spaces. Sometimes I see patterns, but I don't understand why they're taking place. I have to like to ask someone about the pattern.

Speaker 2 (13:59):
Well if there's a particular pattern, if that makes it easier for you to ask rather than me guess what pattern you may have seen. Cause you've probably seen more patterns than I have cause I'm walking through. Whereas you're standing watching them. Yeah.

Speaker 1 (14:10):
For example, in most of the corridors sometimes it's very empty, completely empty and sometimes are like few students standing and I don't know if this should be the case or not.

Speaker 2 (14:22):
I would say in theory the students probably shouldn't be in the corridors. Um, unless they are waiting with someone. We don't allow students just to be sent out to the classroom to wait. They should be going somewhere. So, during lesson times corridor should be empty.

Speaker 1 (14:38):
But as soon as it can be sent out of class?

Speaker 2 (14:41):
They will be sent straight to "back on track". They shouldn't be just sent out for a five-minute breather. They should just be sent to sort of a "back on track" room is where they've been naughty. That's where they would go.

Speaker 1 (14:52):
Are there any forms of tutoring between the teachers and the students? Individually tutoring?

Speaker 2 (15:00):
So, the room opposite probably has small groups of students, um, working in it and there might be odd places around the school where that does happen. As well. Yeah.

Speaker 1 (15:12):
Last question. What's the main ethos of this school?

Speaker 2 (15:19):
That work hard and gives you success that isn't just sort of talent? It is what work you put in gets you that success at the end. Yeah, that's where I felt like it was a test. I passed that line. It was fine. I can remember the ethos of the school. Um, but that's what I would say is that it's trying to instill the fact that whether it's a love of learning for a subject or a love of learning full stop, but actually. Be here. Can get you to the next place.

Speaker 1:
Do you have anything to add?
I don't think So, Sorry. I'm very, very quick talker as well. Well, if there's anything that you want to know about, let me know.
13.6.4.4 Interview with Teacher 2 (Also the Librarian) from School B1

Speaker 1 (00:05):
I would like to start this interview. So, can you tell me your role in the school?

Speaker 2:
Yep. I'm the LRC manager. I'm the year seven tutor. I'm the cover supervisor and I also am I, Oh, I know. I also have to teach lessons, um, when you did.

Speaker 1:
Okay. Uh, could you please describe the school in general?

Speaker 2:
Mixed school? Extremely friendly. Um, a local community school. So, it's very much for the community.

Speaker 1:
And how does a typical class take place? Can you describe a class?

Speaker 2:
Yes. So, the class will either the class will arrive, or I will go and collect to the class. They then walk into the LRC, stand behind their chairs. They then wait for me to, um, get them to sit down. I then register them, and I then will using the whiteboard on the wall. Um, with the projector I display the learning objective for the day. I explain the learning objective. If it's a period one lesson, we have to do what they call a period one check first, which is where if it's a period one check, what we would do is we would check that the child has every single thing they need. It's normally 11 items. So, it's running for all the stationary. They need a scientific calculator. They need a planner and a reading book. But if it's a lesson between two and five, they don't do a check.

Speaker 1:
Can you tell me more about the daily schedule? How many classes?

Speaker 2:
So, we have, um, every day there's five classes. and one tutor time. Um, the uh, years seven, eight and nine have one timetable and the older years, 10 and 11 have a different timetable. Um, So, they're split in a day.

Speaker 1:
Could you read this paragraph about self-directed learning?

Speaker 2:
Self-directed learning is defined as a process of students taking initiative to do some learning and social activities, which help them in their daily life inside the building. For example, reading a book, solving extra exercises, working in groups, doing homework, group meetings or revision for exams.

Speaker 1:
So, can you tell me what self-directed learning activities you have in the school?

Speaker 2 (02:57):
Okay. So, in here they have, um, the LRC afterschool homework club. Um, So, that is a voluntary thing that anyone from any year can come to. Yes. In the LRC it runs from 3 o'clock to 04:15, Monday to Thursday, and it runs to 2:35 till 04:15 on a Friday. The average attendance amount is roughly 40 to 60 students that come. I have myself and a team of TA's that run. They also do something called accelerated reading, which is where only small amount of students will come out. But although they have to do that in their lesson, they will voluntarily come read books and quiz in their own time as well. We have the Duke of Edinburgh award, which they use the LRC to volunteer. So, they couple of times a week we'll come into the LRC after school to help myself, run the LRC, any relevant jobs that
need doing, book covering, labelling, whatever's needed doing. Also, the students will come here voluntarily to, um, complete homework or read a book during breaks lunches, um, and after school.

