

Institute of Education, University of London

Let the children speak:

Year 1 children inform Cognitive

Acceleration pedagogy

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Thesis submitted in fulfilment of the regulations of
the Institute of Education, University of London
for the degree of PhD

July 2014

Abstract

Cognitive Acceleration (CA) Intervention Programmes claim to raise children's thinking abilities. Evidence from cognitive tests suggests that participants achieve a higher level of thinking by the end of the Year 1 Programme and better results the following year in National Standard Attainment Tests than non-participants. However, test results measuring impact neither inform teachers about how to improve their pedagogy nor give any insights into how the children experience being learners during CA lessons.

A constructivist approach is used in this two year study to better understand the children's perspective on learning within the CA Programme. Interviews where children have opportunities to express their personal constructs afford insights into their understanding of learning during lessons. The impact of CA on children's developing personal constructs regarding what helps learning is considered. Observations of CA lessons provide insights into the way teachers actualise the CA pedagogy and the way in which children respond within the lessons. The participants of the first year of this study are one group of six children from each of six classes – four CA classes and their four teachers and two non-CA classes and their two teachers. The participants of the second year are one group of six children from each of the same four CA teachers.

Interviews reveal how the teachers understand what helps children learn. At the end of the first year the four CA teachers participate in a short intervention. This provided opportunities for the teachers to discuss the children's constructs to inform the teachers' understanding of the learning process with a view to using this information to improve teaching. Analyses of observations reveal differences in the actualisation of the CA pedagogy in each class. At the end of the first year, analyses of personal constructs indicate that CA participant children verbalise their understanding of learning very differently from non-CA participant children indicating that the CA Programme has made a substantial difference to the children's awareness of being a learner and their ability to articulate their ideas. Analyses of personal constructs in the second year of the study indicate that the children are more conscious of the CA pedagogy helping them to learn. Also, results from CA lesson observations in the second year indicate that the teachers have made substantial changes to their pedagogy in line with CA theory which gives support to the belief that understanding the children's perspectives holds practical implications for teachers in order to maximise children's thinking abilities through the CA Programme.

This study adds a new dimension to the CA literature. This is the first time that the impact of CA is considered through the voices of Year 1 children. In addition, the teachers demonstrate improved pedagogy subsequent to listening to children's lived experience and set themselves personal targets to implement their new understanding.

Declaration

I hereby declare that, except where explicit attribution is made, the work presented in this thesis is entirely my own.

Word count (exclusive of appendices, list of references and bibliography): 85,000 words

Signed: Anne Robertson

Dedication

I dedicate this study to the memory of Professor Philip Adey who is no longer with us.

Philip was entranced by the Year 1 children who filled him with excitement about learning and made him laugh. I was touched by his insatiable desire to improve education, his enthusiasm and dedication and this legacy remains alive in me.

Acknowledgements

I wish to express my appreciation to all the children who participated in this study. I am grateful for the insights they have shared.

I wish to thank the participant teachers for their commitment, co-operation, humility and willingness to share this journey.

I wish to thank all the friends and colleagues who have supported me on this journey in so many different ways.

Contents

Abstract	2
Declaration	3
Dedication	4
Acknowledgements	5
Contents	6
Chapter 1: Circumscribing the journey	12
1.1 Personal history which influenced this study.....	12
1.2 A journey with a changing landscape: change and innovation but is it what children need to learn effectively?	13
1.2.1 Debates within primary education	13
1.2.2 National context of change	14
1.2.3 National context of accountability	16
1.2.4 Innovations to address children's learning	17
1.3 Places of Interest on the journey: developing the research interest of this study	20
1.3.1 Personal/professional journey	20
1.3.2 Children's learning.....	20
1.3.3 Introduction of CA in primary schools.....	20
1.3.4 The methodological approach in this study	21
1.4 The rationale for the study	22
1.4.1 The children's understanding of the CA learning experience	23
1.4.2 The application of the CA pedagogy	23
1.4.3 Boundaries of the study.....	24
1.5 Map of the journey and an overview of the thesis.....	25
Chapter 2: The road of Cognitive Acceleration	27
2.1 Introduction to the context of Cognitive Acceleration Programmes	27
2.2 CA in KS 1: Let's Think: The teaching approach	28
2.2.1 Schemata of concrete operations in Let's Think.....	30
2.3 CA pedagogy	31
2.3.1 The development of CA pedagogy	32
2.4 Key aspects of CA Theory	33
2.4.1 Assumptions underpinning CA Theory	34
2.4.1a Cognition develops through a general central processor.....	34
2.4.1b Cognition develops through the process of interaction between the environment and maturation.....	34
The rate of the development of cognition can be altered by a change in the environment	
2.4.2 CA theory has its roots in school improvement	35
2.5 Piagetian theory of cognitive development	37

2.6	Vygotsky's theory of Social Construction	40
2.7	From theory to practice	42
2.7.1	Results of the pre/post tests in the first year of teaching Let's Think.....	44
2.7.2	Other ways of examining impact	46
Chapter 3: Personal Construct Theory.....		48
3.1	Introduction	48
3.2	The philosophy of Personal Construct Theory	50
3.3	The psychology of Personal Construct Theory	51
3.4	Personal Construct Theory in action	53
3.5	Using Personal Construct Theory in this study	61
Chapter 4: The methodology of this study.....		63
4.1	Introduction	63
4.2	CA and Personal Construct Theory	63
4.3	Methodological framework	64
4.4	Research process	65
4.4.1	Research paradigm: constructivism	65
4.4.2	Constructivism in this study.....	66
4.4.3	Research design	67
4.5	Research strategy for the study and methods of data collection in the two year study (2001-2003).....	67
4.5.1	Child interviews	68
4.5.2	Classroom observations of CA/mathematics lessons.....	72
4.6	The participants of the study	75
	First Year (2001-02).....	77
	Second Year (2002-03).....	77
4.7	Data analysis.....	77
4.7.1	Data collected from children	77
4.7.2	Data collected through interviews.....	78
4.7.3	Data collected through intervention group meetings	78
4.7.4	Data collected through lesson observations	79
4.8	Ethical framework and issues of validity and reliability	81
Chapter 5: The participant teachers		88
5.1	Introduction	88
5.2	The teacher participants.....	89
5.3	Teacher participation in the first year	91
5.4	Interviews at the end of the second year	95
5.5	Intervention group meetings.....	97
Chapter 6: Let the children speak		102
6.1	Introduction	102

6.2	Overview of the chapter	103
6.3	Children's perceptions of their experiences of learning	104
6.3.1	Constructs provided in the first year	104
6.3.2	Constructs provided by each school in the first year	108
6.3.3	Constructs provided in the first and second year of the study	114
6.3.4	Individual children's perceptions of their experiences of learning	119
Chapter 7: Participation during Cognitive Acceleration Lessons		137
7.1	Introduction	137
7.2	Classroom observations	137
7.3	Analysis of observed CA lessons	138
7.4	Analyses of lessons	143
7.4.1	Teachers' oral interactions	144
7.4.2	Children's oral interactions	147
7.5	Analysis of the four themes	150
7.5.1	Creating opportunities to challenge children	151
7.5.2	Creating opportunities to facilitate metacognition	156
7.5.3	Creating possibilities for the children to engage in exploratory talk	160
7.5.4	Consider carefully the social context during each lesson	161
7.6	Analysis of the children's test results	175
Chapter 8: A significant staging post: discussion and conclusions		178
8.1	Summary of the study and the results	178
8.2	How the results answer the research questions	179
8.2.1	How do Year 1 children understand what helps their learning during the CA Programme?	179
8.2.2	What differences emerge between CA and non-CA children's constructs?	184
8.2.3	What differences emerge in CA pedagogy when teachers understand and take account of children's personal constructs?	186
8.3	Implications of the results in relation to the key arguments	188
8.4	Implications for CA Pedagogy and Classroom Practice	189
8.5	Methodological implications	192
8.6	Implications for future research	194
References		196
Appendix 1.1: An outline of the PD Programme		207
Appendix 2.1: Brief description of the Let's Think Programme		211
Appendix 2.2: Pillars of CA with examples from lessons		214
Appendix 2.3: Year 1 tests		217
Appendix 4.1: Teacher preparation for interview		219

Appendix 4.2: Teacher Interview Schedule	220
Appendix 5.1:.....	221
Constructs provided by the teachers in September of the first year	221
Appendix 5.2:.....	222
Constructs provided by the teachers in the first year.....	222
Appendix 5.3: Constructs provided by the teachers in the second year	224
Appendix 5.4:.....	226
Interview with Miss Arum in July of the first year	226
Appendix 6.1: Constructs provided by the children.....	229
Appendix 6.2:.....	241
Interview with Sacha Group B1 March (First year of study).....	241
Appendix 7.1: Transcript of lesson 25 (A1).....	244
Appendix 7.2: Frequencies of oral interactions during the analysed lessons	250

Figures

Figure 2.1: Diagram to represent the image of the interior structure of a road representing the layers involved in actualising CA.	28
Figure 2.2: Distribution of Spatial Relations test gains	44
Figure 2.3: Distribution of Conservation test gains	45
Figure 2.4: Mean residualised gain scores by class	46
Figure 4.1: Diagram to represent one teacher, two groups and the twelve participant children being treated as cases within the multiple case strategy.	68
Figure 4.2: Figure to demonstrate the position of cards on the table.....	70
Figure 4.3: Diagram showing how a child sorts the group according to the construct: Talk – Don't talk ..	70
Figure 4.4: Diagram to show the four groups assigned by Nemy	71
Figure 4.5: To demonstrate a Salmon Line	71
Figure 6.1: Constructs provided in September when children were asked what helped..... their learning.....	109
Figure 6.2: Constructs provided in March when children were asked what helped them to learn	111
Figure 6.3: Constructs provided in July when children were asked what helped them to learn	112
Figure 7.1: The number of events with the intention of promoting challenge.....	146
Figure 7.2: The number of metacognitive events spoken by each teacher	147
Figure 7.3: The groups' total metacognitive responses	149
Figure 7.4: Average test scores of the Spatial Perception test in both years of the study.	175
Figure 7.5: Average test scores of the Conservation test in both years of the study.	176

Tables

Table 3.1: Most frequently mentioned constructs provided by 24 pupils (Unpublished work for MA study, 1998).....	59
Table 4.1: Participants in the study.....	76
Table 5.1: To show teacher participants.....	89
Table 5.2: Teachers' Constructs mentioned more than once	91
Table 5.3: To show the constructs produced in July of the first year of the study.....	93
Table 5.4: To show constructs provided by teachers in interviews in the July of the second year of the study.....	97
Table 5.5: To show which lessons were discussed	99
Table 6.1: The positive poles of the constructs produced in the first year of the study.....	106
Table 6.2: Constructs in September from CA children in the two years of the study	114
Table 6.3: Constructs in March from CA children in the two years of the study.....	116
Table 6.4: Constructs in July from CA children in the two years of the study	117
Table 7.1 The number of observed lessons of each CA group in the study	138
Table 7.2: The codes used in analyses of lessons	139
Table 7.3: Part of a transcript and analysis of a CA lesson	143
Table 7.4: To show teacher events in 64 analysed lessons	144
Table 7.5: The categories of children's talk in the lessons (8 per group).....	148

Chapter 1:

Circumscribing the journey

Do educators know what children need? (Noddings, 2005:11)

Using Personal Construct Theory, this study examines the impact of the Cognitive Acceleration Programme for Year 1 from the children's perspective. This is an alternative approach to the usual Cognitive Acceleration Programmes' method of measuring impact through cognitive test results.

This chapter introduces my personal/professional journey made over many years in primary education. Key historical milestones are indicated and some important current tensions within primary education in England are discussed.

The terrain of the study, a Cognitive Acceleration Programme for Year 1, is introduced, the rationale and the methodological approach are explained.

1.1 Personal history which influenced this study

"To find out what one is fitted to do and to secure an opportunity to do it is the key to happiness" (Dewey, 1916:308). This significant signpost has guided my personal/professional journey as a primary teacher, it underpins my work with children and teachers and leads this current study. All my primary school learning took place in a teacher-centred environment where, as children, we were neither given a voice nor asked for any opinion about what we were learning or what helped/hindered our learning. This experience sparked an interest in me to discover what impact listening to children and valuing their opinion could have on learning. Coming to Initial Teacher Education (ITE), I was determined that my personal/professional journey would take account of this so as to give children the best possible opportunity to find this "key to happiness" (Dewey, 1916:308). My premise was that education should enable children to determine their way. This would make it possible for them to do a good job in whatever role they choose in life.

My personal/professional journey formally began in Scotland in 1972 when I was introduced to the complexities of primary education. As student teachers, we were required to develop subject and pedagogical knowledge and an understanding of a wide range of subjects, understand children's development from a psychological perspective, become familiar with the history of education internationally from a sociological perspective and read widely from a range of literature. Integral to this learning was personal reflection to help mesh together educational ideas from a range of sources coupled with classroom experience. Reflection on theory and practice has remained an essential ingredient of my professional life. This reflection encourages my ongoing practice of reading and of listening to colleagues, psychologists, educational researchers and most of all the children I meet in different contexts. The rationale became to remain a learner of learners. I wanted to remain open to the challenge of trying different, innovative ideas and attentive to evaluating their effect on children's learning so as to choose the

ways that provided the most positive impact. Personal and professional development have always been inextricably intertwined and make for me the journey of life - a personal/professional journey with children as its main focus.

The publication of the Plowden Report (1967) had begun to impact on primary education in the 1970s. Plowden put the child at the heart of primary education and promoted individual and group work alongside whole class teaching. As student teachers we discussed how to manage and organise learning through collaborative group work while listening to children as they learnt. Active listening to children's experiences of learning has remained a key professional interest and a subject of frequent reflection.

Looking back over my forty years' experience of teaching, I recognise that I have used a variety of approaches and pedagogical strategies to motivate children to learn. Listening to children's thinking became a centre of interest so as to understand their view of themselves as learners and the factors that children consider most influence their learning. My aim was to provide a school experience where children could learn most effectively. The perspective of taking account of children's voices was enhanced further through the United Nations Convention on the Rights of the Child (1989). This perspective is also an important element of more recent legislation (Children Act (DfES, 2004); Disability Discrimination Act (DfES, 2005). Furthermore, teachers, carers and educationalists increasingly recognise the importance of listening to children, the citizens of the future, who can provide a valuable perspective on the learning in which they engage (Alexander, 2010).

1.2 A journey with a changing landscape: change and innovation but is it what children need to learn effectively?

1.2.1 Debates within primary education

Throughout my journey, primary education has been the subject of debate. Plowden (1967) suggested regular national surveys of the attainment in English and mathematics but also promoted an expansion to the breadth of the curriculum. Her recommendations shifted the nature of primary classrooms away from rigid attention to the curriculum towards focusing on children and their stage of development. Plowden was influenced by Piaget's theory on the development of children's cognition (Piaget, 1959a) recommending that teachers take account in their teaching of children's development. Through the recommendation of individual and group work, teachers considered the needs of children more thoroughly than ever before putting them at the centre of the learning in preference to the curriculum content. This move also brought a shift in emphasis between content and the process of learning. However, I believe that since the 1990s, children have been, again, sidelined in an attempt to drive up standards as measured by national test results.

The debates have continued to be filled with tensions. A main area of concern is what constitutes a primary curriculum (Wyse *et al*, 2013) One contentious issue has always been the teaching of reading and how best to approach this key skill which affects all learning (Wyse, 2012; Stanovich, 2000; Chall, 1996;

Clay, 1979). Also debated by teachers, researchers and politicians is the best balance between content and process within the curriculum (Pollard *et al*, 2002, Bennett, 1976), the balance between experiential learning and didactic teaching (Muijs & Reynolds, 2005; Pollard *et al*, 2002), in addition the number of subjects primary children should learn, whether learning should be subject based or centre around themes, whether primary children should be tested and, if so, on what and how should this be measured (Wyse *et al*, 2013; Black & Wiliam, 2009; James, 2008; Black & Wiliam, 1990; Fullan, 2001; Pollard, 2010;). A teacher's position within these educational debates is a key influencing factor determining what and how teachers teach within the statutory requirements and school frameworks. For me, these debates have no simple answer and remain complex centres of interest and sources of reflection as well as topics for discussion in professional situations. Some of the debates have led to changes within education, the main aspects of which are discussed below.

1.2.2 National context of change

After Plowden (1967), alongside the shift towards children being more at the centre of the learning environment, society was also changing in that life was more relaxed and freedom took on a different perspective. The 1960s opened avenues where social democracy worked for less discrimination between the sexes and social classes, the old disciplines were rejected and schools began to embrace child-friendly approaches to learning (Swidler, 1979; Jenkins, 1973; Cauwenberghe & Sister, 1972). These changes altered the discipline and ethos within primary schools making them generally less rigid, harsh and adult centred.

However, since the late 1980s in England, the landscape of primary education has been in a process of change. Within the unsystematic and confusing context experienced in the early 1980s, the 1989 National Curriculum was a positive step towards enabling coherence and progression. This statutory document, aimed to provide a "broad and balanced curriculum" in primary education from which all children could benefit (DES, 1989:12). It laid out the areas of study to be taught at each phase of education. Progression within each subject was clearly outlined so that teachers could draw up a development plan. According to the introduction to the National Curriculum (DES, 1989), it was intended that all children should have access to a wide range of well-defined subjects at all stages of primary education providing them with optimum opportunities to succeed throughout their schooling and ensuring maximum possibility of useful employment later. However, as primary teachers began to work with the statutory framework and its implementation, difficulties began to emerge in the form of overload within each subject (Pollard *et al*, 2010).

In 1989, the Primary Assessment, Curriculum and Experience (PACE) project was established to report on the impact of change within primary schools. Changes to the curriculum and difficulties within the profession continued throughout the 1990s. In 1994, PACE reported teachers' anger, despair and their struggle to cope with the changes exacted of them. The National Curriculum and new assessment

procedures were perceived and experienced as over prescriptive and too demanding in terms of teachers' time (Pollard *et al*, 2010).

The content of the curriculum was reviewed and reduced (DfES, 1999; QCA, 1999; Dearing, 1993). However, the Government remained concerned about the standard of education particularly basic skills in reading, writing and mathematics. The Government's view was that standards had not been raised sufficiently through the introduction of the National Curriculum. The Government White Paper, (DES, 1997): Excellence in Schools (implemented in Schools Standards and Framework Act, DfES, 1998) set out further proposals to raise standards. It was considered that to further raise standards teachers needed more support. So, alongside the statutory framework, the National Literacy Strategy (DfES, 1998) and the National Numeracy Strategy (DfES, 1999) were established to support teachers and give further guidance about what was required for children to make good progress in English and mathematics. Schools were not obliged by law to follow the Strategies but Local Authorities (LAs) generally promoted these initiatives.