Speaker 1:  
What do you think about the formal learning spaces as in the classes?
Speaker 2:  
In here? Oh, I like it. I do like it. The only negative I find is like you can demonstrate if I'm doing a lesson, and it falls in the older year's break or vice versa. It's quite distracting because obviously I'm trying to keep them quiet and you've got a very busy corridor. Um, but in terms of an actual for a classroom, I love it. Um, I would love it if it was more updated. It's quite a dated library, but in terms of the actual space, I think it's great.

Speaker 1:  
And the furniture?
Speaker 2:  
Furniture all needs updating. But in terms of the actual what it's for, yes, it's perfect. I can get a full class in here. Um, we do a lot of events here. We do chess club; we do game 24. We do well quizzes. We do coffee mornings, um, EAL events. Um, and I can I have at some stages almost a hundred people in here. Um, So, it is a very good space.

Speaker 1:  
You can read this about informal learning space. You don't have to read it loudly just read it to know about it
Speaker 2:  
Yeah, yeah. They use this a lot. Um, they use this for meetings. Um, they use this, uh, students will come out and be interviewed by teachers there. They use this for, um, mentoring. Um, they use this if they have exams. So, next week they have the PPE exam starting. Um, my office turns into an exam room and a lot of the time some students may be coming in here to be, um, to do exams, etc. So, it is used a lot as you've been demonstrated or as I've demonstrated in the week, you've witnessed MFL, which is modern foreign language uses this everyday as a classroom to do daily lessons.

Speaker 1:  
Apart from the library. Do you think other spaces act as informal learning spaces?
Um, sometimes you might have the odd rooms, So, LSF they have their little rooms at the back they used as mini classrooms and you might find like an English in their corridor. They've got a couple of offices. They're also used as one to one, maths upstairs. They have a little class, like a It's used as a one to one. At the back of music. They have, um, individual classrooms that are used as music rooms. So, students will have one to one singing lessons. They'll have, um, playing an instrument. Um, So, that's in music. Um, you tend to find each department has some sort of mini room being used,

Speaker 1:  
What about the dining space?
Speaker 2:  
Um, that's more, that's not used by teachers that's more of 6th formers going there to study, or students will go there to study if that, if needed. It's more used. So, the dining room is used if they have an event. So, if we have, for example, we recently had our year seven, um, parent evening, like an open evening for parents, which was like parents were able to come in, meet us as tutors, they came a week, timed the, um, had like a little restaurant for them. So, they all came, and we had all the parents were able to sort of mingle. We had a little bowls of crisps and popcorn and snacks out. Um, and it was quite a nice setting. We put little candles on the table. The sports hall was used a lot on the main halls, used a lot of events always used.
Speaker 1 (08:09):
Can you describe the library in terms of all the activities that take place?
Speaker 2:
We have lots of activities. So, as I've mentioned, we did chess tournaments. We do EAL which is English and the additional language where the parents will come in and we do little events with the students and the parents. Um, we have um, quizzes, we have what we call game 24, which is a maps event that happens each year where lots of local schools will come in here and we run like a big maps competition. We have a library event coming up next year where I've got three other libraries that will come in here and use this area and we do like an orphan visit. We have lot a lot, lots of activities.

Speaker 1:
How many students visit per day?
Speaker 2:
Per day here? It varies on the day. I can have up to 80. I could have up to a hundred, I could have, sometimes I might have 30 or 40; it just really does depend on the day. As you've witnessed yourself at seven and eight and nine breaks is really, really busy. So, I can literally have up to a hundred students. Um, the older break you tend to get maybe 30 ish. 40.

Speaker 1:
And they use the space to study?
Speaker 2:
Yeah, not always just to study. So, some will come to study, some will come to read, some will sit and play games. Some we'll revise. Um, some might come and do artwork or anything that they need to do. They will use this space. Laptops, yes. I have 30 Chromebooks, which are brand new, this year. Um, I did have 60 laptops originally and if you see it, in break they are all out, every single one will be taken out and used. Um, the good thing about the Chromebooks when not only had laptops, the battery life didn't last very long, So, you'd find that sometimes I couldn't have them at break or lunch because I had to charge them. Whereas the Chromebooks say last 10 hours. So, they can be used all the way through the day, even in lessons, which is amazing. That's why a lot of the cover lessons take place in the LRC because I have the Chromebooks.

Speaker 1:
Perfect. Yeah, I'm done with my questions. Do you have any comments?
Speaker 2:
No, no. It's been, yeah, it's been a pleasure having, you know. That's right.

Speaker 1:
Thank you very much.
Speaker 2:
That was quick. Thank you.
13.7 Student Questionnaires

Student questionnaires are part of the collected data within the two observed schools. The questions are ethically approved as part of the ethical application. This section provides details of the information sheet sent to student parents or guardians (13.8.1) and the opt-out form in case some parents do not want their kids to fill the questionnaire (13.8.2). There is also the information sheet handed to students before filling the questionnaire (13.8.3). This section also presents the content of the questionnaire (13.8.4). Finally, it presents all the resulting outcome of the questionnaire, as compiled using charts and explained in text (13.8.5).

13.7.1 Information Sheet: Sent to the Student Parents or Guardians

Dear Parent/Guardian,

We would like to invite your child to participate in a research project on school buildings conducted at University College London.

The research is interested in how schools are designed, and how the design then shapes opportunities for students to learn and socialise.

As part of the research an online questionnaire will be distributed via the teachers and your child will be invited to complete it.

The questionnaire consists of two sections. In the first section your child will be asked to name their favourite places in school for specific activities (hang out with friends, have a quiet conversation, study alone, have lunch, revise for an exam); they will also be asked how large their usual group is that they spend time with and how often they use the library. In section two, your child is asked to rate the spaces in the school for two different scenarios, i.e. solitary and social activities.

The school is fully supportive of the study, which has been approved by the UCL Research Ethics Committee (Project ID Number: 6118/006)

Ahmed Tarek Zaky Fouad will conduct the research. He will be supervised by Dr Kerstin Sailer at the Bartlett School of Architecture, UCL, 22 Gordon Street, WC1H 0QB, London.

The questionnaire is anonymous and no personal information will be requested. Please advise your child not to provide any personal information (name, age, address) as part of their responses. If this should happen, this data will be deleted.
Please read the below information sheet. If you have any further questions about the research, please contact the school. If you would prefer that your child does not take part, you can opt out of participation. In this case, please sign and return the form enclosed.

If you are happy for your child to participate, you do not need to take any action. Thanks for your consideration and support.
**Research Information Sheet**

**What is the research about?**
This research is part of a PhD thesis about school buildings and the learning and social activities happening inside. The researcher focuses on understanding how the students use the building and what their activity patterns are.

**How will the children be involved?**
Students are asked to fill in an online questionnaire. It asks questions about the student preferred spots in the building and which learning and social activities they go after while on school premises.

**Who is provided access to the research information (data of the questionnaire)?**
All questions are general information about the school spaces and how students use them. The research will not ask personal questions in the interview. Please advise your child not to provide any personal details in their responses. The results of the questionnaire cannot be re-engineered to reveal the identity of the student. Also, the anonymous data is safely stored on UCL secured server. Only the research team has access to the data.

**Who has reviewed the research?**
The research study has been approved by the Research Ethical Committee and regulations of University College London (UCL).

**Who do you speak to if you have questions about this research?**
If you would like more information or have any questions about this research, please contact the school management or any school teacher. They should be able to answer questions about the research or forward your enquiry to the researcher and then come back with answers to you. You could also contact the research advisor Dr Kerstin Sailer at [contact information]. She is Associate Professor at UCL and happy to answer any question you may have.

**What do you do next?**
If you agree your child to be involved in my research, you do not need to do anything. Please keep this information for reference.
If you **do not** agree your child to be involved in this research questionnaire, please complete one copy of the attached opt-out form and send it to the school.