To provide teachers with the necessary knowledge, understanding and skills, Professional Development (PD) was organised in LAs, heavily financed by the government. According to Earle *et al* this initiative was "the most ambitious large scale educational reform in the world" (2003:11). The Strategies provided a prescribed and standardised aspect to the curriculum imposed from above with little discussion or consultation. This imposition was highly contentious within the history of the educational system in England. The encouragement from LA advisors to follow the Strategies further eroded teachers' possibilities to provide a clear balance between process and content. By adopting the Strategies, decision making about the planning and organisation of the teaching of English and mathematics was taken from teachers. According to Pollard and Triggs (2000), this situation resulted in an education system which reflected a hard-won and often uneasy compromise between new obligations and an enduring vision that had its roots in a different era. My experience of working with teachers during the 1990s was of finding it difficult to discuss teaching and learning with them as they were overburdened, frustrated and disillusioned. Classroom environments were fraught and children suffered from being with teachers who felt disempowered. While working with teachers at this time, I encouraged them to return to consideration of children's needs in an attempt to make greater progress.

Amid teacher dissatisfaction, complaints from school inspectors and evidence from educational research that standards were not being raised, the Strategies were further developed, reviewed and updated through Excellence and Enjoyment (DfES, 2003) and the Primary Strategy (DCFS, 2008). These initiatives were supposed to give more freedom and responsibility to teachers to work within the framework and, alongside, encourage the use of pedagogical strategies said to be effective for children's learning (DCFS, 2008). Where head teachers supported teachers' professional freedom, children began to experience a more creative and innovative approach to learning. But where concern remained focused on test results in English and mathematics, freedom from standardised approaches was limited (Alexander, 2010, Pollard, 2010). In reading recent reports of school Ofsted inspections, the use of teachers' innovation is being commended where obvious positive impact on children's attainment can be measured. In my view, this is

a positive step towards returning ownership of the curriculum to those who can most effectively provide the best learning experiences for children.

During this period of educational change, there have been many scientific and technological advances in the world which have also influenced the content of a curriculum required for children of the 21st Century. Alongside technological expansion, changes in the social agenda towards Inclusion and Diversity as well as an understanding of Rights in the areas of gender, race, religion, disability and sexual orientation have all led to changes in National Policies and Legal requirements (SEN Code of Practice, DCSF, 2012; Children Act, DfES, 2004; Education Act, DfES, 2002; SEN and Disability Act, DfES, 2001; Disability Discrimination Acts, DES, 2005 & DfES, 1995). Knowledge and attitudes towards globalisation and sustainability further influenced educationalists' ideas regarding how and what primary children should learn (National Framework for Sustainable Schools, DCSF, 2008).

In recent years, to take account of the educational and social changes and the areas of dissatisfaction surrounding the current curriculum and standards, the National Curriculum has, again, been under the spotlight of review with the prospect of agreeing a new curriculum. The current government has been engaged in designing a new curriculum, seeking advice from head teachers and educationalists coming from a wide range of perspectives. The new curriculum (becoming statutory, September 2014) however, has again, been shrouded in controversy regarding its structure and the amount of acceptable content. The general consensus among teachers appears to be that the new curriculum has been produced from above rather than from teachers' knowledge and experience. The new curriculum may have been received more positively by teachers had there been an extensive and intensive period of consultation, trial and piloting before it was finalised.

1.2.3 National context of accountability

During all the changes to the recommendations of what primary children should learn, the over-arching accountability of teachers and schools has also undergone change. Although much of the PD provided after the introduction of the Literacy and Numeracy strategies (DfES, 1999; DfES, 1998) increased teachers' subject knowledge, the manner in which autonomy and creativity over planning and teaching were removed destroyed some of the fundamental satisfaction in teaching.

My experience as an LA advisor and teacher educator in the 1990s was that teachers felt undermined, lost confidence in themselves as educators, professionals who knew and understood how to help children learn. Adding to this loss of confidence in personal and professional competence, teachers had another issue to face: in 1998, Literacy targets were laid down for each LA in England. Designed to raise standards, the schools Standards Minister, in introducing them, announced that any school which did not raise standards would "*be exposed*". The 1999 Moser Report: Improving Literacy and Numeracy: A Fresh Start (DfEE, 1999) introduced National Learning Targets. The Schools Standards and Framework Act (DfES, 1998) also gave power to LAs and the Secretary of State to intervene when schools were inspected and failed by Ofsted. So began a culture of naming and shaming particular schools which

further undermined teachers and introduced a fear of failure that was unprecedented in the profession. The regime of testing 7 and 11 year olds through national tests (Standard Attainment Tests (SATS)) following the introduction of the National Curriculum which was closely followed by national reporting of results in the form of League Tables, added to this fear. Ostensibly, the information from the national tests was to provide parents with information about local schools. However, competition between schools and LAs was stimulated through media reporting headlines such as “Worst schools” and “Most improved LAs”. Such reporting served only to drive the focus more and more on English and mathematics test results despite warnings by inspectors that this form of accountability was not improving teacher morale nor raising standards (Bell, 2005; Bell, 2004, Tomlinson, 2004; GTC Report to Education Secretary, 2004).

The initiative to report schools’ results to local and national newspapers has led teachers to sacrifice the prioritising of children’s learning and, instead, make results the priority. This has translated into classrooms, particularly in Year 2 and Year 6, where children spend many weeks preceding the tests, practising test questions and learning by rote specific areas that teachers think and hope will be addressed in tests. Educational research shows that children learning rote facts tend to regurgitate them for a time but have no deep knowledge or understanding of the areas covered (Black & Wiliam, 1998; King & Dillon, 2012). This way of teaching reduces children to boredom and lack of enjoyment in learning. This study was conducted at the height of teachers’ concerns about testing and league tables, stimulated by concern for how children understood their own learning experience. Although the PACE project (Pollard *et al*, 2010) reported on aspects of children’s experience in schools in an effort to bring about change in classrooms, it is unclear how much attention has been paid to the children’s views by teachers and what resultant changes have taken place.

1.2.4 Innovations to address children’s learning

Despite all the pressures of the changing context innovation has continued within the educational research community. Some head teachers, teachers and educationalists held on to their vision of how children learn. So within this context of change and accountability, researchers who believed that it was necessary to look at more than the content of the curriculum continued to work at developing knowledge and understanding of how children learn. In particular the development of children’s thinking continued to be a focus of attention. In my view this was helpful in trying to re-establish a balance for children in their learning experiences. A number of programmes were devised in the 1980s and 1990s with the express intention of improving children’s thinking ability. In the main, the designing and development of programmes is costly in terms of resources and time. It is important if time, money and attention are to be given to such programmes that evaluation demonstrates a positive impact on children’s learning. This section focuses attention on high profile “thinking” programmes because the programme chosen as the context of this study is one aimed specifically at developing children’s thinking.

One programme was Philosophy for Children by Lipman (2003, 1991, 1981,) which includes ethical and moral problems, civic values, science reasoning, rationality and aesthetics. In this programme the teacher

becomes the “intelligent questioner”. The nature of the discussion entered into by children is an extremely important feature of the programme. Lipman proposed that the written words model philosophical dialogue and suggested that teachers should structure the activities to promote this dialogue among children. The purpose of the discussion is to externalise the reasoning that children use so that it can be examined. By explicitly examining the reasoning, children are led to consider the process of thinking: to enter into the process of metacognition by considering the nature of the thinking being used.

Several evaluations of Philosophy for Children have been conducted, results showing raised attainment in English and mathematics and also improvements on a measure of formal reasoning and on creativity (Lipman, 1980). A systematic review of ten controlled outcome studies (Trickey & Topping, 2004) demonstrated a consistent moderate positive effect on a wide range of measures. However these results are difficult to assess as little detail was provided about the control groups. In 2007, Topping and Trickey conducted a further evaluation but used a contemporary programme by Cleghorn (2002) based on Lipman’s work (Topping & Trickey, 2007). More detail was provided about the schools participating in this study and results demonstrated that the participant children made significant gain immediately following the programme. Two years later when re-tested the mean score for the same children was very similar to the post-test score. This demonstrated that some children, Topping and Trickey suggested the higher achievers, were able to maintain the cognitive gain over time despite not engaging in a further “thinking programme” and were somewhat advantaged in sustaining the gain. However, they cautioned against assumptions being made regarding the replication of these results and suggested careful attention to the integrity of the implementation of the programme (Topping & Trickey, 2007). This caution would seem valid as the data appear to doubt raised attainment over time for the greater proportion of the children if as Topping and Trickey suggest the programme works best for the higher achievers.

Another initiative aimed at developing thinking is the programme Activating Children’s Thinking Skills (ACTS) (McGuinness, 1999). This programme uses school subject material so is a context-delivered programme designed for use in Key Stage 2 (KS 2). This way of focusing the teaching on thinking while using the curriculum as the context, known as “an infused programme”, benefits the teaching of thinking skills. McGuinness (1999) maintained that the skills are matched directly with topics in the classroom and therefore content instruction is strengthened leading to deeper understanding. McGuinness added that this method promoted an easier transfer of learning. The approach seemed particularly appropriate for primary schools where the teacher is generally in charge of the whole curriculum for a class. The cognitive framework used in this programme is a taxonomy of thinking skills adapted from Swartz and Parks (1994). Children are encouraged to develop their decision making processes, discuss their reasoning and reflect on their thinking strategies. Teachers ask questions designed to promote thinking, encourage children to make their thinking explicit, give children time to think and support the transfer of thinking skills across the curriculum (Dewey & Bento, 2009).

An evaluation of ACTS as an infusion approach to teaching thinking indicated enhanced performance on cognitive ability tests following two years of the ACTS intervention (Dewey and Bento, 2009). The analysis

of this study highlighted several possible components responsible for raising children's cognitive abilities, for example, the use of language, the use of metacognition and the social facilitation aspect of the group work. However, analysis made clear that no single key component could be identified as responsible for raising children's thinking ability (Dewey and Bento, 2009). In my view these findings are not problematic because increasing intelligence is complex therefore it is understandable that a range of pedagogical strategies that work together be adopted.

Although the above programmes have demonstrated a general effect on children's learning, the one that stood out most for me was Cognitive Acceleration (CA), initially produced in the 1980s for Key Stage 3 (KS 3) to develop thinking. Since the early 80s, CA has grown and developed and has demonstrated over the years through evidence-based empirical research the impact on children's attainment at several stages of development: Year 1, KS 2, KS 3 and KS 4. The Cognitive Acceleration through Science Education (CASE) at KS 3 tested participants at the end of the two year intervention (Years 7 and 8). CASE has been evaluated regularly since 1987 with results reported in detail in Shayer and Adey (1992) and long-term benefits reported in detail in Adey and Shayer (1997, 1994, 1993). Evaluation showed that students made significant gains over their non-participant peers thus demonstrating that the thinking ability of a significant number of students was raised above that of non-participants. Furthermore, two years later, participants showed increased achievement levels in GCSE mathematics, English and science. The participants also showed raised achievement in their 'A' level results. This suggested not only long term gain but also transfer of gain across subjects.

Since the 1980s, CA Programmes have continued in schools throughout the years of change, accountability and the Government's drive to increase skills in English and mathematics. Teachers who use CA Programmes have seen the long term benefits for pupils and they, themselves, continue to benefit from the PD offered by the Programmes (Adey *et al*, 2004; Shayer & Adey, 1993, Hewitt & Hewitt, 2002). In my experience, CA offers more to children and teachers than the other programmes: lessons, resources, PD, support and ongoing information on the impact by the publication of test results. However, I believe that considering test results uniquely is inadequate and provides only partial information. A fuller picture could emerge should children participate in the research hence the rationale for this study (Section 1.4 of this chapter).

One aspect common to each of these CA programmes is the pedagogy underpinning the CA theoretical base. CA pedagogy is of particular interest in this study as it provided an opportunity to focus on teaching and learning within a particular context while teachers were caught up in the issues of testing and accountability in other areas of the curriculum. The CA approach is explained and discussed fully in the next chapter.

1.3 Places of Interest on the journey: developing the research interest of this study

1.3.1 Personal/professional journey

After a long journey as a classroom teacher (1975-1995) and then an advisory teacher in a local authority (1995-1998), the opportunity arose to be a member of the CA team in the development and implementation phases of the Year 1 CA Programme (1998-2002). Following the development stage of the programme (1998-2001), I began the initial stages of the personal research which resulted in this study. During the course of the research my journey took a new turn, in 2002, into Initial Teacher Education (ITE). Having built strong relationships within the LA and with the participant teachers, the data collection continued unhampered. The participant children were unaware of any change. The new role did not change the data collection or the analysis of data as the journey of both was already well underway. However, the new phase of the journey was useful in sharing data following initial analysis with a wider group of teachers during professional development sessions with interested mentors. Also, the ITE role provided opportunities to share pedagogical strategies shown to make an impact on children's learning with teachers new to the profession. This role has enabled me to reach more children through its ripple effect on students and teachers thus the constant mainspring of my professional journey to make an impact on children's learning has been fully active throughout.

1.3.2 Children's learning

The 1999 modified and updated National Curriculum reduced the number of facts required to be learnt by children (DfES, 1999). The identification of fewer facts to be taught reflected the need for balance. At the time of its introduction, there was a sense of relief within the profession however evidence suggested that the revision did not significantly increase its emphasis on the process of learning. The number of areas to be addressed within the six years of primary schooling (KS1 and KS 2) remained too numerous which coupled with the testing and reporting regime, encouraged teachers to concentrate on teaching facts rather than taking time to allow children to enter into experiential learning. Many teachers were still dissatisfied with the curriculum and wanted improvement.

1.3.3 Introduction of CA in primary schools

In 1996, the Director of the inner city LA in which this present study was conducted remained concerned that the local results of SATs were below the national average. She wanted to raise attainment of a large number of children significantly across the core subjects. Inspectors in the LA examined some of the intervention programmes discussed above to assess their suitability for meeting the needs of the local children. To this end, several initiatives aimed at raising attainment were financed and promoted in schools.

The LA trialled Philosophy for Children in ten primary schools for two years and then evaluated its effect. In England, Lipman's work was promoted by Fisher who showed how the approach could be used successfully across the curriculum. Fisher (1998) maintained that the programme made a difference to

children's thinking. He worked with the LA to trial the programme and to establish it within the schools. The teachers who taught the programme voiced their appreciation and that of the children who enjoyed using it. However, teachers expressed concern over the time taken out of the curriculum by the programme and, following the trial, no school continued with the programme. In addition, the inspectors considered that the results did not bear sufficient evidence to invest further in this programme.

While Philosophy for Children was being trialled in primary schools in the LA, CA was being implemented in all of the LA secondary schools (CASE@KS3). Evidence demonstrated a significant effect on the achievements of those year groups in the CA schools. Given the long term continued evidence-based statistics of raised attainment at KS 3 locally and nationally, as well as the longer-term gain shown in GCSE and 'A' level results, it was considered that a CA Primary Programme would be the best way forward for the LA. The chief inspector proposed that a CA Programme be developed to increase the thinking ability of children in Year 1 (aged 5-6 years). She was convinced that since CA had been shown to be successful in raising KS 3 students' reasoning abilities, then it might be equally successful with younger children. She managed to secure finance from the Single Regeneration Budget (SRB) for this hypothesis to be investigated under the direction of Professor Philip Adey, King's College, London. The research subsequently undertaken by Adey and his researchers used cognitive ability tests to draw conclusions about the impact of the CA Programme on Year 1 children. The pre/post tests during the years when the project was being piloted and developed showed that participant children made significant cognitive gain compared to non-participant children. These tests provided an overview of children's cognitive gain but did not provide information about children's experiences of learning in CA. To address this limitation of the quantitative research, this present study set out to understand more fully how children experienced and constructed learning in the CA environment.

1.3.4 The methodological approach in this study

Previous personal study towards a Master's degree (1996-1998) informed one aspect of the methodological theoretical approach adopted in this current research. The small research project was informed by a six week teaching intervention programme in science. At the end of the six weeks, I interviewed each of the 24 identified children individually. The interviews focused on the children's views of learning during the programme, any awareness of differences in pedagogical strategies being used and their own progress during the programme. Personal Construct Theory (PCT) (Kelly, 1955) underpinned these interviews. This approach allowed children to compare the intervention science lessons with previous science lessons by identifying and exploring their constructs in both contexts. PCT was useful in allowing children's voices to be heard on that occasion so it was considered as useful for this study too. In this study, children were interviewed on three occasions during the year to give them opportunities to explore what helped them to learn. Having identified constructs they were then encouraged to explain and describe how these behaviours or attitudes helped learning. PCT with its associated literature is discussed in Chapter 3.

The previous investigation established a focus group of the four participant teachers. During the group sessions, the teachers shared their reflections of observing children working during science lessons and I shared the constructs provided during child interviews. The teachers reported that listening to the children's constructs and their elaborations enabled them to better understand children and their needs. The teachers realised that children required opportunities to learn in groups where they could share ideas orally in order to enhance positive self-esteem. By observing and listening to their classes working, the teachers saw children in a new way and this in turn prompted them to reflect on their assessment of children and the experiences they provided for their classes.

The experience of using PCT to learn more about how the children construe their experience of learning indicated possibilities for further use of this theory to children's benefit. Consequently, PCT became a key underpinning theoretical base for this current study. The evidence provided by the early study led me to believe that using PCT with children can contribute towards a deepening understanding of how children learn and can inform the debate about what makes an effective primary curriculum.

The previous study indicated that children in Years 2 and 3 could access and express personal constructs to provide useful information to teachers regarding learning and teaching. It was proposed for this present study, that PCT be used to investigate what these younger children could communicate about how they experienced learning during the CA Programme. The intention was that this communication would give insights into some of the aspects that affect children's learning as such information cannot be gained by performance tests alone. This investigation adds to the literature available regarding how young children experience learning during CA and provides information from this perspective to inform teachers' pedagogical practice. The interest in the children's experience prompted the rationale for this study which took place within the context of the Year 1 CA Programme: Let's Think: A programme to develop thinking in 5-6 year olds.

1.4 The rationale for the study

The rationale for this study was firstly to hear children's articulation of their experience of learning within the CA Programme in order to develop knowledge about what helped/hindered their learning within the CA context. Secondly, to determine any differences in the way the teachers used the CA programme once they had been made aware of the children's perspective to assess the value of sharing children's constructs.

Although the programme has been evaluated using quantitative data demonstrating its effect on children's cognitive levels, this study brings a new perspective. Here the children indicate what differences the CA experience made to their learning and in turn, by listening to children's constructs, teachers chose what to prioritise in their teaching to provide a better learning experience. Many evaluative reports have been written about CA, and, in particular, CA with Year 1 children. However, it is new to consider the impact of the programme from the perspective of the children themselves.

1.4.1 The children's understanding of the CA learning experience

Pre/post tests of cognitive ability provided quantitative data on child performance during the CA programme. However, this study offered an opportunity to hear from children how they experienced learning in this context in order to conceptualise from their perspectives factors that influenced thinking development. In school, individual learning is the result of the interaction between child and teacher and other children, interaction between the child and the teaching content and pedagogical strategies and interaction within the child concerned. This study explores at some depth the individual differences over time between children's constructs and investigates trends within the constructs of groups of children with the same teachers.

Debates about how young children learn form part of the on-going decision making process about the National Curriculum, its content and how it is taught. Some of the main voices within this debate have already been explored above. All voices are important but the voices of children speak through this study. To hear children's voices is important because they give a perspective that would remain unheard otherwise. Without this perspective, CA could become a programme that is delivered, something that is "done to children" rather than a facilitative programme that works with children to enhance learning and help them to make sense of what is changing within them in terms of conceptual understanding and the process of learning. Furthermore, taking account of the children's constructs allows a view into how the pedagogy, social collaboration and interpersonal relationships involved in learning during CA impacts upon the children's thinking development. My contention is that the children's views on what helps/hinders learning should always be considered in decision making regarding curriculum design, content and pedagogy.

During the early phases of the development of the CA Programme, before this small investigation began, it was unclear how the change in thinking development took place in five year olds through the CA Programme. The difference between the scores of pre/post-tests gave the measure of the thinking development of each child during the Programme. The pre/post assessments indicated that the thinking abilities of some children appeared to develop substantially, others appeared to make little progress while others appeared to regress. How children understood what helped their learning was an area identified for examination as a way of gaining information about children's learning. It was important that children were given the opportunity to respond according to their individuality. However, the group aspect of learning during CA is a vital part of the pedagogy and, needed to be considered within this study. It was, therefore, necessary to use a methodology that allowed children to express individual experiences of learning as well as gain a view of group experiences.

1.4.2 The application of the CA pedagogy

The CA Programme provides both activities for the children and also a suggested pedagogy that teachers learn about during the PD (Appendix 1:1 An outline of the PD Programme). The teacher is a key person to the success of the programme: "success" being measured by an increase in children's reasoning abilities.

Each of the teachers fully participated in the associated PD but each interpreted the pedagogy in a unique way as noted through the many observations of lessons which took place. Their interpretation and understanding as experienced by the children were aspects to be considered in this study to assess the effect of teacher differences within each group of children. The intention was to discover if there were key aspects of difference within the application of the pedagogy which made a specific difference to children's understanding of what helped their learning and subsequently affected their thinking development.

Having begun to understand how children construe what helped their learning during CA and how the teachers were using the pedagogy, it was necessary to make teachers aware of these findings. This led to investigating whether their new awareness had any impact on children's experiences of CA.

1.4.3 Boundaries of the study

The LA required that the main study should be evaluated in order to determine the Programme's effectiveness. This evaluation reported the results of pre/post tests of cognitive abilities as described in Chapter 2. These results noted that some children made significant progress during the CA Programme while others did not. This current study drew upon the CA Programme for the activities, the results of pre/post tests and the PD. However, this study has its own rationale, conceptual framework and its own methodology. It took account of the key role played by the teachers in children's learning within the CA context by observing their implementation of the pedagogy over two years. However, it focused particularly on the children's perspective of their experiences during CA, a perspective that was in danger of being ignored if evaluation analysis rested entirely on test outcomes.

In the first year some non-CA Year 1 children provided their perspectives on learning which offered the possibility of comparing CA and non-CA participants' understanding of learning and of examining any differences that the CA Programme made upon children's personal constructs. The study also investigates changes in teachers' constructs over two years identifying differences which may be a result of heightened awareness.

At the end of the first year of this study, the participant teachers met on four occasions in order to hear the children's constructs with explanations of how they understood CA helped/hindered their learning. This was to give teachers an insight into the contribution children can make towards their learning experience. Regular observation of lessons and interviews with children and teachers over two years created the possibility to triangulate views— children, teachers and observer- to provide as full a picture of the situation as possible so that accurate interpretations could be made from this informed position.

Other factors influencing children's learning, for example, family background, personal circumstances were not considered. The parameters and ethics of this study were discussed and agreed with the project director and the chief inspector within the LA when it was proposed. Further details are provided in Chapter 4.

The factors explored above gave rise to the following research questions:

How do Year 1 children understand what helps them to learn during the CA Programme?

What differences emerge between CA and non-CA children's constructs?

What differences emerge in CA pedagogy when teachers understand and take account of children's personal constructs during the CA Programme?

From the research questions, came decisions as to the methodology to be followed throughout the study. The structure of the study to investigate these questions is as follows.

1.5 Map of the journey and an overview of the thesis

This first chapter introduces both the context of the study and the interest in developing understanding of children's learning from the perspective of listening to and being informed by children. It also makes clear my personal journey as researcher throughout the duration of the study.

In order to address the area of interest a review of relevant literature was conducted. Chapter 2 introduces CA which is the underpinning context of this current study, describing the programme used in the study and detailing some of the pedagogical implications reviewed in the literature. It provides results from the pre/post cognitive tests demonstrating a disparity in children's attainment during the Programme and indicating that further investigation from a different perspective could reveal insights into the impact of CA on children's understanding of what helps their learning.

Chapter 3 reviews PCT and some of the ways it has been used with children. Research describing studies using PCT in various contexts with children indicate ways of encouraging children to provide relevant constructs which can be used to inform parents /carers/ teachers about children's experiences.

While published research of relevant factors in the areas of CA and PCT inform this study, there is comparatively little research previously undertaken from the perspective of children in Year 1.

Furthermore, although the CA literature from KS 3 is plentiful, published literature regarding the influence of CA on young children's learning is limited. This study informs the body of literature available concerning how Year 1 children learn within the context of the CA Programme.

Chapter 4 describes the Methodology used in the study to examine the research questions enabling the children's understandings of what helps their learning within the CA environment to be investigated. This necessitated a research method which included observations of lessons so as to analyse the context as well as opportunities to interview the children to explore their ideas. In order to analyse the impact of the teachers knowing children's constructs a longitudinal research design was required. The study was conducted over a two year period with four CA teachers. Comparison between CA and non- CA children required non-CA participants. In the first year, the sample size of 24 CA children in four classes and 12 non-CA children in two classes was understood to be optimal in terms of promoting the reliability of

research results. In the second year, observing and interviewing 24 CA children with the same four CA teachers was considered appropriate.

Initially each group comprised three boys and three girls and had as similar an ethnic-mix as possible. The data collection included observations of lessons and the results of interviewing children to collect their personal constructs. The lesson observations were analysed according to the events during CA lessons in line with CA theory as well as categories of talk used by the teachers and children. These categories of talk were constructed during the pilot year of this study after observing many lessons. The children's interviews were analysed according to the personal constructs that the children provided. The children were given time to explain their constructs and their explanations provide qualitative data which enriches the quantitative analysis of the constructs for a fuller understanding of the children's experiences during CA lessons. A further aspect of data collection came from group conversations held with the four CA teachers. These conversations were conducted within a focus group and took place on four occasions between the end of the first year and the beginning of the second year of the study.

Chapters 5, 6 and 7 present the results of the study. Chapter 5 provides information about the teachers' participation, a brief summary of each of the group meetings, analyses the constructs provided by the teachers when asked for their understanding of what helps children learn and their responses on hearing the children's constructs.

Chapter 6 analyses the interviews held with individual children in each of two years. In the first year CA and non-CA children are interviewed three times. In the second year only children from the same CA teachers are interviewed. This meant that the same four CA teachers could be observed and interviewed during the two years.

Chapter 7 includes an analysis of CA lesson observations and categorisation of the oral interventions made by the children and teachers. The categories of talk identified during CA lessons enable the quantification of aspects of the CA pedagogy used so that it is possible to discuss different effects depending upon the use made of the pedagogy.

Chapter 8 discusses the outcomes of the study and examines the implications of the results. This chapter also includes a critical reflection on the methodology of the whole study and ends with indications for future research.

Chapter 2: The road of Cognitive Acceleration

Every child's general ability to process information – their ability to think – can be improved by the process of 'cognitive acceleration. (Adey *et al*, 2001: 4)

The context of this study is a Cognitive Acceleration (CA) Programme for Year 1 children.

CA programmes purport to promote the development of children's ability to think and to process information through a pedagogy derived from the theories of Piaget and Vygotsky. This chapter describes the CA programme for Year 1 (5-6 year olds). Its origins within the secondary school context of the science curriculum are discussed. The purpose of this chapter is to explain the theoretical background of CA and to report on ways in which its impact has been researched. The chapter also serves to demonstrate measureable positive effect that a CA Programme has on children's thinking abilities as measured by cognitive testing.

However, the argument put forward is that results provided by the cognitive tests are limited whereas opportunities for children to explain what helps their learning during CA provides information to teachers which in turn can inform the CA pedagogy thus enabling a more effective CA pedagogy.

2.1 Introduction to the context of Cognitive Acceleration Programmes

The image for this chapter is one of the interior structure of a road. On the surface there are children using the CA Programme for Year 1: Let's Think and teachers facilitating the learning informed by the associated PD programme. Immediately below the surface is the CA pedagogy for Let's Think derived from the original KS 3 pedagogy. CA pedagogy is developed from the layer of CA theory which is underpinned by the hard core: the theories of Piaget and Vygotsky.

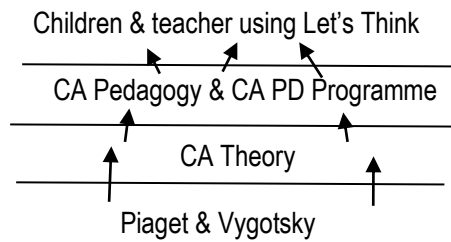


Figure 2.1: Diagram to represent the image of the interior structure of a road representing the layers involved in actualising CA.

This road has been developed over many years and now incorporates several programmes in various subjects, for example, science, mathematics, English, technology and the Arts. It includes programmes for ages from Reception (aged 4-5 years) through Key Stage 1 (KS 1), Key Stage 2 (KS 2), Key Stage 3 (KS 3) and Key Stage 4 (KS 4). The road has taken many batterings over the years from the tensions and debates arising from research by educationalists and the required changes from government advisors. However, despite the storms, the road remains strong and in constant use. CA continues to demonstrate its effectiveness in increasing learners' cognitive abilities, therefore, it remains an attractive road upon which to travel and learn.

This chapter describes the Year 1 programme, Let's Think: A Programme for the development of thinking in 5-6 year olds (Adey *et al*, 2001), in some detail in order to more fully understand the context within which the study takes place. It also goes below the surface to examine the pedagogical characteristics of CA programmes and the theory from which it originated.

2.2 CA in KS 1: Let's Think: The teaching approach

To teach CA lessons effectively teachers are offered PD to develop understanding of the underpinning theoretical assumptions and the suggested pedagogy. The aim of the PD is to increase teachers' understanding of CA theory and, where necessary, make changes to their beliefs about learning and teaching. The PD provided for CA consists of days out of class where teachers come together to explore the theory and pedagogical practices, modelling visits whereby each teacher received at least three visits from a member of the research team who modelled a lesson with the children, coaching visits to classes by the researchers where the teacher taught the CA lesson and was given feedback by the researcher and peer visits to classes when possible. More detail of the PD for the CA Programme in this study is in Appendix 1:1.

A change in teaching methods towards an interventionist methodology needs support to be available to schools by the trainers/researchers so this is always built in to CA PD (Adey and Shayer, 1997). This conviction has been supported by Joyce and Showers (2002) who have evaluated teachers' development

programmes. They confirmed that to introduce a new teaching method it was necessary to provide information about the theory and the materials, demonstrate the pedagogy being required, offer a chance to practise the methods and provide coaching and feedback to embed the new pedagogy in the classroom. This confirmed what CA researchers had included in PD for several years.

Each lesson, with one exception, Lesson 15, is given to a group of six children, working with the teacher. A lesson lasts approximately 30 minutes. Each day of a given week, the teacher gives the same lesson to a different group within the class. In this way the whole class does the same CA activity from Monday to Friday. During each lesson the children and teacher talk together while using the equipment in an effort to solve the challenges suggested. Lesson 15 being taught to the whole class with each group working simultaneously is the exception.

The CA lessons provide activities where the children are expected to discuss possible solutions and come to an agreed conclusion. Encouraging children to talk has been researched by educationalists other than CA researchers. It has been noted that where teachers provide instruction in the use of talk children benefit more fully from shared group activities (Howe & Mercer, 2007, Gipps, 1994; Bennett & Dunne, 1992). Barnes & Todd (1995) developed the concept of “exploratory talk” to encourage teachers to instruct children in the value of discussion. This concept is used by Mercer *et al* (1999) who give the definition of exploratory talk as:

.... engage critically but constructively with each other's ideas. Statements and suggestions are sought and offered for joint consideration. These may be challenged and counter-challenged. But challenges are justified and alternative hypotheses are offered. In exploratory talk, knowledge is made publicly accountable and reasoning is visible in the talk. (Mercer *et al*, 1999:97).

Mercer *et al* set out to examine the premise that children's individual reasoning ability would be increased if they were first instructed into the use of exploratory talk and then given collaborative activities to work through together. In their conclusions, they reported that

.....being taught to use exploratory talk helps develop children's individual reasoning skills. It appears that even non-verbal reasoning, like that involved in solving the Raven's problems, (refers to the Raven's Progressive Matrices – non-verbal reasoning tests which were used to assess the programme under examination in Mercer's research) may be mediated by language and developed by adult guidance and social interaction amongst peers without the provision of any specific training in solving such problems. (Mercer *et al*, 1999:108).

Mercer believes that language is a cultural tool vital in the development of thinking. “Language is a means for transforming experience into cultural knowledge and understanding.” (1995: 97). This resonates with Vygotsky who maintained that a child's cognitive development is dependent upon engaging in spoken language with adults and other children (Vygotsky, 1978). He argued that the true direction of the development of thinking is from the social context to the individual. Mercer also argues that language is more than a means through which individuals share ideas and communicate them. It is also a means for people to think and learn together (Mercer, 1995). Wells (1999) uses the notion that he calls “dialogic inquiry” to update Vygotsky's ideas for today's classrooms. Wells promotes the construct of “a community

of inquiry” which is close to Mercer’s “interthinking” (Mercer, 2000). Both believe that talking in learning is a reciprocal process where ideas bounce backwards and forwards as children take their thinking forward. CA teachers are asked to encourage children to verbalise their reasoning using the theoretical models provided by Mercer *et al* (1997). This talk takes place within the CA structure and revolves around aspects known as the Pillars of CA: within the context of social construction, concrete preparation, cognitive challenge, bridging and metacognition all form part of a lesson.

2.2.1 Schemata of concrete operations in Let’s Think

The main objective and emphasis of each CA lesson is for the children to develop thinking rather than focusing on developing content knowledge. Piaget (1952) suggested that one radical cognitive shift occurs in children between the ages of four and seven years. According to Piaget, during this period, most children move from one way of thinking, **pre-operational**, to a qualitatively different way, **concrete thinking** (Piaget & Inhelder, 1974). It was decided, therefore, to capitalise on this window of opportunity (Piaget, 1952) and provide CA lessons in Year 1 (5-6 years of age), the first year of formal schooling. Since CA lessons aim to encourage a more complex type of reasoning pattern than that already operating the intention was that most children would, therefore, be helped to develop from pre-operation to concrete thinking while recognising that some children would move from an early stage of concrete thinking to a later stage. For details of the qualities of these two types of thought Piaget’s own research offers very detailed descriptions (Piaget, 1952). In general terms, children are learning to manipulate objects in a scientific way, that is, for example, to order and classify rather than make pictures and tell stories. Children are also encouraged to take account of more than one piece of information at the same time. Children are moving from uni-dimensional thought patterns to multi-dimensional thought patterns. Pre-operational thought is described as iconic thought, that is, a little like a photocopier. Children can take in an idea and reproduce the same idea. Concrete thought involves manipulating at least two ideas in order to produce a third: something new. The CA Programme for Year 1 children aims to accelerate the transition between these two types of thought. This is considered to be important because in order for children to benefit from the curriculum being taught they need to be able to handle and manipulate ideas effectively.

Each lesson in Let’s Think is built around one or two of the schemata of concrete operations outlined by Piaget as basic reasoning patterns which help us to make sense of the world and operate at different levels: seriation, classification, spatial perception, causality, time sequence and rules (Piaget, 1954). Appendix 2:1 briefly describes the Let’s Think Programme indicating the schemata underpinning the lessons.

2.2.2 The structure of the lessons

The lessons open with **concrete preparation** when the context is introduced and the vocabulary needed is agreed. This is an important time of familiarisation with the equipment and the context for what is to

follow. The context is usually linked to an aspect of the curriculum or to something familiar in daily life. When this link is made explicit **bridging** is taking place. Sometimes the teacher asks children specific questions to encourage them to reflect on what the activity calls to mind. At other times children spontaneously make comments such as, “*This is just like.....*” and “*This reminds me of.....*” . **Cognitive challenges** are posed during the activity. These cognitive challenges are provided in the programme and the teacher can use the suggestions as appropriate to each group. The criterion here for teacher choice is to challenge each child in their thinking by providing opportunities for cognitive struggle at times within the lesson. With the teacher’s facilitation, children discuss, ask questions of each other, challenge each other’s assumptions, clarify ideas and gradually come to an agreed solution. This is **social construction** in action. **Metacognition**, encouraging children to become self-reflective, to monitor and evaluate their thinking and learning processes, occurs at points throughout the lesson. As the children work together to solve the problem, the teacher is alert to occasions for questioning children not only about the task but also about their thought processes. Appendix 2:2 provides more detail of these CA Pillars.

2.3 CA pedagogy

CA Programmes are described as “intervention programmes” as they are seen as additional to and different from the “normal” curriculum (Shayer & Adey, 2002:16). The notion of “intervention” has been questioned and contested. Desforges (1993) argues that children think naturally and do not need special programmes to develop their thinking. He argues that children are well endowed as thinkers. “They are good thinkers, able to discern pattern, to generalise pattern, to test out pattern and to be imaginative in the creation of possibilities” (Desforges, 1993:5-6). The fact that children are able to think is not in contention with CA. It is my view that children’s thinking development can be enhanced by CA programmes by giving children the tools to learn more effectively and efficiently. Desforges goes on to assert that the curriculum should be focused on the self rather than on activities or on the curriculum. This links with Kelly’s theory (1955) where children are encouraged to self-reflect, become more aware of their constructs and their impact.

All formal education could be constructed as an intervention in that it is a deliberate attempt over a period of time to instruct children and adults in a number of concepts within agreed fields. The National Curriculum (1999) prescribes what is to be taught so this has to be used as a vehicle for much of the school week. There is attention to the process of learning within the prescribed curriculum and teachers are encouraged to facilitate discussions between children about the learning process and give children access to a full range of subjects enabling them to develop their creativity.

In 2002, Shayer and Adey suggested that CA constituted a new paradigm for “normal education” (Shayer & Adey, 2002:16). “Normal” in this context refers to the mainstream accepted curriculum as opposed to “intervention” programmes of which CA is one type of a number available. Shayer and Adey claimed that CA may offer a model, based on psychological theory, which could substantially influence curriculum development at national level.