**Thank you very much for your time.**
13.7.2 Parent Opt-out Form

(If you do not want your child to fill in the questionnaire, please fill in the form and send it to the school)

Title of Project: Implications of the Spatial Design of School Buildings on Student Interactions and Student Self-Directed Learning Activities

I have read the information about the study and have talked about this with my child.

*Please tick the box below.*

I am not willing for my child to take part in the study.  

Name of child: ........................................

year: .....................................................

Signature of parent/guardian: ..............................................................

Date: ......................................................
Hello!
My name is Zaky and I am a student at University College London, studying for a doctoral degree at the School of Architecture.

I am interested in school buildings and how they support learning processes and social activities. This questionnaire asks questions about your preferred spots in the building for specific learning and social activities.

Title of Project: Implications of the Spatial Design of School Buildings on Student Interactions and Student Self-Directed Learning Activities
This study has been approved by the UCL Research Ethics Committee (Project ID Number): 6118/006

I would like to invite you to participate in this research project.

Please read the information above. If you have any questions, or if any part is unclear, please ask your teacher about the questionnaire. They should be able to provide all information about the research. It is up to you to decide whether to take part or not; choosing not to take part will not disadvantage you in any way. If you do decide to take part, this questionnaire is completely anonymous. No one will know who filled it in.

None of the questions need your personal information. Please do not write any personal information within your responses.
Thank you for reading this information sheet and for considering taking part in this research.
13.7.4 Student Questionnaire Content (18 Questions)

- What is your school year? (Select from drop down)

- What is your favourite spot in the school to **hang out with friends**? (Drop down question)
  - Super Studio
  - Playground
  - House/Dining space
  - Library
  - Corridors
  - Outdoor Learning Terraces
  - Lecture Theatre
  - Any of the studios
  - Other

- Please explain where exactly this favourite spot for hanging out is (which floor, which corner
of the space, which house you’re in etc.) and tell me why you like this place. (open text box)

- You want to **talk to one friend in a quiet space**, where do you go together? (Drop down question)
  - Super Studio
  - Playground
  - House/Dining space
  - Library
  - Corridors
  - Outdoor Learning Terraces
  - Lecture Theatre
  - Any of the studios
  - Other

- Please explain where exactly this favourite spot for quiet conversations is (which floor, which
corner of the space, which house you’re in etc.) and tell me why you like this place. (open text box)

- Where would you go if you want to **sit alone**? (Drop down question)
  - Super Studio
  - Playground
  - House/Dining space
  - Library
  - Corridors
  - Outdoor Learning Terraces
  - Lecture Theatre
  - Any of the studios
  - Other

- Please explain where exactly this favourite spot for being alone is (which floor, which corner
of the space, which house you’re in etc.) and tell me why you like this place. (open text box)
- Assuming you could go anywhere in the school, where would you **have lunch**? (Drop down question)
  
  Super Studio  
  Playground  
  House/Dining space  
  Library  
  Corridors  
  Outdoor Learning Terraces  
  Lecture Theatre  
  Any of the studios  
  Other  

- Please explain where exactly this favourite spot for lunch is (which floor, which corner of the space, which house you’re in etc.) and tell me why you like this place. (open text box)  

- If you wanted to **revise for an exam** inside the school, where do you go? (Drop down question)
  
  Super Studio  
  Playground  
  House/Dining space  
  Library  
  Corridors  
  Outdoor Learning Terraces  
  Lecture Theatre  
  Any of the studios  
  Other  

- Please explain where exactly this favourite spot for revising is (which floor, which corner of the space, which house you’re in etc.) and tell me why you like this place. (open text box)  

- Do you prefer individual or group studying inside the school? (Multiple choice question)
  
  individual  
  group study  

- If you prefer groups, how big is your study group? (Drop down question)
  
  2  
  3  
  4  
  5  
  6  
  7  
  8  
  9  
  10  
  >10  

- How often do you go to the school library per week? (Drop down question)
  
  1  
  2
How long do you stay in the school library on one school day? (Drop down question)
1-15 mins
15-30 mins
30-45 mins
45-60 mins
1-2 hours
>2 hours

If you wanted to **study alone** or concentrate, do problem solving by yourself, or finish your homework individually - how do you feel about these spaces? (select question)