We are talking here about re-focusing the main aim of the whole enterprise of education from being primarily concerned with content – knowledge, understanding, skills and attitudes – towards a primary concern for intellectual development per se. (Shayer & Adey, 2002:16)

It had taken many years of concentrated and sustained work developing CA pedagogy for the point to be reached where CA could be proposed as a way of thinking from which to develop a recognised curriculum. Unfortunately, this proposal has not yet become a reality in that the new curriculum for September, 2014 has not been built from this perspective.

2.3.1 The development of CA pedagogy

According to Adey, “a person’s intelligence, their information processing capability, is controlled by their working memory capacity” (2003:25). CA programmes adopt this view, common within developmental psychology, and take it into account when trying to raise thinking ability in young children.

Understanding what happens within the brain as children learn may affect the pedagogical strategies used by teachers and therefore the position they take can be important. For example, teachers using the model of the brain where the short-term memory is perceived as a store with a finite capacity retaining a limited number of units (Atkinson & Shiffrin, 1968) may limit the amount of information that children are exposed to for fear of overloading them. Teachers considering a relationship between working memory and long term memory may offer children several opportunities for the same learning so that the learning embeds itself in the long term memory (Baddeley, 1990). Teachers who use a model which concentrates on the conscious element of information processing (Craik and Lockhart, 1972) may concentrate more on how children remember rather than being concerned about the amount children have to remember. Whereas teachers who use a model which promotes the effectiveness of multiple coding helping learning are more likely to use a multi-sensory approach to learning.

Technological developments allow scientists to study the brain in detail from a different perspective. It can be seen that through childhood and adolescence the brain becomes well organised until the main structures in the pre-frontal lobes are finalised. Technology demonstrates that the frontal area of the brain does not appear to be fully mature until around the age of thirty. Functional MRI images show that young people, until about 17 years of age, process emotions, instructions and procedures much more consistently in the amygdala (the seat of emotions) while adults process the same activities in the frontal lobe (the seat of rationality) (Johnson, 2004; Yurgen-Todd, 2000). This information is relevant in this study because according to this model, most children of 5-6 years are at the stage when the failure rate to store memories is declining and their brain is becoming better organised. This means that teachers can use a pedagogy which consciously encourages the developing memory. Also, teachers actively using bridging, one of the CA Pillars, may develop important neurological pathways as the brain organises itself. Consideration is given to the children’s memory capacity and teachers are encouraged to help children to develop strategies for efficient transfer of information from the short term to the long term memory. Children in Year 1 are more likely to process learning in the amygdala which assumes that the role of emotions is more dominant than the role of reason. The pedagogy for Year 1 needs to take this into

consideration. Therefore, the way teachers respond to children as they contribute and participate in Let's Think could influence the rate of children's cognitive development. Positive encouragement and support could offer children what they need in order to encourage engagement with learning.

CA lessons provide challenges using general reasoning patterns rather than aiming to address a specific concept as in a narrow learning objective. The lessons, as suggested by Piaget (1952), use situations that cannot be easily explained by existing thought patterns thus stimulating more complex patterns. CA researchers further suggest that, if children are given the necessary experiences and environment to understand the processes of thinking and learning, they then develop not only their general reasoning patterns but also an increased awareness of these patterns through metacognition. One aim of CA is to encourage children to become more conscious of their metacognitive processes. It is believed that by becoming increasingly aware of the process of learning, children, in turn, may take more control over their learning. In support of this, Barnes & Todd state that each of us can learn only by making sense of what happens to us through actively constructing a world for ourselves (1978).

During CA, children construct meaning as they are encouraged to talk about what they think. Mercer *et al* (1999) maintain that teachers rarely induct children into how best to use language for constructing knowledge. Other researchers have come to similar conclusions and believe that children are frequently unclear about the purpose of the activities in which they are engaged and unfocused in their discussion. Research also shows that teachers do not make the success criteria clear. This leads researchers to conclude that much of the value that could be gained by children's interactions is being lost (Christie & Martin, 1997; Galton & Williamson, 1992). According to Alexander (1995) well-structured oral, collaborative activities encourage children to concentrate on the task more frequently than written work in isolation. CA offers the possibility of higher levels of interaction and cognitive engagement specifically designed to raise the cognitive levels at which children operate as they work together in solving the challenges posed. Children are encouraged to express their ideas, discuss possible solutions, agree and disagree with each other giving reasons and challenge each other as appropriate.

2.4 Key aspects of CA Theory

Examining aspects of CA theory allows the origin of the pedagogy to be understood. Crucial elements of the pedagogy are effective social construction, challenge by the activities and engagement in metacognition. In beginning to develop their theory, Shayer and Adey (1981) were explicit in their focus of restricting themselves to the cognitive domain of children's learning. They understood that other factors affect learning, for example, motivation, but they were primarily interested in cognitively matching children's thinking to new curriculum materials. CA theory is built upon ideas from both Piaget and Vygotsky and is based on the three following assumptions:

1. Cognition develops through a general central processor.
2. Cognition develops through the process of interaction between the environment and maturation.

3. The rate of the development of cognition can be altered by a change in the environment.

2.4.1 Assumptions underpinning CA Theory

2.4.1a *Cognition develops through a general central processor*

A belief in a central cognitive processor, which controls all understanding, underpins CA theory. The theory assumes that this central processor and its development is an essential consideration in the acceleration of children's general intellectual functioning.

Developmental psychologists believe that the effectiveness of a general processor develops from conception to maturity under the influence of genetic inheritance, maturation and experience.

Technological advances described above do not appear to conflict with this view. Psychologists subscribing to this perspective consider that it is empirically justified to believe that a general cognitive processor underlies any particular talents or areas of expertise (Logie, 1999; Towse *et al*, 1998; Anderson, 1992).

The implications of understanding how the brain works, memory development and its effect on learning are important for education and for this study. Primary teachers need to consider the immaturity of the brain and take it into account when planning for learning. The ability to process information effectively is one measure of how intelligently children can respond in given situations. Where contexts are unfamiliar children need to draw on relevant previous knowledge and problem solving strategies to make connections so as to act with intelligence. This is what you use when you do not know what to do (Piaget, 1959a). This concept corresponds in some measure to Sternberg's model of intelligence as the capacity for mental self-management (Sternberg, 2003). According to Sternberg the degree to which a person can call on a range of appropriate successful solutions within a variety of situations is a measure of their intellectual functioning. CA encourages children to consider a range of options in tackling challenges and in reaching solutions. Children's ability to think through and respond to unfamiliar situations is an indication of their intelligence and regarded as evidence of the general nature of intellectual functioning through the central processor (Shayer & Adey, 1981).

2.4.1b *Cognition develops through the process of interaction between the environment and maturation.*

The rate of the development of cognition can be altered by a change in the environment.

These two assumptions require a belief in a constructivist approach to the development of cognition. CA theorists believe that children's intelligence is sufficiently flexible to be amenable to change by a well-designed intervention providing a cognitively stimulating environment (Adey, 2003). Constructivism proposes that children interact with the experiences provided within the environment in order to develop their intelligence. Furthermore the quality of that environment affects the rate that cognition develops so adults providing the opportunities for children have a crucial role in raising children's intellectual

functioning. This suggests a case for teachers who are charged with raising standards, ensuring that they hear from children what the children themselves find useful in helping them to learn.

According to Schwandt (1997) constructivism is the belief that the mind is active in the construction of knowledge. The mind forms abstractions or concepts from impressions received from outside so as to make sense of experiences. Within this belief, acquired knowledge and its evaluation take place within a constructed, conceptual framework through which the world is described and explained. These constructions undergo modifications in the light of new experiences so are continually changing. Constructs and interpretations are formed within cultural and historical practices, languages and shared understandings. The development of children's cognition within a classroom context, therefore, needs to take account of the children's lives as they engage and interact with peers and adults. Social constructivism focuses on the social process and interaction between people (Schwandt, 1997). Social dimension is important in this study as CA lessons in Year 1 are conducted in a small group of six children with the teacher. One aspect of Piaget's theory proposes that cognition develops through the process of the interaction between maturation and the environment (assimilation, accommodation and equilibration) and Vygotsky stresses the interaction between the cultural environment and the development of cognition. The belief that general cognition develops through the process of interacting with the environment, a central assumption within CA theory, is now a widely held belief of cognitive psychologists (Smith, 1996). All CA activities take account of this interaction by providing and encouraging a collaborative environment for solving challenges.

Another important notion taken from both Piaget and Vygotsky is that children need opportunities which they do not readily understand and which are slightly difficult; they need to struggle to come to a solution and are helped to do so through social mediation. The notion that the rate of cognitive development can be altered by a change of environment is found within theories from cognitive and developmental psychologists (Crook, 1994; Vygotsky, 1986; Dunn, 1984; Piaget, 1954). This is a second important assumption within CA theory and all activities are intended to challenge every child to some degree.

Being underpinned by Piaget's theory of cognitive development and Vygotsky's notion of social construction, CA encourages children to work together, share ideas and construct meaning and understanding within their Zone of Proximal Development (ZPD). Vygotsky (1978) described language as a psychological tool, something each of us uses to make sense of experience. In his view children begin to understand a concept in the social space and gradually internalise this understanding as they listen to new ideas, discuss them and explain their thoughts and reasons.

2.4.2 CA theory has its roots in school improvement

Adey and his colleagues promoted the belief that every child's general ability to think can be improved through the use of CA pedagogy (Adey *et al*, 2001; Shayer & Adey, 1981). This belief came not only from their teaching experience and working with children but also from studying the writings of the two theorists Piaget and Vygotsky and then undertaking empirical research using the theoretical ideas to demonstrate

the pedagogy required to accelerate children's thinking. The intention of CA is, therefore, to raise attainment in all curriculum areas by increasing children's intellectual capacity. This work has been on-going since the early 1980s and has been rooted in an attempt to improve academic standards for all children (Adey, 2003; Shayer & Adey, 2002; Adey & Shayer, 1994; Adey & Shayer, 1993; Adey, 1988; Shayer & Adey, 1981).

Shayer and Adey undertook a five year research programme as one aspect of a review of school curricula in England and Wales in the 1970s: Concepts in Secondary Mathematics and Science Programme (CSMS). This research programme was established to examine typical levels of thinking within secondary aged students. A method was developed of assessing levels of cognitive demand through the science curriculum so that teachers could more accurately predict how children would respond to science lessons. At this time of review of both primary and secondary schooling, Her Majesty's Inspectorate reported that science should be considered a suitable subject for all children to be taught (cited in Shayer & Adey, 1981, P v). Also, the Association for Science Education (ASE) published a policy document promoting the view that all children should learn science in schools (ASE, 1979). According to Shayer and Adey, who led the science aspect of the CSMS research, the opinion that all children should learn science initiated a change from previous policies which had been based upon the assumption that science was only taught to a minority of children. In previous research, Bloom had identified that only 5% of children were offered science taught (cited in Shayer & Adey, 1981, P v). Shayer and Adey believed that the move to include the teaching of science to all children may create a difficulty for secondary school teachers in being able to provide appropriate activities within the curriculum for all children (Shayer & Adey, 1981). They were rightly concerned that teachers would need support in making science accessible to all children in their classes.

Within the context of school improvement, at the outset of the CSMS research, Shayer and Adey proposed to investigate the nature of children's difficulties in learning science by developing a general theory where a model of learning processes could be built and applied to a range of individual learning experiences (Shayer & Adey, 1981). They believed that if they investigated how children at various ages learnt and applied scientific processes to scientific content then they would be able to generalise the principles through which children learnt. The purpose of developing such a general model of learning was so that teachers could use the model to match activities and provide learning experiences for children to enable them to succeed more frequently and learn effectively. In this way it would be an understanding of children's learning that would lead the way in the school improvement agenda. I believe that this was a meaningful and helpful way forward in raising standards as well as being relevant to children. According to Shayer and Adey (1981), for their model to be helpful it needed to take account equally of the processes children employed in learning, the content of the curriculum and teaching methods employed by the teachers. In recognising the importance of how children learn and investigating thoroughly the level at which children think, Shayer and Adey hoped to provide a science programme which matched children's

abilities and therefore helped teachers to teach children in ways that produced effective enabled learning. The assessment of children's thinking was made on the basis of cognitive tests.

2.5 Piagetian theory of cognitive development

According to Shayer and Adey, the advantage of a general, over-arching model of learning processes was that its application can be widespread, therefore, cost effective while at the same time accurate enough to predict appropriate teaching material for a vast number of children to learn more effectively than indicated at that time. In proposing to develop a general model of learning processes while investigating the difficulties that children faced in learning science, Shayer and Adey found Piaget's theory of cognitive development an attractive place to begin. They believed that Piaget's theory based on a genetic epistemology was the one that could offer the possibility of developing a model whereby the thinking demand of learning materials and children's cognitive development could both be measured by using tools developed from the same set of fundamental principles. If this were the case then learning materials could be matched appropriately to each child or class of children. Shayer and Adey believed that they could draw on Piaget's theoretical understanding of the growth of knowledge and apply it to the thinking of the school population in order to create a measure of predicting what children can do. They believed that it should be possible to develop from it two sorts of measuring instruments One would measure the level of development of children's mental schemas and the other would determine the level of cognitive complexity of curriculum material.

Using Piaget's understanding of the cognitive development of young people meant that Shayer and Adey could measure children's level of development and determine the cognitive demand of curriculum material from the one starting point. Furthermore the level of detail in Piaget's writings about young people from 0-16 years old provided a wealth of information that could continue to inform educationalists by developing their understanding of how young people think. In the first instance, Piaget's theory provided Shayer and Adey with a tool which gave a structure to enable them to listen to children as they completed the tasks intended to evaluate children's reasoning and to measure their mental schema. At the same time it gave them a way to determine the level of cognitive demand of aspects of the curriculum. Since these two measures were being drawn from the same set of assumptions, Shayer and Adey argued that logic dictated that it should be possible to predict the upper limits of the levels of curriculum material that could be understood by each child at the point of testing (Shayer & Adey, 1981).

In their view, no other learning theory offered this possibility so they proceeded to investigate what aspects of Piaget's theory they could validate. Piaget argued that an individual's way of intellectual functioning operates in interaction with the environment leading to a progressive development of intellectual structure (Piaget, 1959b). Cognition, according to Piaget, continually assimilates, accommodates and organises knowledge into coherent structures or schemata giving rise to systems of rules, procedures and routines from which to operate. These systems or reasoning patterns that Piaget described as structures of intelligence are sets of mental operations that are not context dependent so can be applied to objects,

ideas and beliefs encountered within the environment as well as through various subjects within a variety of curricula. Cognitive functioning could, therefore, be described as an active, ever changing process.

Piaget's observations also led him to believe that in functions where there was movement there was also a stabilising mechanism. In Piaget's theory the stabilising function within cognition is equilibration. Achieving equilibrium between assimilation and accommodation involves a struggle but this is vital for development or cognitive adaptation. According to Piaget accommodation and assimilation come into balance only to prepare the subject for a new disequilibrium. The ratio between these two functions may vary but the equilibrium existing between assimilation and accommodation is what characterises a complete act of intelligence (Piaget, 1950:6). "According to Piaget, assimilation, accommodation and equilibration are all active processes by which the mind transforms, and is transformed by, incoming information" (Siegler, 1991: 24). CA lessons seek to assist children to assimilate, accommodate and transform their minds by providing the necessary structure. The CSMS team used the detailed descriptions of the interviews that Piaget held with children in order to begin to create their own tests appropriate for children in schools in England and Wales (Piaget, 1955).

Shayer and Adey stated that as many as possible of the key features of Piaget's interviewing method had to be maintained to achieve the same end (Shayer & Adey, 1981). A series of Science Reasoning Tasks (SRTs) were produced, trialled, tested and evaluated. This process is fully described by Shayer and Adey (1981), making it clear that transparency and openness to scrutiny was crucial to them. Through the detail provided by Shayer and Adey in all their publications it is possible to replicate their work with validity and have confidence in the integrity of their results. Also regular use of the tests by many teachers over a number of years followed by publication of results all testify to the robustness with which the tests were designed and evaluated (Adey & Shayer, 1997; Adey & Shayer, 1994). The possibility to test large numbers of participants in routine classes across the country providing a general picture of thinking levels of young people in state secondary schools was advantageous in that this set a benchmark for that population.

Piaget believed that as children's thinking developed the structures or reasoning patterns (schemata) that they use grow and change. He identified qualities of thinking and categorised these qualities as happening within various stages. In most cases, the adaptation mechanism works to maintain stability between assimilation and accommodation. However, within this process, Piaget believed that at certain points in life equilibration enables radical conceptual shifts to occur. These shifts result in significant cognitive restructuring allowing for a different quality of reasoning patterns corresponding to structures of intelligence. It is through these reasoning patterns that an individual adapts to and organises their environment. Piaget detailed these shifts and changes describing them as significant stages of cognitive development that all young people go through as they develop. This is the origin of his Stage Theory. If the work of the CSMS team was going to be built on the work of Piaget and be respected in terms of reliability and validity then the CSMS team had to establish that Piaget's notion of Stage Theory was

reliable and valid to demonstrate that their work had a solid foundation. They also had to establish that their use of Stage Theory was valid in a different context.

The CSMS study described in detail the cognitive levels for the participant children from which general characteristics of the school population in Britain were derived. These descriptions served to identify the levels of cognition required of school curricula. The strength of the testing regime in validity and reliability lies in the empirical detail and evaluative scrutiny that Shayer and Adey brought to the work (1981). They state that they can confirm to a great extent the accuracy and consistency of the Piagetian descriptions characterising the different stages of the development of thinking. However, they also identify cases where the Piagetian account is not supported by evidence and analyse what they believe to be the differences in their findings (1981). Their evaluation led them to conclude that the individual probing that Piaget could achieve through his interviews with children enabled him to develop his general model of cognition whereas the large scale testing that was achieved through the development of the SRTs allowed for statistical analysis to be applied to the model and this exposed some anomalies within Piaget's model. They cited examples where children used concrete strategies to come up with solutions to problems which Piaget (1955) had classified as formal. Also, other examples demonstrated that children's responses described as stage-related by Piaget were not so according to the CSMS data.

The strengths of the SRTs lie in their using material familiar to the school context, they can be easily administered by teachers who then hear their children's reasoning and they are not age-corrected in the way that standard Intelligence tests are, so give a measure of cognitive development of each child. The results of SRTs provide a detailed analysis of the quality of thinking of each child. Such information cannot be extrapolated from other sorts of tests. For example, standard Intelligence tests are statistical devices which provide an age-related score and a comparison with the rest of the population of that age. Such tests do not provide any information as to how children think, the quality of that thinking or predict what cognitive tasks a child may achieve or fail. The techniques that Piaget introduced and that Shayer and his team developed for use in the SRTs are unique in the way they access and probe children's thinking.

The advent of Piagetian Theory into the world of psychology generated many investigations, both empirical and theoretical, that were not all in accord with Piaget. However, Shayer *et al* stated that the standard of much of the work produced discrediting Piaget's model was poor and characterised by disagreement, incongruity and conflict in particular regarding the stage of concrete operations (Shayer *et al*, 1988). Shayer *et al* cited numerous studies which claimed to test the structure of the developmental stage theory (for example, Case, 1985; Halford, 1982; Siegler, 1981; Pascual-Leone, 1970). Having analysed many of these important studies, Shayer *et al* concluded that one important area of confusion in the studies was that they failed to distinguish between the variables of chronological age and cognitive development with a constant false trail of ages and stages (Shayer *et al*, 1988). Shayer & Adey (1981) demonstrated that children reached the formal operational stage of development later than Piaget had suggested. Shayer *et al* (1988) concluded that Piaget's conceptualisation of concrete operational thinking as one single-structured whole was inaccurate.

One finding relevant to this study is that of Bryant (1971: 47-48) who stated that children as young as three can grasp that “such fundamental things as number, area and volume remain constant if one changes the appearance” whereas Piaget had cited this as a much later development (5-6 years). This finding is significant to this study as one of the tests used to identify the children’s level of cognition is a test of conservation. The implication of this discrepancy for Adey *et al* (2002) in testing children’s level of understanding of conservation was that the test had to be robust, able to demonstrate its validity and able to be replicated.

According to Eames *et al*, researchers have not been able to replicate findings to correspond to claims of researchers such as Donaldson, McGarrigle and Bryant (Eames, Shorrocks, Tomlinson 1990). Siegler maintained with certainty that “young children can learn more than Piaget thought they could” (1991:53) and he cites several studies indicating the evidence for this (Bullock, Gelman & Baillargeon, 1982; Wilkening, 1981). However, Siegler is very clear that the detail and depths of description provided by Piaget on children’s reasoning processing remains unsurpassed (Siegler, 1991). He also maintains that Piaget points us in the right direction to learn more about children’s thinking. Shayer and Adey did just that when they began to use Piaget’s theory. In the first instance, at task level, the detailed descriptions of children’s reasoning, were used to design the SRTs. Secondly, at one level removed from the task, the broader characteristics within each stage of development, were used to identify the stage of cognitive development of each child in the CSMS sample.

The important question for teachers therefore is how they encourage thinking development so that children move towards formal operational thinking effectively. In this study most of the children are in the concrete operational stage during the CA programme and are developing along the road towards formal operational thinking. Through the study, various factors that help/hinder children to learn may emerge. Analysis of these factors could inform the process of the development of children’s thinking. In particular, the analysis may shed light on the key aspects that encourage the unification of the thinking process as children move from concrete operational thinking to formal operational thinking.

Having examined Piaget’s theory at depth Shayer and Adey were convinced that general cognition develops through a central processor and that with maturity the underlying structure of thinking becomes more unified. Like Piaget, they believed that cognition develops through the process of interaction between the environment and maturation and that the rate of thinking development can be altered by changing the environment. This belief also meant that they were influenced by another psychologist, the Russian social psychologist, Vygotsky.

2.6 Vygotsky’s theory of Social Construction

Like Piaget, Vygotsky (1896-1934), also saw the child as actively constructing personal knowledge and understanding but he placed an emphasis on social interaction. He believed that the relationship between the individual person and the social context was integral and complex. Vygotsky understood that the development of knowledge was a complex and conscious act. “It is a complex and genuine act of thought

that cannot be taught by drilling, but can be accomplished only when the child's mental development has reached the requisite level (Vygotsky, 1986:149). This is similar to Piaget's theory of the development of cognition. Like Piaget, he also believed that direct teaching of concepts was usually a waste of time in that children generally do not understand them from within. "Direct teaching of concepts is impossible and fruitless. A teacher who tries this usually accomplishes nothing but empty verbalism, a parrot-like repetition of words by the child, simulating a knowledge of the corresponding concepts but actually covering up a vacuum." (Vygotsky, 1986:150).

Vygotsky's theory places emphasis on the culture and social aspects of a child's life. He maintained that, in order to understand the mental functioning of an individual, it was necessary to consider the cultural and social processes experienced by the individual. His model of mental functioning is based on the belief that learning is a two-way operation: interpersonal processes and culture provide a framework for learning; the child constructs meaning and understanding from this structure. Mental function is, therefore, firstly action with the world and secondly reflection upon it, using the language and other symbols of the culture to make sense of it.

Vygotsky explored the effect of more knowledgeable others directly intervening to assist the learning process. He argued that it is through this instruction, this engaging co-operatively with more knowledgeable others, that children acquire the tools needed for thinking and thus learn. Vygotsky explored the paradox that giving children activities that match their cognitive level often leaves them bored and at a standstill; whereas, introducing concepts too far ahead of their development produces "empty verbalism" (Vygotsky 1986:150). He maintained that "the only good kind of instruction is that which marches ahead of development and leads it; it must be aimed not so much at the ripe as the ripening functions" (Vygotsky 1986:188). He described how more knowledgeable adults within the culture help children learn and developed his notion of the ZPD. He defined this zone as the distance between the child's actual developmental level and the potential level of development under the guidance of a more expert adult or in collaboration with more competent peers.

Vygotsky believed that the intervention by the expert should be at a level just beyond the child's existing level of development so that it provides a challenge but not too far ahead as to be incomprehensible. The child can then accomplish something new and, therefore, learn. This fits with Piaget's notion that activities need to be a little ahead in terms of understanding so that children have to struggle in order to make sense of new knowledge. However, Piaget did not help the children as they carried out his tasks as he was investigating how the child went about the task for him/herself in order to learn about their development. According to Vygotsky, the process of collaboration, where what is known already is confirmed and new information is given and actively received, allows the child to develop intellectually (Vygotsky, 1986). Research by Roazzi and Bryant (1998) confirmed Vygotsky's ideas with children aged between 4-6 years. In small groups the younger children were asked to solve a problem. In each group some older children were also present. These were not allowed to tell the younger ones the answers but they could help by giving clues about processes that could be used. Roazzi and Bryant found that the

young children could not solve the problem alone but when the older ones supported them and offered clues the younger ones could reach a solution. According to Vygotsky then, the role of the teacher and other children in any group, as more knowledgeable others, is crucial, in developing children's thinking through working in collaboration in solving challenges a little ahead of children's actual development.

CA Programmes use the social mediation theory outlined by Vygotsky (1962) to provide challenges within lessons where children are required to discuss their ideas. Most learning during CA lessons takes place within small groups, well managed by a competent teacher, so helping to realise Vygotsky's theory where the social context is crucial to children's development.

2.7 From theory to practice

At the outset of the PD, some teachers expressed surprise that CA is built from theories of both Piaget and Vygotsky. Some of them held the view that Piaget and Vygotsky were opposed to each other. Many had read or heard criticisms of Piaget in their initial teacher education and believed that a constructivist approach promoted through Vygotsky's work was the preferred way to teach. However, the PD provided selected readings from Piaget's writings and the teachers began to realise the value of his detailed work which afforded them insights into how to use Piaget's work on children's development in their classroom planning. The teachers were encouraged to read original sources but other researchers who used Piaget and Vygotsky were also referenced. For example, Rogoff (1990, 1994, 1998) demonstrated how she used both Piaget and Vygotsky in her research. In her analyses, Rogoff (1990) points out the value of the different perspectives offered by the two theorists. She suggested that the two theorists both promoted a role for social interaction in cognitive development with Piaget emphasising cognitive conflict between same status peers while Vygotsky focused on the children's interaction with a more experienced partner. Piaget concentrated on the transformations of perspective that characterised mathematical reasoning while Vygotsky looked more at the development of the societal language for solving intellectual problems. Also, Rogoff pointed out that Vygotsky examined the process of collaboration in shared thinking and reaching a shared solution while for Piaget the social process provides individuals with the possibility to see or hear alternative views and then to explore the logical consequences of their own positions. According to Rogoff (1990), the role of peer interaction in supporting cognitive development was central to Piaget's theory. Interaction with peers while discussing problems demonstrated effectiveness, however, interaction with peers appears to be less effective than interaction with adults in the development of skills in planning and remembering tasks. This data gave rise to discussion among the teachers regarding their role in facilitating children's cognitive development during CA lessons.

Bruner's (1960) perspective on Piaget's "notion of readiness" was also discussed during PD sessions. The similarities between Bruner's "spiral curriculum" and the various levels of challenge suggested within CA lessons were points of interest to teachers. CA theory is very clear that children need to be challenged in each lesson and the teacher is responsible for facilitating those challenges in appropriate ways for each group and class. The main point of difference between Piaget and Bruner identified as a different way of

understanding development was also discussed. The gradual development of cognitive skills described by Bruner (1961) rather than distinct stages of development as described by Piaget (1955) was a topic that the teachers debated. Piaget believed that the environment provided for each child was crucial to developmental progress, challenge and stimulation being key. This concurs with Bruner's theory that a teacher "can speed up a child's development" (1960) and this, in fact, is what the CA evidence has provided over many years.

Results of attainment have been collated and analysed annually since the onset of CASE @ KS 3. These have been well documented and publicly reported (Adey and Shayer, 1997; Adey and Shayer, 1993). In 1987, evaluation of CA in KS 3 showed that boys made significant gains over their non-participant peers at the end of the two year intervention. Girls also made gains but they were not significant (Shayer and Adey, 1992). In 1989/90 results of GCSE Examinations for the same participants were analysed. These results are reported in detail in Adey and Shayer (1997). The documentation shows that participants in Years 7 and 8 make cognitive gains above that of non-CA participants and significant gain in GCSE and "A" Level results in science, English and mathematics. According to the literature, this evidence of long-term gain and of cross-curricular benefits gives credence to the theories that there is a central cognitive processor, cognitive conflicts/challenges encourage the stimulation of more complex reasoning patterns and that a change in the environment alters general cognitive development (Adey & Shayer, 1997).

Evidence of this nature from KS 3 over the years has caused some disquiet in education circles with regard to the theory and practice of CA. One line of argument is that development in a schema that has not been addressed does not provide the evidence that there is a central cognitive processor as CA researchers believe nor does it negate the domain specific intelligence model proposed by Gardner (1993). Schemata do not represent different domains within the brain. It could be that there is a central cognitive processor underlying general intellectual functioning and that some other learning can be domain specific. Adey disputes Gardner's theory and suggests that intelligence has a general component operating across all domains and more specialised components. "Intelligence consists of a hierarchy of abilities including both a very general factor and more specialised ones." (Adey, 2003: 24). Despite the questions and doubts raised in the public forum, CA continues to be sought by schools and LAs nationally and also internationally for its lessons, PD and analyses of attainment. It was this continued belief in the value of CA and the consistent reported evidence of raised attainment in KS 3 that led to the birth of CA in KS 1. However, my argument is that results provided by the cognitive tests are limited and that if opportunities are provided for children to explain how they experience CA lessons then the pedagogy could be made more effective.

As discussed in Chapter 1, a significant amount of time and money has been invested in the development and evaluation of intervention programmes to complement or supplement the National Curriculum or other school curricula. It would be reasonable to assume, therefore, that each programme should make some difference to the performance and attainment of the participants and to the teachers' pedagogical practice. It could also be argued that teachers should be directed towards those interventions which make the most

significant differences, learn what it contributes to academic gains and then use these practices in their class teaching. According to Adey and Shayer:

It is a scandal of the intervention literature that although evidence has shown that the interventions have had effect on tests closely related to the intervention methodologies, few appear to have been accompanied by increased general school achievement of more than very modest amounts. Often no difference at all is found in comparison with controls. (1997:90).

In order to evaluate any benefits of the programme the CA Year 1 children were assessed during the academic years of its initial development. During the pilot phase of the CA Programme, testing was also piloted. Pre/post-tests of cognitive development were administered in September and July in each academic year. During the first year the Programme was taught, children in fourteen classes in ten schools were taught the CA programme in addition to the National Curriculum within the normal school day, while children in eight classes in six schools, following only the normal curriculum, acted as a control element. Two assessments in cognitive development were used: a spatial relations test which was given to every child in all 22 classes in a group of between four and six and a conservation test which was given individually to a one third sample of children. The details of the tests are provided in Appendix 2:3

2.7.1 Results of the pre/post tests in the first year of teaching Let's Think

Figures 2.1 and 2.2 show the distribution of gains made in each class for the Spatial Relations test and the Conservation test for the first year of teaching the CA Programme. Each child's score on each post test was subtracted from each pre test in this initial analysis.

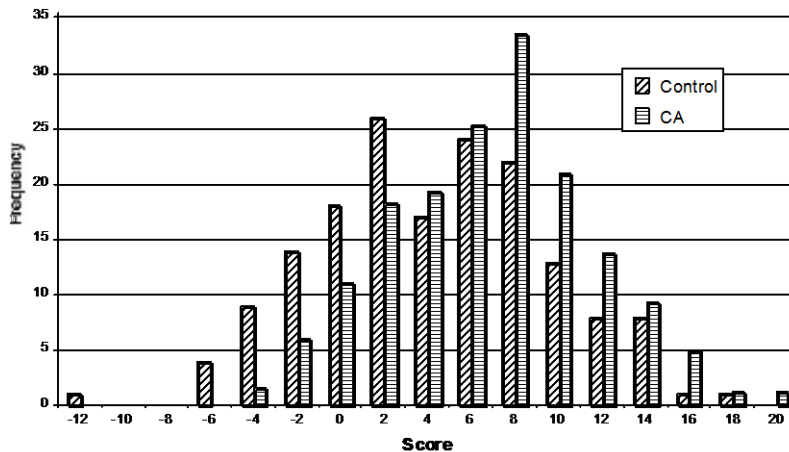


Figure 2.2: Distribution of Spatial Relations test gains

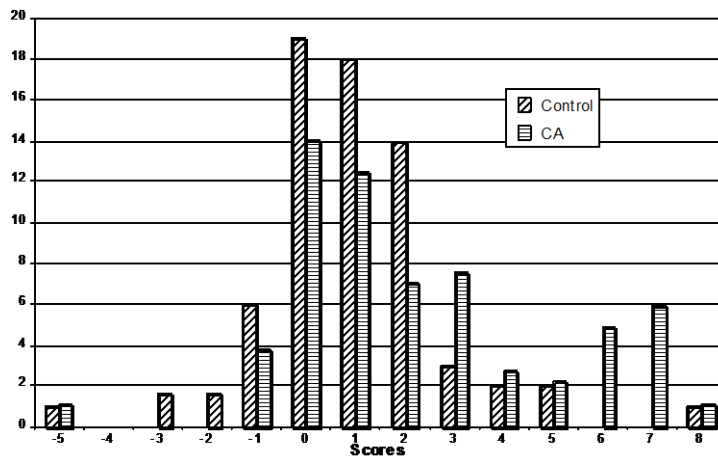


Figure 2.3: Distribution of Conservation test gains

As can be seen, initial results of the CA Programme showed CA classes having substantially greater cognitive gains than control classes. Data also show substantial differences between classes. There is no interaction between baseline test scores which means that any differential effect arising from the fact that the CA and control groups had significantly different mean baseline test scores can be discounted.

Analyses by date of birth and social criteria, show that children born within any quarter of the year and from a range of backgrounds are spread across the spectrum. These factors, therefore, appear not to hold significance to children's cognitive gain. This was surprising as it had been expected that summer born children would be at a lower level of thinking than autumn or spring born children as the summer born children had had less time in school during their Reception year. Analysis of the results of CA by gender revealed differences. The data indicate that the boys in the control classes made greater gains in cognitive development than the girls. In the CA classes both boys and girls made similar cognitive gain and both made greater gains than children in control classes. However, the cognitive gain by CA girls was significant whereas for boys it did not reach significance. This is interesting particularly as results of National Testing at the time indicated that boys were attaining less than girls. The CA results appear to indicate that boys and girls are making broadly similar cognitive gains at this stage of formal schooling.

It may be considered that, if the assumptions of CA theory are accurate, results should indicate no substantial difference in any isolated attribute. It could also be argued that a successful PD programme should convey the pedagogy to teachers in such a way as to minimise teacher effect. The PD programme was evaluated positively.

The overriding impression gained from this research is that this professional development programme was perceived as exceptionally successful in enhancing teachers' pedagogy and children's learning skills. (Hewitt and Hewitt, 2002:23)

Yet Figures 2.2 and 2.3 indicate that the CA classes get a range of results.

In order to see this more clearly the mean of the residualised gain score of each child in each CA class was calculated for each of the two tests. For each child this is calculated by subtracting the mean gain score of the whole control group from each raw gain score.

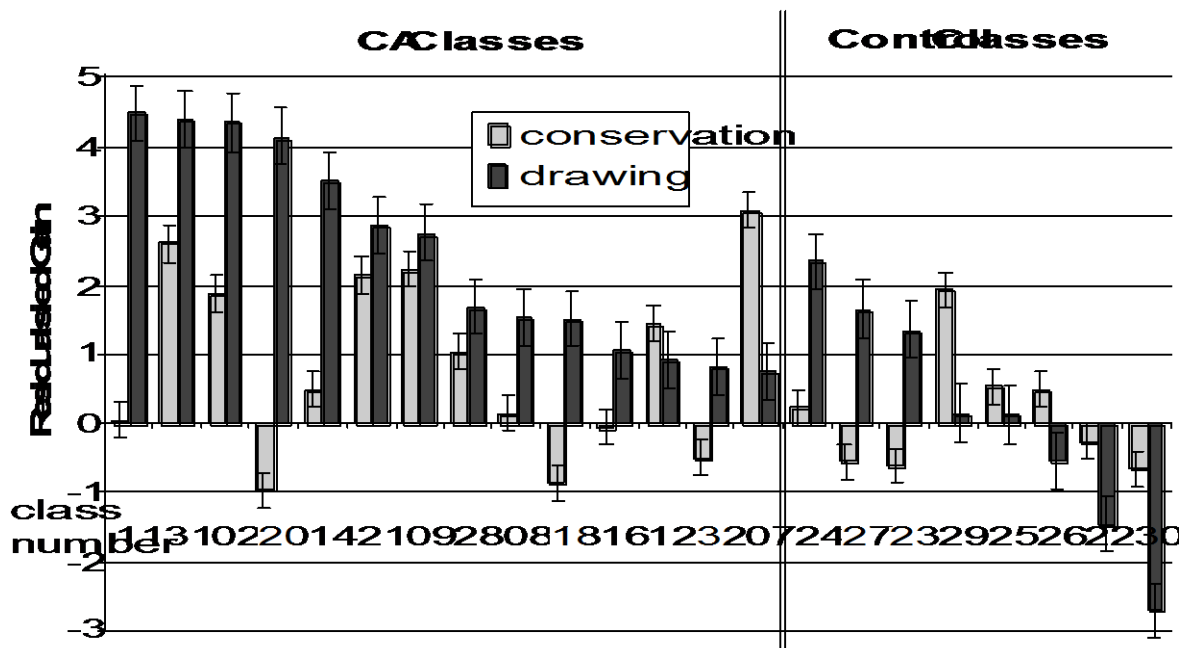


Figure 2.4: Mean residualised gain scores by class

Figure 2.4 indicates that five CA classes achieve greater cognitive gain on the spatial relations test than the best control class and twelve CA classes show greater cognitive gain on spatial relations than five out of eight control classes. The results indicate that four CA classes made more cognitive gain on the conservation test than any of the control classes. Class 29 stands rather alone among these results. There is good reason to believe that the children in this class were coached by their teacher for this test due to a variety of circumstances. If this class was removed from the analysis of conservation results it would be seen that seven of the CA classes scored higher than any of the seven remaining control classes. However, these results have to be understood in the context of very small numbers, especially with regard to conservation when only one third of each class was tested (9 or 10 children or less per class).