<table>
<thead>
<tr>
<th></th>
<th>Completely Dislike</th>
<th>Slightly Dislike</th>
<th>Neutral</th>
<th>Like</th>
<th>Very Passionate</th>
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</thead>
<tbody>
<tr>
<td>Super Studio</td>
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<td>☹</td>
<td>☹</td>
<td>☹</td>
<td>☹ ☹</td>
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<tr>
<td>Outdoor Terraces</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canteen</td>
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<tr>
<td>Library</td>
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<tr>
<td>One of the studios</td>
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<tr>
<td>Playground</td>
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<tr>
<td>Other</td>
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<td></td>
</tr>
</tbody>
</table>

If you wanted to **study with your friends** in school, finish a group assignment or discuss a group project - how do you feel about these spaces? (select question)

<table>
<thead>
<tr>
<th></th>
<th>Completely Dislike</th>
<th>Slightly Dislike</th>
<th>Neutral</th>
<th>Slightly Appealing</th>
<th>Very Passionate</th>
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</thead>
<tbody>
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<td>☹</td>
<td>☹</td>
<td>☹ ☹</td>
<td>☹ ☹</td>
</tr>
<tr>
<td>Outdoor Terraces</td>
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</table>

456
<table>
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<tbody>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Library</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One of the studios</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Playground</td>
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<td></td>
<td></td>
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<tr>
<td>Other</td>
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<tr>
<td>...........</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- If you have any other thoughts, or there is something you want to add or comment on, please write it here (open text box)
13.7.5 Outcome of the Student Questionnaires

13.7.5.1 Student Spatial Preferences for Interactions

Students have different preferences as their favourite place to hang out (figure 13.71). In school A1, the majority prefers the playground (50.7%), while in school B1, they prefer the dining spaces (45.8%) and the playground is ranked second (30.5%). In school A1, students favour staying in the open studios (which is ranked second of all places 16%), over the closed studios/classrooms (1.3%). Contrarily, in school B1, students do not have the option of open studios and only 1% prefer the closed studios to hang out. Students in A1 admire the upper floor terraces (12%), which is another missing place in school B1. The library space is highly admired by the students of B1 (ranked third with 10%), while it is less popular in A1 and only preferred by 4%. The dining space is not as popular in school A1 as B1 (12% < 45.8%).

While the previous data portrayed preferred locations of student mixing and socialising, students have other preferences associated with quiet conversations or interactions with friends (figure 13.72). These preferences reflect where the students go when they want privacy. In school A1, the playground is still ranked first (26.7%), but the terraces and dining spaces compete as comparably popular (18.7% and 17.3%). In B1, the majority prefer the corridors (34.9%), followed by the library (21.4%) and the playground is ranked third (19.7%).
The higher level of solitude (than quiet interactions), is the student’s state of seeking alone time (figure 13.73). In both schools, there are a lot of similarities in terms of their preferences. The library is ranked as first choice (A1=30.7%, B1=54.6%). Moreover, the spatial preference for being alone appears as a personal issue. It is shown from the high percentage of the category “other”, ranked second in both schools, which reflects the student reluctance to share the information, or it being very specific and does not fit the available choices. The playground ranks third in both schools, as a destination to be alone.

When asked about their preferred place to have lunch (or eat in general) inside the school (figure 13.74), for school A1, there is almost a tie between the dining space (30.7%) and the playground (29.3%), although the school does not allow eating outdoors. High percentage of students also admire the terraces (14.7%), the open studios (6.7%) and the library (4.0%) to have lunch, which are all against the school rules. Students of B1 are very happy with the dining space as a first preference (53.5%). The playground, where the school rules allow food, ranks second (18.9%). Students also want to eat in the classrooms (11.8%), library (6.2%) and corridors (2.9%), which is not allowed by the school.

**13.7.5.2 Student Spatial Preferences for Intellectual Activities**

Furthermore, the questionnaire asks the students about their studying, reading and revising patterns inside the school building, which take place outside the class time (not driven by the
teacher). These intellectual student-directed activities are practices of self-directed learning identified by scholars in the literature review (section 2.6). First, the questionnaire tries to find out student grouping vs individual preferences (figure 13.75). Students of both schools prefer group studying, whereas B1 is higher than A1 (73% > 65%).