2.7.2 Other ways of examining impact

Although the purpose of each CA Programme is essentially to raise attainment of all children by developing their thinking abilities, it can be seen that while many children made substantial gain others did not. The results also show that some classes make substantial gains while others do not. However, test results cannot provide the reasons for these differences.

Much has been written about the theory, methodology, testing and results of various CA Programmes. (Adey, 2003; Adey *et al*, 2002; Adey & Shayer, 1997; Adey & Shayer, 1993). CA is still in great demand which could be read as an indication of CA's usefulness to teachers and its effectiveness for increasing

children's cognitive skills. However, in the literature there are debates about what the CA Programmes test and what this evidence actually indicates. Adey himself agreed (2001) that other factors influenced learning but proposed that they were more difficult to control and measure and that concentrating on cognition was making a difference. However, he was prepared for other factors to be investigated in the Year 1 Programme. For example, he made it possible, at the outset of the development of Let's Think, for children's motivation styles to be measured pre/post test so that the questions and challenges concerning motivation posed by Leo and Galloway (1996) could be investigated.

I was interested in factors that impact upon children's success in learning as measured by cognitive functioning in the prescribed tests. As a constructivist, I believe that each experience a child has contributes to the building of their construct system and their interior narrative about him/herself and the world. This construct system, in turn, impacts upon learning outcomes with the learning experience itself being a central, key factor affecting further development. It is my belief that this reflexive experience requires further exploration in order to understand more fully the factors that affect learning. This led me to question the impact of the CA Programme on children's understanding of what helps their learning. This interest plus the disparity within the results during the initial years of the main project gave rise to the main research questions:

How do Year 1 children understand what helps them learn during the CA Programme?

What differences emerge between CA and non-CA children's constructs?

What differences emerge in CA pedagogy when teachers understand and take account of children's personal constructs during the CA Programme?

As I was interested in developing understanding of the children's perspectives of their learning experience during CA, a methodology was required to elicit the necessary information from children. This methodology needed to take account of aspects not assessed during CA pre and post programme testing. Test results neither give explanations as to why the result is at any particular score nor explanations as to any changes that take place during the year. The methodology also needed to take account of the teachers' implementation of CA and other aspects that may influence learning through the CA Programme. Teachers work with children on a daily basis and much can be learnt from their reflections and analyses of their practice. It was also necessary to investigate the interaction between children and teachers during CA lessons and assess its impact on children's learning. The methodology must allow the children's and teachers' understanding of the experience of CA groups and activities to be expressed. It was necessary, also, to obtain information from the teachers regarding their personal views of their experience of teaching. From previous experience the theoretical base which enables and allows for all of this kind of information to be gathered is Personal Construct Theory. The following chapter explores this theory and discusses its usefulness in this context.

Chapter 3:

Personal Construct Theory

Personal Construct Theory has a focus on the unique manner in which individuals make sense of their experience. (Butler & Green, 2007:17)

This chapter introduces the theoretical underpinnings of Personal Construct Theory. Although the theory was written over half a century ago and is most frequently employed in the medical field, I demonstrate through this chapter that it is the most useful theoretical framework for this study. There is a substantial body of literature indicating that young children hold a view of themselves that when accessed can provide information regarding this self-view. The literature demonstrates that children can access their personal constructs which, in turn, can inform and enlighten those who work with them.

3.1 Introduction

As explained in the previous chapter, the context of this study is the Cognitive Acceleration Programme for Year 1 children aimed at developing children's thinking. The Programme is based on Piaget's schema theory of concrete operations and his belief in cognitive challenge stimulating intellectual development. This is combined with Vygotsky's social construction theory.

The Programme was shown to be successful in classes of children in inner London between 1998-2002 when the Programme was trialled and then tested with three cohorts of Year 1 children. Pre-/post- tests of cognitive ability carried out on participant and non-participant children to measure the effect of the Programme demonstrated that cognitive development was accelerated as a result of participation. Overall results showed that participant children made more intellectual gain than the non-CA participants. In its conclusions the research suggests that the CA intervention rests on the four principles of cognitive challenge, social construction, metacognition and the schema theory. However, it is acknowledged that the method used to measure the success of the Programme could not give an indication of the specific importance of each of these four principles. Therefore it is neither possible to conclude that all four principles are necessary nor that they each contribute equally to the overall effect of raising children's intellectual abilities (Adey *et al*, 2002). Adey *et al* suggest that a controlled experiment in which each of these four principles was independently varied would be required in order to confirm how each contributes to the success of the Programme.

Given that this kind of experiment could affect children's learning such an undertaking would raise ethical difficulties. Furthermore within a school environment such an experiment would not be practical. Since it is not clear how any combination of these principles affect the overall success of the Programme, I further suggest that it is not possible to be clear from the data provided whether the participant children construct the experience of the Programme as helpful or unhelpful in learning.

Engagement in a dialogue with children about their experience of the CA Programme could provide more insightful information about what they think helps them learn. In turn, the outcomes of this dialogue may inform researchers as to which aspects of the CA Programme become consciously embedded in children's minds. They may be able to discuss particular aspects of the Programme which they identify as helping them to learn. It is reasonable to believe that the aspects mentioned by children would be those most raised in their consciousness and therefore the ones on which to capitalise as most likely to increase their intellectual abilities. Teachers who know and understand more fully what helps children learn could be encouraged to develop their pedagogy accordingly.

Engaging with children requires that they be given a voice that is respected. We, increasingly, live in a pluralistic society where diversity is being more commonly recognised and celebrated. This diversity includes accepting that children as well as adults can provide important information regarding how they understand their lives and what is happening to them. Currently, children are being empowered and being given a voice in more situations that affect their lives. The United Nations Convention on the Rights of the Child states that:

Parties shall assure to the child who is capable of forming his or her own views the right to express those views freely in all matters affecting the child, the views of the child being given due weight in accordance with the age and maturity of the child. (UNCRC, 1989, Article 12)

Article 13 goes on to say that freedom of expression includes freedom to seek, receive and impart information of all kinds (UNCRC, 1989, Article 13).

A climate of child involvement and the giving of a voice to children in school has been slow to develop. In the past, children were often considered too young or too immature to be active in decisions affecting their lives whereas more recently they are recognised as active players who can exert some influence within their daily lives (James *et al*, 1998). Because children were assumed to be poor informants, unable to fully understand many of the issues impacting on their lives (Matthews, 2006) research relating to them was, in fact, research about children rather than research into their perspectives. More recently, there has been growing interest in understanding children's experiences from their own perspectives (Mayall, 1994). Indeed, more recent educational research demonstrates a positive contribution to the improvement of teaching and learning by children (Rudduck and Flutter, 2003). Much of this work has been done in Secondary schools and with Year 6 children in primary schools as part of the Improving Schools Programme (DCSF, 2009). However, there is evidence to suggest that where processes are inclusive of younger children they too can provide relevant and useful insights (Alderson, 2003).

The challenge is to give children opportunities to speak and to share their views in appropriate formats so that they feel free to say what they really want to say and can access the appropriate words. As part of the initial stage of the pilot study, I experimented with various ways to access children's experiences. The children found articulating what helped them or hindered them in the CA lesson particularly challenging. Researchers and teachers regularly asked this question at the end of each trial CA lesson. Invariably, the children were unable or unwilling to articulate their thoughts. When individual children were taken out of

class to be interviewed using the CA metacognitive approach, even with prompts and reminders about the lessons, the children found it difficult to express their thinking. They mostly concentrated on speaking about the tasks and the equipment finding it difficult to talk about their personal experience. Had it been possible for children to articulate their experiences using the CA methodology, an alternative framework would have been unnecessary. The use of Personal Construct Theory (PCT), a recognised and well established framework for enabling children to provide personal experiences, had previously been a successful analytical framework for accessing children's thoughts. Using a framework other than CA to analyse children's experiences in this study is considered a strength as information from more than one source provides enhanced reliability and interpretability (Robson, 1996). The PCT framework enabled the children to concentrate on themselves and the others in the group and consider their place in the learning process as distinct from the task actions of the lessons. Analysis from the two sources, PCT data and observation data from CA lessons, provided consistent information. During the pilot study, the data generated from the PCT framework was considered invaluable in terms of children articulating their thinking therefore its use was encouraged in the main data collection.

3.2 The philosophy of Personal Construct Theory

PCT was defined by George Kelly who was born in Kansas in 1905. A man who developed many varied interests, he studied mathematics and physics followed by post-graduate study in Psychology and Speech. Kelly defined a clear, precise, contained theory which can open up the individual's world into an almost limitless number of facets (Fransella, 1995).

In his early work, Kelly outlines his underlying philosophy which is underpinned by two contrasting concepts (Kelly, 1955). The first takes a wide view and sets human life within the process of time while the second narrows the view and focuses on the unique way in which each person contemplates the individual circumstances and events meshing together in their life at any particular point. Kelly presents PCT in a detailed, scientific way. He begins by expressing his fundamental principle, his postulate being "A person's processes are psychologically channelised by the ways in which he anticipates events" (Kelly 1955, Vol 1: 1).

Two additional, related aspects basic to Kelly's philosophy are his understanding and perception of truth and knowledge and his insight into the nature of reality. These two aspects are separate and yet related, they therefore overlap at certain points. Kelly appears to have used his perception of truth as the link between these two aspects; searching for truth permeates his life's work. He assumes that it is true that the universe exists and that, therefore, there is a reality. He believes that the universe is integral, that it functions as a unit with all its parts having a unique and exact relationship. He asserts that this real universe is in a continual process of motion. In the measure that human beings live and grow in this universe, knowledge develops and perceptions of truth and reality change. Kelly himself says, "No one

has direct access to the truth. All our present perceptions are open to question and reconsideration” (Kelly 1991, Vol. 1: 5).

Kelly expresses his philosophy in this basic statement:-

We assume that all of our present interpretations of the universe are subject to revision or replacement. We take the stand that there are always some alternative constructions available to choose among in dealing with the world. No one needs to paint himself into a corner; no one needs to be completely hemmed in by circumstances; no one needs to be the victim of his biography. We call this philosophical position constructive alternativism. (Kelly 1963, 1:6)

In Kelly's view, the philosophical position of constructive alternativism, change is always possible, even if bringing it about is not always easy. His philosophy asserts that reality exists but nobody has direct access to it. On the contrary, each person looks at their world through their system of personal constructs thus enabling them to place unique interpretations upon events and circumstances. This process results in being able to predict likely outcomes within a range of familiar circumstances. Many alternatives are available with which to make sense of self, relationships and the world. On the one hand, these alternatives are limited, for example, by social context; on the other hand, to the degree that boundaries of tradition and culture can be pushed back and changes made in social practice, people can be opened to the wider horizons of further possible constructs.

Kelly believed that scientists aim to make predictions about the natural world, develop theories and test them in experiments so as to formulate hypotheses. They then test their hypotheses and observe results. He asserts that human beings generally follow a similar cyclical procedure in the development of their system of constructs. Their constructs become their theories about the world in which they live, the essential difference being that scientists observe behaviours and then conduct their experiments on them by varying certain conditions. The human person-as-scientist, however, uses the behaviour itself to become the experiment. For Kelly, then, all human behaviour is seen as testing constructs which are being built and refined in a continuous process of movement. Human behaviour, therefore, is an integral part of the scientific process not the end product.

3.3 The psychology of Personal Construct Theory

From this scientific, philosophic backcloth, there emerges a psychology asserting that within the human person thinking and feeling are not two separate processes. Kelly sees the human person as one whole; he circumscribes the whole human experience as one, living, moving inter-connected process. In enabling people to explore their constructs, develop different hypotheses and take responsibility for their lives, Kelly was aiming to help them understand their lives and their world by becoming more aware in a two-fold way. Firstly, he wanted individuals to be aware of themselves in process that is always able to change and develop. Secondly he wanted them also to become aware of the events that they construe and see them as processes enabling change. The aim of this two-fold awareness was essentially to become more

unified. He believed that there is, inherent in the human person, the ability to take control of life and do something with it and it is this belief that converts philosophy into psychology.

Having explained his premise in detail, Kelly goes on to outline his eleven corollaries, the propositions which follow as a natural consequence. Through these, Kelly builds up his image of each individual as anticipating events and choosing to construe these events through a system of personal constructs thus creating their own reality. These constructs are built up by observing personal recurrent themes and their differences and then placing personalised interpretations on them. Each person has a finite number of constructs which cover a particular focus and range. Constructs have ordinal relationships to one another, and, therefore hold degrees of importance. A construct used successfully can absorb new experiences forming links and relationships with previously held constructs. People's constructs can share areas of common ground while remaining unique, individuals interpret others' behaviour, each person can play a role in the social process of another.

To the extent that one person construes the construction processes of another, they may play a role in a social process involving the other person. (Kelly, 1991 Vol 1. p. 66)

Kelly clearly places his theory in the field of psychology, therefore, stressing the realm in which it is situated and the boundaries which surround it. He explains that he is observing processes and hypothesising in a psychological manner. He explains that the human processes themselves are not psychological. By focusing on the anticipatory nature of behaviour, Kelly's theory is forward-looking rather than reactive. This is built on his assumption that each person is a scientist who seeks prediction (Kelly, 1991 Vol 1). Therefore Kelly encouraged the view that a person could look at a coming event and identify their likely behaviour. If they are unhappy with that stance then they have opportunities to evaluate and change their patterns according to how they construe the situation.

In order to understand Kelly's theory, it is necessary to grasp his meaning of the word "construct". Construing is anticipating and experiencing events. In this context, a construct is the word used for the basis on which a prediction is made and, therefore, involves action on the part of the person. Constructs are dichotomous or bi-polar in that to understand a construct, the individual must recognise the similarity between people/objects/experiences and also the differences. For each person the meaning of each construct will be different. For example, one child named **patience** as a quality of a teacher helpful to their learning and named the opposite pole as **noisy** whereas another child named **patience** as helpful and the opposite pole as **gets angry quickly**. On discussion it transpired that the first child found her energetic teacher who spoke a lot and who forcefully encouraged the active engagement of children in many drama activities off-putting to learning whereas the second child enjoyed the drama activities but felt scared by the teacher when she lost her temper and was thus reluctant to participate in learning. Kelly argued that his theory is one which encompasses the whole person and therefore the theory can be implemented in any area of life to help to understand how people make sense of others, events and circumstances.

From these underlying beliefs, Kelly asserts that each person creates a unique way of perceiving the world. Each one builds constructs like templates and then uses them, adjusting them here and there so as to better fit particular circumstances. It could be said that these constructs are organised into a system of groups and sub-groups like a giant interactive filing system, including cross-references for the files which do not fit neatly into just one cabinet. According to the theory a child does not possess a copy of reality that s/he can bring out as required but a child constructs the story of their reality based on their experience of that reality. So to understand a child's construction of their learning in a CA context this study must allow a view into those constructs. As constructs evolve with experience, this study should evaluate how far those constructs are becoming ways of being within the lessons, how much the constructs are revised over time and what influences change within these constructs during the lessons.

Within the literature there are some criticisms of Kelly's theory. Although he expressly states that construing is both thinking and feeling, Bruner argues that Kelly does not deal adequately with emotions (Bruner, 1956: 355). Carl Rogers confirms this view (1956) and Mackay also states that "PCT has been widely criticised on the grounds that it is too mentalistic". (Mackay, 1975:128) In 1966 Kelly tried to address some of the criticisms stating that the holistic nature of PCT has important implications for our understandings of ourselves and others. Fransella, who has publicised Kelly's work extensively, states that for Kelly to conceive of a person as being divided into segments such as emotion (affective) and thinking (cognitive) – not only does the person an injustice but impedes our approach to understanding (Fransella, 1995 p.115). She goes on to clarify that Kelly explained that our emotional experiences are integrated within the theory as they relate to an awareness that our construing system is in a state of transition. According to Kelly, we "feel" when we are aware that our construing system is inadequate or is about to change in some radical way and, therefore, construing includes feeling. Construing does not need words. When people are immersed in meditation or music, they can be actively construing.

Experiencing and construing are part and parcel of the same process. We can no more construe without experiencing than we can experience without construing. (Fransella, 1995:115)

Harre confirms this when he maintains that feelings do not exist as entities (Harre, 1982). He suggests that in order to understand emotions, we have to look at the given society in the particular time to see what is culturally important and available at that point. This is important in this study in that the children live within their family and home culture and are also situated in a particular school and class. In order to understand the children's constructs it is necessary to understand the complexity of this context within which the study takes place. In order to examine how PCT illuminates this study it is important to examine how the theory is implemented with children and evaluate its use.

3.4 Personal Construct Theory in action

Since the publication of Kelly's theory (1955), many professionals have studied it, explained it through their writings and lectures and found ways of using it in various contexts. In this way, it has become more widely known particularly in the clinical rather than in the educational field. In many ways, this is

unfortunate, especially since Kelly himself was an educator and because learning has such an important place in the theory.

One major name in the field is Ravenette (1977) who argues that children do not appeal to their construct system in order to act but rather they are, themselves, their construct system. Understanding that children are this rapidly evolving system where they are trying out different ways to respond to situations in order to make sense of their world may help teachers to provide a learning environment best suited to support the learners. Furthermore, Butler and Green (1998:4) suggest that children's behaviour is seen as experimental. "If children's behaviour reflects their construing it may thus be possible to infer their experience or construing from their behaviour." By observing CA lessons it may be possible to infer how children understand their experience which may then be confirmed or revised when their constructs are provided during interviews.

In order to enable people to enter the scientific process more effectively, Kelly suggests attention to the use of language. He states:

Suppose our verbs could be cast in the invitational mood rather than the indicative ... this would have the effect of orienting one to the future, not merely to the present or to the past. It suggests a variety of interpretations or constructions. It would set the stage for prediction of what is to ensue. It invites the listener to cope with the circumstances. It suggests that this is a hypothesis which can be pursued, tested, abandoned or reconsidered at a later time. (Kelly 1969:149).

Children providing constructs are required to recognise similarities and differences within the learning context and be able to verbalise these aspects. In expressing constructs children are sharing their individual view of their experience. The observer/listener/researcher can then pursue a hypothesis and interpret the constructs provided by the children in the light of experience.

A range of techniques has been developed to help people elicit their own constructs so that their knowledge and understanding of themselves, others and the world in which they live can grow and develop. This personal growth is an important aspect of development enabling change through personal choice and responsibility. This work has been developed extensively with children particularly by educational and clinical psychologists. In this study, however, the elicitation of constructs is primarily to provide information into how children experience learning and what is affecting learning in the context of CA lessons. In order to use PCT within this study it is necessary to explore various implementations of the theory with young children in order to evaluate the most useful ways to elicit constructs from children between 5-6 years.

Kelly's original method for eliciting constructs was the Repertory Grid which can be seen as originating from his mathematical background. The purpose of this Grid was to elicit constructs about the roles that the individual applies to the people with whom s/he relates. It is important that the Grid lists a representative group of role titles thus ensuring that people the individual "likes" as well as "dislikes" figure there. By looking at three role titles at a time, the individual is asked to name the ways in which two are alike but different from the third. This process is repeated several times. Because of the bi-polar nature of

constructs the similarities and differences are of equal importance. From this, Kelly went on to design a statistical procedure of analysis to relate these constructs mathematically. He states, "Factor analysis provides ways of seeing how constructs are interwoven to give substance to the fabric of society" (Kelly 1991, Vol. 1:189). This form of analysis proved neither simple nor popular. Kelly himself became concerned that the grid was getting in the way of, and clouding the constructs. Using the Repertory grid with young children would not seem to be helpful nor provide the information required.

Various forms of the grid method have evolved over the years, for example, the "ranking" form and the "rating" form (Fransella & Bannister, 1977, Bannister & Mair, 1968). In these, each construct is used as a scale along which the elements can be placed. For most situations and with most subjects, a five point rating scale offers more possibilities than the dichotomous method suggested by Kelly. Ravenette (1980), also, has produced several simple forms for use with children. The triadic elicitation was and remains very popular. It comes closest to Kelly's theory as to how constructs are formed. In addition, it allows for much creativity and adaptation according to the situations and circumstances. A child can be asked for the names of three family members or three friends. The child is then asked to say in what ways two of these people are the same and therefore different from the third. However, young children may find this three-way comparison conceptually difficult and require a simpler form. Alternatively, a child could be asked to think about him/herself and a friend and provide similarities and differences between them. In this way the emergent pole and the contrast pole can be elicited, for example **I'm quiet but he talks a lot**. In this case, the emergent pole is **I'm quiet** as it is the aspect that is first revealed.

Another approach, which has been successfully used with young children, is the Salmon Line developed by Salmon (1988). A construct is elicited, for example: no good at reading/ very good at reading. A line is drawn and marked 1 – 7. The individual is asked to mark on the line: where they stand at the moment, where, if they have ever been lower and where they expect to reach at a point in the future. These activities can be extended to include other people's perceptions, for example: Where would your teacher place you on the line?

Kelly recognised the role of the teacher as helping and enabling the "learning as a personal exploration process". He stated, "To become a fully accredited participant in the experimental enterprise she (the teacher) must gain some sense of what is being seen through the child's eyes" (Kelly, 1970: 262). Pope and Shaw stated that for education to be a joint venture between teacher and learner it is essential that each has some awareness of the other's personal constructs (cited in Pope and Keen, 1981). Pope and Keen have demonstrated the value to the learner of reflecting on and coming to a deeper awareness of their constructs and the relationships between their ideas and those of their peers. In conclusion, Pope and Keen state that active involvement with personal and others' ideas may encourage "the learner to see himself as a more potent force in the determination of his own learning and in the development of new knowledge". (Pope and Keen, 1981: 94).

Teaching a CA group is a joint venture between the group and the teacher and between the individual children in the group and the teacher. It may be possible to enhance children's learning by raising awareness of perceptions of the experience being shared by all participants.

Educationists often assert that children's emotional states impinge on their learning. Baddeley (1987) and Sarason (1975) both showed anxiety and negative moods impairing memory recall and, therefore, learning. The evidence seems to suggest that negative emotions while learning give rise to less adequate encoding resulting in poor retrieval later. The implications for CA lessons are that the metacognitive aspects of the lessons may help to deepen the children's awareness of their learning and that learning in a relaxed and friendly group may give rise to more effective learning. Teachers being aware of what helps children to experience learning in a relaxed atmosphere could help effective learning to take place.

Work using PCT with children has demonstrated that children's lives have improved as a result. Mueller (1996) has shown that children's interior perceptions of self and self in relation to others, as revealed through imaginative play, are related to their state of mental health. One form of assessment used in his study of pre-school children was "The Teddy Bear's Picnic" which allows the child's own perceptions of self and others to be examined. These results gave a unique understanding of each child which was then the subject of qualitative analysis. Mueller believes that a highly negative set of constructs characterises an emotionally troubled child. This being brought to light enables the child to receive the professional help required to address the difficulties. Teachers' understanding allows them to perceive the child neither as naughty nor ill-disciplined but as emotionally in need of support. This, in turn, can alter the way any teacher behaves towards the child, generally, using an approach characterised by compassion rather than annoyance.

Ravenette (1980) has developed forms of grid techniques which are particularly suitable for use with children from about the age of eight. These are relatively quick to administer and to analyse. Their main advantage is that the child is directly involved in looking at him/herself and others in relation to family, teachers and peers. Ravenette particularly recommends the use of photographs and pictorial representations of situations. It is often more possible to elicit children's constructs in this way than when children are asked to construe real people in a verbal way.

With younger children and those with limited language it is possible to use pictures of facial expressions to elicit constructs. As an advisory teacher, I used this method to gain information from children who were struggling in learning to read. Individual children were asked to colour the face which best resembled their own in given situations, for example, when asked to read to the teacher. These coloured faces were then used as prompts within unstructured interviews to elicit, if possible, further information.

The following is an example from part of a recorded interview (as part of my work to improve the standard of reading in the LA and used as part of MA study, 1997) with a child aged 7 years:-

A: *When you read to your teacher, your face is....?*

Child: Like this ... (picking up sad face coloured in) ... Can't smile.

A: *You can't smile when you read to your teacher because?*

Child: Too hard.... Don't know words ... Steven can smile 'cos he knows words. Can't smile if you don't know words, can you? Miss don't smile when I read. She smiles when Steven reads.

It was possible, from the information gathered in this interview, to elicit constructs about how the child perceived herself as a learner in various situations within the school context. It was also possible to explore her relationships with her teacher, peers and parents. She was able to show where she could /could not smile and where people smiled at her. The behaviour being identified as, **being smiled at** was an indication to the child of acceptance. Where adults did not smile, the child construed herself as **not being liked because she was stupid**. She could, spontaneously, offer the contrast pole of her construct in relation to the facial expression. In discussion with the class teacher, it became apparent that she had not considered how the child construed herself either as a person or as a reader. Resulting from this, the teacher began to assess her own constructs in the relevant areas. She construed the children who were experiencing difficulties as **stupid and not worth my time**. She generally asked the teaching assistant to **hear them read**.

Six months later, a marked difference could be noted in the constructs of both child and teacher. The teacher had begun to enter into the child's world by providing appropriately differentiated classroom activities and re-structuring her management of the class and use of her time. When re-assessed, although the child had made only a little actual progress in reading competence, she did, however, colour more smiling faces than previously. In interview she explained, "I can do more things. Words ain't so hard now. Miss smiles with me now."

One aspect of the methodological theoretical approach adopted in this current research was informed by another element of previous study. At the time (1998), I was interested in children on the Special Education Needs (SEN) Registers identified as having poor reading and writing skills while, at the same time, being apparently able to attain at least an average level of work in science. The investigation included all children in two Year 2 classes and two Year 3 classes in one school (116 children) who participated in a specially designed programme of science teaching for six weeks. From this group, children on the SEN register who met particular criteria defined by me for the study:

Year 3 children assessed at National Curriculum Level 1 or below in reading and writing but Level 3 in science identified at the assessments recorded at the end of KS 1 (12 children identified)

Year 2 children that teachers believed would, at the end of the academic year, attain Level 1 or below in reading and writing but at least Level 2 in science (12 children identified).

Observation of science lessons in the classrooms before the intervention revealed that no investigative work by the children took place which the teachers explained by describing the children as **too naughty** or **unable for such work**.

During the study I taught science for six weeks in each of these classes where I established mixed ability groups working collaboratively. During these lessons the identified children, alongside the others, were heard to discuss complex concepts, provide reasonable hypotheses, participate fully in investigations and orally explain findings. The children also engaged in research by reading non-fiction texts in pairs. The children agreed ways to record the results both from their reading and from their investigations. Each group then explained their findings to the class.

As each group had a different aspect to work on, investigations having been chosen from children's questions, all children learnt something new from listening to the other groups within their class. Opportunities were provided for children to ask questions of other children and for them to discuss possible ways to take investigations further.

The last part of each lesson was devoted to discussing the method of work and the thinking involved in the lesson so as to allow for the possibility of developing children's metacognitive abilities and to evaluate the teaching strategies with a view to these being adjusted for subsequent lessons if children reported anything particularly helpful or unhelpful. The teachers and the classroom assistants observed and listened to the children throughout the lessons.

At the end of the six weeks, I interviewed individually each of the 24 identified children. The interviews focused on the children's views of learning during the programme, any awareness of differences in pedagogical strategies being used and their own progress during the programme. PCT was the underpinning basis of these interviews. This approach allowed children to identify and explore their constructs regarding the science learning they had experienced during the half term and compare it with previous science learning experiences.

Constructs mentioned by more than half of the children are summarised in Table 3.1. The positive pole only of the constructs is given here but the children provided the opposite pole. For example, one child said that she could **talk** and **share ideas** and identified the opposite pole as **not allowed to talk in other lessons so I cannot get ideas from other children to help me learn**.

Construct	Frequency
I am able to talk during lessons and share ideas.	24
I do not have to read and write so I can think about the science and learn more. This makes me like the others and the teacher can forget I am stupid.	24
It's good I do not have to sit on the dummy table.	24
Teachers think that reading is the most important thing to be good at.	20
Enjoy the new kind of teaching better than old kind.	23
Can't read well but know things in science that I can say in these lessons.	17

Construct	Frequency
Everybody has good and bad things but if you cannot read teachers think you're stupid and that's bad.	15

Table 3.1: Most frequently mentioned constructs provided by 24 pupils (Unpublished work for MA study, 1998)

Using the constructs as the basis of a conversation, 23 children could offer explanations regarding how they experienced some of the differences in teaching. The constructs provided by the children in this small study demonstrated how they experienced teaching and learning and identified key aspects that directly affected progress. All the children were clearly able to express their constructs: their views and feelings regarding the learning experiences afforded to them.

The final aspect of the investigation was establishing a focus group of the four teachers involved. During these sessions, the participant teachers shared their reflections of observing the children working during the science lessons and I shared the constructs, anonymised, provided during child interviews. The participant teachers reported that by listening to the children's constructs and elaborations of what these meant, they realised that children required opportunities to learn in groups where they could share ideas orally in order to have positive self-esteem, that children had a view about what helped and hindered learning and that listening to children was invaluable, a skill that they had been giving scant attention. By observing and listening to children working, the participant teachers saw children in a new way and this in turn prompted them to reflect on their assessment of children. They reported that they generally assessed children by their reading and writing skills and had not taken opportunities to listen to the children expressing themselves. One of the teachers commented that if her children had said that she thought they were stupid she would entirely understand. In fact, she had thought that the identified children in her class lacked intelligence before the programme but that her view had radically altered as a result of listening to the children and observing them during the science lessons. She reported, "This has serious implications for the way I teach in future".

Further study could have revealed whether specific aspects of the "new kind of teaching" made particular differences to these individuals. Collecting children's constructs before the programme as well as at the end could have provided more detail for comparison. Another aspect that could have been investigated was whether experiencing being treated "as the same as others" and being seen as a person with "something to share" was a significant factor in the acceleration of progress in learning as well as its impact on motivation to learn. The experience of using PCT to learn more about how the children construe their experience of learning indicated possibilities for further use of this theory to children's benefit. Consequently, PCT became a key underpinning theoretical base for this current study. Evidence from this study suggested that using PCT with children can contribute towards a deep understanding of how children learn and can inform the debate about what makes an effective primary curriculum.

It is accepted within the psychological field that the view a child holds of him/herself is an important aspect affecting the child's behaviour in a range of circumstances. Butler and Green (1998) demonstrate that it is important for a child's anticipation of how s/he will perform to relate to how s/he actually performs so that their self-view is validated. When the two are too disparate the child can lose confidence, feel guilt or develop a range of dysfunctional behaviours, for example temper tantrums, inappropriate attention seeking.

Kelly neither dealt specifically with the development of constructs from early childhood nor with the development of children and therefore, it could be argued that his work is not appropriate for use in education. However, he saw that a person's entire life was an anticipatory, developmental, evolutionary process (Fransella 1995). This being the case, he had no need to differentiate between children and other groups of people. In fact, Kelly had no room for any categorising of people in his theory. Another argument against using this theory in this study could be that it has been tried and tested with children when they are in difficulty. So educational psychologists use PCT to help children identify particular aspects of their behaviour or how they feel in specific situations and work at aspects of change in their lives.

In this study, PCT is not being used with children who have a problem but simply as a way of finding out how children understand what helps them to learn during CA. Having previously used PCT with children and teachers to help improve the learning environment, it has been shown that there is considerable scope within it to devise methods to elicit constructs from children which may provide insight into how they understand the learning taking place in CA lessons. Learning has been described as "a change in construing which takes place within the learner" (Thomas and Harri-Augstein, 1985). The authors go on to say that learning involves simultaneous changes in the perception of thinking and feeling which then alters behaviour. If these changes are valued by adults then there is a perceived increase in competence. It may be useful to children's learning for teachers to enter into the children's experiences to better understand how children are construing their learning. Salmon points out that the child is the central focus of the learning situation and that to understand the children's learning and behaviour it is necessary to understand the child's constructs (Salmon, 1995a).

The internal process of learning can often go unobserved or can be misunderstood (Thomas and Harri-Augstein, 1985). In fact, it has been found that the adult world tends to ignore children unless they are causing trouble (Rich, 1972). Salmon (1988) maintains that our constructs embody the dimensions of meaning which give form to our experience of the world which is complex and all-of-a-piece. Constructs are essentially interwoven within a personal system of meaning. Attending to children's constructs can reveal important information regarding various aspects of children's perceptions of their identity as well as of their learning (Butler & Green, 2007, 1998; Jackson 1988; Hartley 1986; Epting 1988; Butler 1985; Harter 1985; Ravenette 1980).

As children describe and explore their many constructs about learning they give information regarding their experiences of learning. Several propositions are explored in stages through the literature. The first is

that each young child holds an individual view of him/herself which forms and develops with maturity and as s/he interacts within their social context. Five year old children spend a large proportion of their waking hours in a classroom and so it would be reasonable to assume that the social context of the classroom plays a large part in the development of their self-view particularly with regard to learning. My hypothesis supported by the literature is that each child's perspective has an impact on learning (Butler & Green, 2007). Much of the literature demonstrates the value of PCT when educational and clinical psychologists and social workers work with children displaying negative behaviour choices, children in trouble with the law, struggling in school or with serious illnesses. I am suggesting that using PCT to discuss learning within the CA context could reveal a wealth of information useful to teachers and educational research.

In order to investigate this hypothesis it was necessary to find ways of accessing children's self-views and of exploring their experiences. In interviewing children it can be difficult to encourage them to verbalise their ideas. Sometimes they may answer as they think they are expected to reply rather than by saying what they really think. They may believe there to be a correct answer. They may think that they are being assessed or judged and that there may be some consequence to their response. This is particularly so in the school context where children are frequently told that they are right or wrong in their responses.

3.5 Using Personal Construct Theory in this study

This study focuses on 5-6 year old children's unique views of their individual experiences while using the CA Programme.

The methodology must allow for each child's unique expression of their lived experience of the CA programme and of his/her own experience as a learner to be heard and valued without judgement. Observation of CA lessons illuminates how children's verbal constructs reflect behaviour during CA lessons. Listening to children as they work through CA activities reveals something of their reasoning processes. Children can be heard describing their ideas, explaining their reasons and asking questions in the social space of the learning group. This is an essential aspect of the pedagogy.

According to one corollary emanating from Kelly's original postulate, "A person's construction system varies as he successively construes the replications of events." (Kelly, 1991. Vol 1:50). He goes on to explain:

This experience corollary has profound implications for our thinking about the topic of learning. When we accept the assumption that a person's construction system varies as he successively construes the replications of events, together with the antecedent assumption that the course of all psychological processes is plotted by one's construction of events, we have pretty well bracketed the topic of learning. Learning is not something that happens to a person on occasion; it is what makes him a person in the first place. (Kelly, 1991. Vol 1.: 53).

This study seeks to explore the ways in which the CA Programme interacts with the children's developing constructs about learning. In the first instance, this study aims to give children opportunities to express constructs relating to learning not primarily to help them become more aware of their learning but more to

help develop understanding of what affects a five year old child's learning. However, it is reasonable to assume that simply asking children to verbalise their constructs encourages some greater awareness. This needs to be taken into account as the children make progress through the academic year. Also the use of language when interviewing children is very important. For example, it is necessary to avoid the possibility that children experience judgement, or that any construct receives more affirmation than another. It is very important to listen to the words each child uses and to check out their meaning so as not to make assumptions but to truly enter into their world.

During CA lessons, children work in small groups which remain the same as much as possible throughout the academic year. As the study seeks to explore children's experiences of learning, any emerging individual and group patterns may reveal important impacts upon learning in different classrooms. The situations provided through the literature demonstrate that children can use their constructs and with help can change various behaviours and attitudes to improve their lives. How 5-6 year olds construct their view in the context of a particular learning environment is, as yet, unclear. From the constructs provided it may be possible to gather information about the key factors that affect the rate and pattern of learning especially when done within the context of one learning programme, thereby minimising the differences within the learning environment.

Since this programme is specifically designed to accelerate thinking ability the study may provide important information regarding key factors that affect thinking development thereby helping to inform the results of the cognitive assessments at the end of the programme.

Chapter 4:

The methodology of this study

Let's Think helps you to think about how to do things, like solve problems. If you don't know how to think about things then you can't do the things, can you? (Thomas, Group B2)

This chapter outlines the methodology used in this study including the attention given to the pilot study and ethical considerations. The interpretive approach conducted within the constructivist paradigm allowed for various methods of data collection which have been outlined. The participants of the study are introduced.