![Figure 13.72: Preferred Study Group Format (A1 Left, B1 Right)](image)

Secondly, the questionnaire finds out the group formation patterns (figure 13.76). In both schools, students prefer similar group formations. They prefer groups of four (A1=31% and A2=30%), and groups of three (26% and 21%). Studying in pairs is also admired by the students (15% and 13%). Student percentage decrease for groups larger than six.

![Figure 13.73: Group Study Population Preferences (A1 Left, B1 Right)](image)

In terms of the location of doing any of the intellectual activities, such as studying, revising, colouring, drawing, etc. (Figure 13.77), the library is ranked first in both schools (A1=53.3% and B1=61.8%). In school A1, the students prefer the open studios (17.3%) over the closed classrooms (8.0%), while students in B1 only have the option of closed classrooms (16.2%). Apart from the conventional indoor study locations, students of both schools still prefer to study in the dining space (A1=8.0% and B1=10.0%). Very few percentages in both schools prefer studying in the playground (A1=2.7%, B1=2.1%) and the corridors (A1=1.3%, B1=1%).
The library is highlighted as an important hub for student activities, even before decoding the questionnaire results. There are questions about the student relation to the library space. Figure 13.78 portray the number of student visit to the library space according to the student preferences. In both schools, the majority of students go to the library once per week (A1=67% and B1=55%), and the percentage decreases as the number of days increase. However, students of B1 have higher percentages than A1 at high number of days (more than 4 days/week).

Figure 13.79 illustrates the student answers about the durations spent in the library. In both schools, the majority (60%) spend between 0-15 minutes. Again, there is higher percentages for B1 students at longer periods, than school A1. Both graphs reflect that school B1 students are keener to use the library more frequently and for longer periods of time, than A1. Calculations of the results estimate that a student of school A1 spends (on average) 38 minutes per week in the library, compared to the higher estimate of 62 minutes per week (approximately one hour) for school B1, although B1 lunch break is shorter than A1 lunch break (B1=30 minutes < A1=50 minutes). These data are revisited in the discussion on library spaces (chapter 7.2).
Apart from seeking answers about where students go in the school, the questionnaire finds out the student perception of different locations within their school, to accommodate their intellectual activities (even if they are not being used by the students). The same question is repeated for intellectual activities of an individual quiet atmosphere (e.g., reading a book, using a laptop quietly) and other intellectual activities of a vibrant atmosphere (e.g., group projects, group revision). There are five ratings ranging: completely dislike, slightly dislike, neutral, slightly appealing and very passionate about certain space.

Figure 13.80 demonstrates the student views of different spaces to accommodate quiet intellectual activities, when they seek high degrees of concentration. From the graphs, in both schools it is very clear how the large open crowded spaces are equally completely disliked, such as the playground (A1=48% and B1=47%), the dining spaces (A1=24% and B1=21%) and the corridors (A1=56% and B1=48%). Contrarily, the library is highly appreciated in both schools (A1=45 and B1=34%). In school A1, open studios are still more appreciated then closed studios even for quiet activities (16%>11%). Students are mostly neutral about the
terraces. In B1, students mostly appreciate the classrooms (rated as slightly appealing by 34%).

Figure 13.78: Student Rating for Different Spaces for Vibrant Intellectual Activities

Figure 13.81 demonstrates the student views of the same spaces to accommodate vibrant group intellectual activities (low degree of concentration). For both schools, the results do not change much. The playground, corridors and dining spaces are not appreciated. The major difference is that, for school A1, the open studios are now more appreciated than the library. While equal percentages (29%) are very passionate about both spaces, 43% are finding the open studios slightly appealing, more than the library (only 21%). In school B1, the students are mostly fond of the library and classrooms for vibrant intellectual activities.

13.7.5.4 Summary of the Student Questionnaire

There are certain patterns of student preferences derived from the questionnaire data. Firstly, for hanging out and social activities, the students favour the playground, open studios and terraces in school A1, while the dining space is mostly preferred by B1 students. Secondly, for quieter and more private interactions, terraces and dining spaces compete with the playground as student favourite spots in A1. As for school B1, the majority like the corridors and the library. Thirdly, for complete isolation, students of both schools prefer the library. Students also appear to be reluctant about sharing their alone location, which is expressed as high choice of the category ‘others’ as an answer to the question.

Student spatial preferences for having lunch does not correspond to the eating locations assigned by both schools. In A1, students prefer to eat outside in the playground, in the terraces and open studios, which are all against the school’s regulations to eat outside the dining spaces. In school B1, students are happy with the dining space, but some percentages want to eat in the classrooms, library and corridors.

For student intellectual activities (reading, studying, revising, drawing, etc), students favour grouping over working individually. They prefer groups of 2 to 5. Beside the library as the main location of those activities, students also admire the open studios (only school A1), classrooms and dining space (for both schools). Students on average visit the library twice per
week for 20 minutes per session in school A1, which is less than the average of school B1 (3 visits per week for 23 minutes per session.

Finally, students of both schools rated different spaces based on how each location accommodates intellectual activities. For individual quiet activities (e.g. reading), they favourably rate the library and dislike the playground and the corridors. For group vibrant intellectual activities (e.g. group projects), they still dislike the playground and corridors, however they highly recommend the open studios (A1 students) even over the library. In schools B1, students recommend the library and classrooms.
13.8 Quantitative Data of Snapshots

This section presents the collected data of snapshots. It shows one example of a simple snapshot on the floor plan in A1’s level 5 terrace (figure 13.82), while table 13.17 shows the indications of each symbol. This section also provides a sample of the full tabulated snapshot data sets, as displayed in table 13.18 and 13.19 for schools A1 and B1 respectively.

![Snapshot Example in A1’s level-5 terrace](image)

Table 13.17: The Transcription (Meaning) of Each Symbol on the Snapshot

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Representation</th>
</tr>
</thead>
<tbody>
<tr>
<td>⭕️</td>
<td>Student Sitting</td>
</tr>
<tr>
<td>○</td>
<td>Student Standing</td>
</tr>
<tr>
<td>→</td>
<td>Direction of movement</td>
</tr>
<tr>
<td>▲</td>
<td>Staff Member</td>
</tr>
</tbody>
</table>

*Blue outline shows group cluster
*Text defines activity*
Table 13.18: Sample of the Snapshots Tabulated Data in School A1

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<th>Day number</th>
<th>Time</th>
<th>City/Area</th>
<th>Level</th>
<th>Location</th>
<th>Activity</th>
<th>Patient</th>
<th>SNS</th>
<th>Group name</th>
<th>Group size</th>
<th>Subname</th>
<th>Last name</th>
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<th>Layer</th>
<th>Age Type</th>
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<td>3rd</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>30</td>
<td>Student</td>
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Table 13.19: Sample of the Snapshots Tabulated Data in School B1

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466


13.9 Quantitative Data of Gate-Counts

This is an example to show the locations of three gates indicated in purple (figure 13.83). The researcher records the number of students passing through these virtual gates at different times of the day, while differentiating between the two directions of circulation (direction 1 and 2).

![Figure 13.80: Gates Example on the School Plan (From A1; Level 4)](image)

The results of multiple gate-counts recordings are being displayed from each school separately (A1 and B1). Table 13.20 shows the repeated individual recordings across different times of the day in school A1 (circulation, break and class times). Table 13.21 shows the total of each time, and table 13.22 aggregates the summation of all times and deduces the average. The same steps are displayed for gate-counts of school B1 in three tables (13.23, 13.24 and 13.25).
Table 13.20: Repeated Recordings for All Gates During Circulation Time, Break Time, and Class Time (School A1)

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<th>Gate</th>
<th>Recording 1</th>
<th>Recording 2</th>
<th>Recording 3</th>
<th>Recording 4</th>
<th>Recording 5</th>
<th>Recording 6</th>
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Table 13.21: Total Recording for Circulation, Break and Class Times (School A1)

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Table 13.22: Total and Average Gate-Counts of All Times (School A1)

469


Table 13.23: Repeated Recordings for All Gates During Circulation Time, Break Time, and Class Time (School B1)

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Table 13.24: Total Recording for Circulation, Break and Class Times (School B1)

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