4.1 Introduction

This research originated in an interest in children's perceptions of learning within a CA Programme as an alternative way of understanding the impact of a CA programme on Year 1 children. Chapter 2 established that the CA test results indicate an increase in attainment for a significant number of children. However, test results provide no insight into how children understand what helps their learning. An alternative way to examine impact is to listen to the children and observe lessons in order to analyse the children's understanding of what helps their learning. PCT offers the possibility of enabling children to discuss how they understand what helps their learning which give insights into their experiences of the CA Programme. The literature review also established that the constructs held within any person influences their subsequent understanding and actions. My hypothesis is that teachers becoming more aware of personal constructs, their own and those of the children, and taking these into account during CA lessons, could help to provide a better learning environment for the CA Programme. This chapter explains the methodology chosen to investigate the hypothesis. The methods of data collection were decided following a pilot study in the year preceding the two year study. The study examines the following research questions:

How do Year 1 children understand what helps them to learn during the CA Programme?

What differences emerge between CA and non-CA children's constructs?

What differences emerge in CA pedagogy when teachers understand and take account of children's personal constructs during the CA Programme?

4.2 CA and Personal Construct Theory

According to Kelly (1955) people hold a vast number of personal constructs which are continually evolving and being used to test and develop an understanding of the world around them. Teachers and children are constantly interacting. This interaction creates a multi-faceted impact upon constructs and forms part of the testing and hypothesising about the world. Interaction is going on all day in a primary classroom between and among groups of various sizes within the class and individuals. The children often listen or

talk to the teacher or to each other and also interact with numerous types of equipment, for example, pencils, books, cubes, jigsaws. Awareness of all these interactions and the impact they have on learning is often lost in all that is going on during the day. However, during CA lessons, children are expected to become more aware of the learning process as they engage in the challenges and in metacognition. This study aims to capitalise on this growing awareness of what it means to be a learner by engaging children in conversations about what they consider helps their learning.

This study required a methodological framework which allowed for both the exposure of children's personal constructs and the examination of children's and teachers' participation during CA lessons so that what was impacting upon and altering constructs during CA could be identified and analysed. The methodology needed to allow for a comparison between CA and non-CA children to expose differences in developing constructs. The study also required a strategy which could investigate the impact of raising teacher awareness of children's constructs.

4.3 Methodological framework

According to Schwandt (1997) methodology is the theory of how an inquiry should proceed. An inquiry originates in an interested inquirer who stands within a personal biography and who speaks from a particular perspective: both personal and professional. This perspective colours the purpose and nature of the inquiry. The purpose and the context of the inquiry dictate in some measure the theory most appropriate for its underpinning. It can be seen from Chapter 1 how personal biography inspired the purpose and nature of this study. Personal interest in the uniqueness of each human being influenced the research questions and therefore the theory to be adopted in the pursuit of deeper understanding.

Schwandt (1997) said that methodology involves analyses of the assumptions, principles and procedures in a particular approach to inquiry which, in turn, govern the use of particular methods. The methods used to investigate how the experience of the CA Programme affects children's personal constructs, had to allow children the opportunities to express, identify and discuss their constructs. Observation of CA lessons to see and hear children in context with a teacher using the equipment so as to analyse the experience influencing the developing constructs was also required. Observations of lessons in classes not participating in CA were also required so that analyses could be made between CA and non-CA participants in order to compare constructs. Lesson observations and their transcripts created the possibility to understand the children's experiences when, later, personal constructs were discussed with the teachers. Observations of lessons, also, allowed deeper insight into the meaning of the personal constructs so as to have sufficient knowledge to analyse and interpret them. The observations needed to be naturalistic so that the presence of the observer had as little affect on the normal running of the lessons as possible. The methodology needed to include opportunities for hearing the teachers' constructs about teaching and learning, discussing children's constructs and their impact on learning and examining lesson transcripts in the light of the children's constructs. The effect of this awareness raising then needed to be measured in some way so the methodology had to allow for data collection before and after the raising of

awareness of personal constructs. Consideration, also, needed to be given to this process itself: the effect that raising children's awareness of their constructs had on their learning and the effect of raising teachers' awareness of their pedagogy.

4.4 Research process

4.4.1 Research paradigm: constructivism

A paradigm is a basic set of beliefs that guides action (Guba, 1981). The overarching paradigm, therefore, determines the researcher's way of being (ontology), their theory of knowing (epistemology) and their methodological assumptions. An inquiry could be said to be a search for the truth of a particular situation, event or set of circumstances. This inquiry is a search for a deeper understanding of how children experience what helps their learning in the context of CA and the impact of raising teachers' awareness of the children's experience.

In this inquiry, therefore, it was necessary to discover children's understanding of their learning. The ontological stance was provided by the response to the philosophical question: Does understanding the learning process impose itself from outwith the child or is it the product of individual consciousness being shaped by a number of factors? During this study, my ontological perspective was that there are multiple realities within the complex nature of any social entity (Cohen and Manion, 1998:6). In a primary classroom, children have a multitude of experiences each day which interact with the personal constructs already held within them. This interaction leads to further development of their understanding of the world resulting in their unique perspective on life. This relativist perspective determined my way of being as a researcher and of paramount importance was the question, "What is the most effective way to conduct the research in the context of CA in Year 1 so as to get insights into some of the realities lived by the children in order to understand them more fully?"

To develop my theory of knowing within this ontological perspective, account had to be taken of the parameters of the context within which it lies. This research was conducted within the fields of education and social psychology. The parameters of conduct, therefore, are bounded within these traditions and ethics.

Since the purpose of this study lies in developing knowledge about how children construed an understanding of a process of learning within CA, there was an attempt to be free of pre-conceived notions and solid hypotheses based on personal experience of how children understand learning. Laying aside pre-existing ideas was an attempt to interpret and build a construction, drawing conclusions only from the evidence gathered. The ontological notion of the existence of a definitive, objective truth to be found was alien to me. Therefore, the traditional positivist type of research frequently conducted within education and social psychology was inappropriate. This positivist research usually uses experimental methodologies and tends to rely on an empiricism which assumes that knowledge mirrors some objective reality. The

most appropriate basic belief system to inform and guide the present inquiry was the theory of knowledge known as constructivism.

Constructivism starts from the assumption that knowledge lies within each person and that each person has no alternative but to construct what they know on the basis of their experience. This theory of knowing, epistemology, sees knowledge building as personal, subjective and unique. This imposes on the researcher an involvement with the participants and a rejection of the positivist tradition (Cohen and Manion, 1998:6). The purpose of a constructivist inquiry is to understand constructions initially held by participants. Therefore, the researcher is construing and re-construing through interpreting, with empathy, the participants' constructs with the goal of understanding the world of lived experience from the point of view of those who live it (Schwandt, 1997). The following section outlines the use of constructivism in this study indicating why this is the most appropriate paradigm for this study.

4.4.2 Constructivism in this study

This study is a search to understand individual constructs as well as constructs created within a social group in classrooms. The purpose is to examine the constructs from the perspective of how they were developing within the CA Programme and analyse their possible impact on learning. Constructivists believe that knowledge consists in constructions about which there is relative consensus among those competent to interpret the construction (Guba and Lincoln, 1994; Schwandt, 1994).

Since the intention was to examine how the experiences of CA impact upon the children's developing constructs, it was important to become competent in understanding children's and teachers' personal constructs through observing the participants in action, listening to them and checking out any ambiguity of meaning within an environment of empathy and objectivity. It was paramount to become an expert in interpreting participants' words and actions; the constructs that they were in the process of construing. The constructions and interpretations made in this study were inevitably influenced by social, historical and cultural elements within all those involved and within the activities themselves. However, by making the influences explicit and analysing them as the interpretation develops, it was hoped that influences remain transparent.

With a view to building knowledge, individual understandings were made explicit. Also as CA lessons involve a teacher and a small group of children working together during an activity understanding of particular groups was also discussed. Understanding how children construed these shared experiences revealed how CA impacted upon learning.

The constructivist paradigm assumes a relativist ontology (there are multiple realities), a subjectivist epistemology (knower and subject create understandings) and a naturalistic (in the natural world) set of methodological procedures. (Denzin and Lincoln, 1998: 27).

In this study, the children and teachers were construing knowledge and understanding as they worked with the lessons provided. In parallel, I was construing knowledge and understanding as I observed, interviewed the participants, collated results, made choices about what to include as important and what to

exclude as relatively unimportant. Through the process, competency in interpreting the participants' constructs allowed for the generation of knowledge and a deeper understanding of how children understood what helped their learning. In turn, in a true constructivist way, these constructions and interpretations were tested against lesson transcripts and teachers' experiences and so further knowledge was generated.

4.4.3 Research design

The design needed an effective approach to develop an understanding of child learning and of children's understanding of that learning in a naturalistic environment. According to Denzin and Lincoln (1998) before deciding upon the research structure and the most appropriate strategies of inquiry, a spotlight must be switched on to the purposes of the study. This focus enables the researcher to decide upon the most effective strategies to obtain the information required. One aim of this study is to better understand how the children perceived what helped them to learn during CA. The second aim is to be informed by the children's constructs of what helps their learning so that CA can be taught more effectively.

Strategies of inquiry enable the chosen paradigm to be put into action; in this case the constructive, interpretive paradigm. According to Denzin and Lincoln (1998) the strategies are the skills, assumptions and practices used by the researcher when moving from a paradigm to a collection of empirical materials. Research strategies locate paradigms to specific approaches and methods of collecting information. This study embraced a case study type strategy using several data collection methods. Within this methodology there was exploration of social phenomena rather than testing hypotheses. The methods also allowed for the collection of "unstructured" data, the analysis of which included interpretations of the meanings of human actions (Denzin and Lincoln, 1998:110). The case study type approach allows the focus to be on subtleties and intricacies of complex social situations, in particular relationships and social processes (Denscombe, 2005).

It was necessary to embrace and acknowledge any pre-conceived notions about how children learn. Having done this, it was necessary to put these aside as much as possible so as to listen to and observe children and teachers during the lessons. Interviewing the participants to elicit constructs necessitated some degree of structure to obtain the necessary information but also sufficient flexibility to allow personal constructs to emerge. A research design which connected the overarching paradigm (constructivism), to the case study strategy of inquiry and the methods of collecting empirical data was planned.

4.5 Research strategy for the study and methods of data collection in the two year study (2001-2003)

The constructivist-interpretive paradigm allowed for a case study research strategy to be adopted as the best tool to illuminate the questions posed in this study. A multiple case study design was adopted in line with Yin's work (1989). According to Robson (1996) a multiple case study strategy is a research approach which allows for empirical evidence to be collected about particular elements involved in a study, focuses

on the phenomenon being investigated in context using multiple sources of evidence, not only quantitative data but can involve copious amounts of qualitative data. Such a strategy allows for a multi-dimensional approach to data collection and this was considered most appropriate for this study as it allowed information to be gained from several avenues. I describe this study as a “nested multiple case study” in that the four teachers are each considered cases. Within each “teacher case” are two groups of children and within each “group case” are six children, each of which is considered a “case”. The diagram below represents one teacher, two groups and the twelve children concerned. The boundaries of each “case” are determined by CA lessons and their implementation. CA lessons are observed, children are interviewed about learning within CA, teachers are interviewed about their experience teaching CA and teachers participate in a short intervention in between the two years of the study.

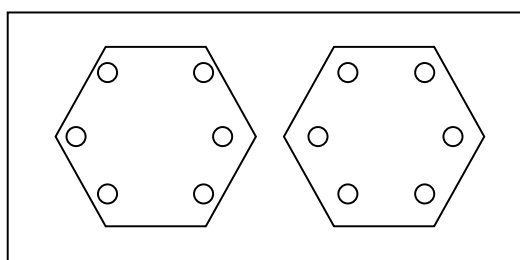


Figure 4.1: Diagram to represent one teacher, two groups and the twelve participant children being treated as cases within the multiple case strategy.

This section describes the methods of data collection in the study: child interviews, classroom observations, teacher questionnaires and interviews. A pilot study (2000-2001) took place before the final research design of the investigation was decided upon so that it could inform methods of data collection as well as assist the process of becoming competent in interpreting constructs from participants. The trialling of pilot materials supported the refinement of the research questions which originally encompassed too many areas. This defined the study more effectively and brought a focus, particularly, to the child interviews which at first addressed too many issues.

4.5.1 Child interviews

The investigation required a way of collecting children’s views in order to discover how children understand what helps them to learn so it was necessary to discuss with the children and enable them to articulate their ideas.

It has long been agreed that it is difficult to interview young children with the purpose of finding out how they construct learning. Piaget, who has contributed greatly to knowledge and understanding of young children and who conducted many interviews with children has been criticised over the years. For

example, Wood (1998) suggested that Piaget underestimated the importance of the language used when interviewing children. Wood maintained that with a slight change of language Piaget would have obtained different results and therefore reached different conclusions. The language used in interviewing young children, therefore, is a critical aspect of the interview procedure. Rich (1972) suggested that the task of the interviewer is to exploit those factors which increase communication and minimise those which block it. He also warned that it is common for a child to be led to make false statements, simply by the form of the question put by an adult. Giving a child some measure of control over the interview may encourage more open communication. This may mean that more accurate results are obtained as the child is more likely to say what they really want to say rather than what they think the researcher wants them to say.

Piaget (1974) invited interviewers not to talk too much and not to be suggestive. He advised that a good interviewer must know how to observe and let the child talk freely and at the same time be alert for important information. An interview schedule was, therefore, required which allowed each child to talk freely but remain focused on the matters under consideration. It was necessary for children to explore how they understand what takes place during lessons without being led. PCT was considered the most appropriate overarching theoretical perspective. PCT allows the child to be at the centre of the interview. Furthermore, data collection methods can be flexible and adapted to young children. The interviewer does not need to say much or direct the interview so plenty of time can be given to the children. It was considered appropriate to hold individual semi-structured interviews where children were encouraged to provide constructs and then discuss them where possible.

Children's absence from the classroom for interviews had to be kept to a minimum. At the same time, the interview had to be long enough to gather useful and relevant information. Time also had to be allowed to enable children to relax. Leading questions had to be avoided but clarity in understanding assured.

CA children were always timetabled to be interviewed following a CA lesson so that the experience was fresh in their minds. Children were assured that what they said would be treated with respect. Each child decided whether or not they would switch on the recording equipment. The interview began with the child naming the members of their group. This was easy and non-threatening. I wrote the names on small cards and the child arranged them on the table in the seating position of the group that day. From the pilot study, I learnt that it helped to engage each child in doing this as it focused attention on the group and as each child gave the names s/he already began to mention the activity that the group had just been doing. For example:

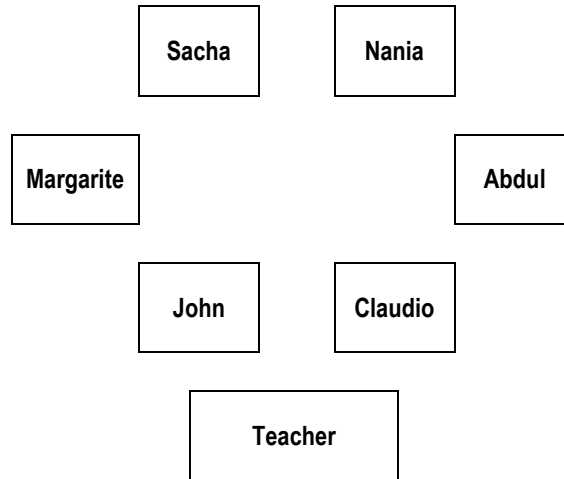


Figure 4.2: Figure to demonstrate the position of cards on the table.

Each construct is bi-polar as explained by Kelly (1955). To elicit the positive pole of each construct, each child was asked one question: *“Can you say what you think helps you to learn during Let’s Think?”* The only other direct researcher-led question was: *“Do you all do that in the same way?”* This enabled the opposite pole to be elicited because each child sorted the cards into groups of who performed in the same way and those who did something differently. For example:

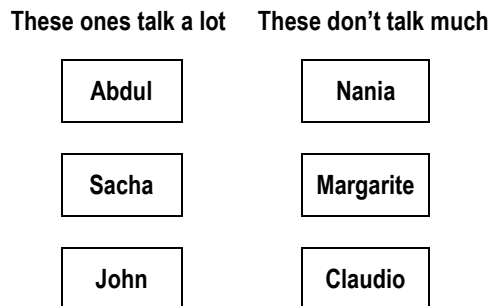


Figure 4.3: Diagram showing how a child sorts the group according to the construct: Talk – Don’t talk

It took several attempts during the pilot study to find a method to elicit the opposite pole in a constructive way. Children did not understand the word “opposite”. Also, the method needed not to convey any suggestion of judgement or criticism.

The final version of the pilot study method was used and this worked well as the children immediately launched into separating the cards. As they did so they explained what they were doing with details of the experience of the group. For example:

I think really well because I am clever. Tamu is clever too so he thinks so that card goes with me and Susan too. Dawn doesn’t think though. She wants to vote all the time and she does not have good

ideas. Karen can't think and Mooni maybe can but he can't really speak English so maybe he can think in his language. So four groups of us doing thinking different.

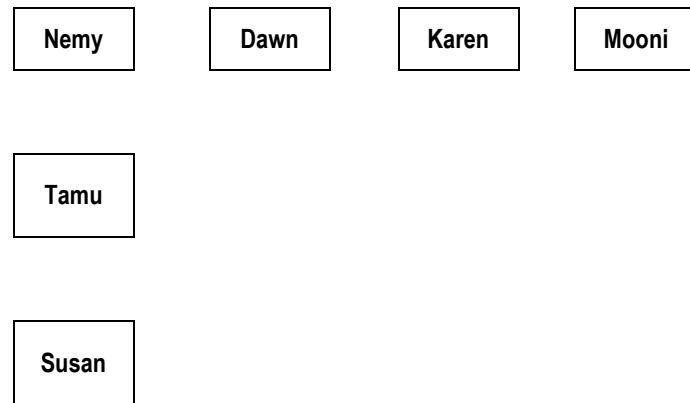


Figure 4.4: Diagram to show the four groups assigned by Nemy

Interviews with non-CA children took the same format but focused on mathematics lessons as these were considered the nearest classroom context to CA.

When each child had finished producing constructs and grouping their peers for each construct mentioned, the concept of the Salmon Line (Salmon, 1995a) was introduced. This is a method of enabling interviewees to rate constructs. I drew a line marked zero to three:

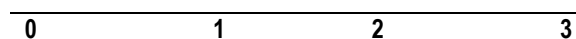


Figure 4.5: To demonstrate a Salmon Line

The child was asked to choose one construct – for example, **talk/don't talk** – and then asked, “During Let's Think, do you **talk** a lot (3), some (2), hardly at all (1) or not at all (0)?” Their place on the line was then identified. The child next placed each group member's name card on the line for the construct under discussion. The process was then repeated for each construct produced. In the course of this stage children usually embellished their actions with reasons for their choices. During the pilot stage, the Salmon Line was drawn indicating 0-5 as the scale. During trialling, it was clear that children found this gradation too complex and difficult. The children only used 0 – not at all, 1 – hardly at all, 2 - some, 5 - a lot. So to look for a more trustworthy method the reduction of categories to 0-3 was tried. A scale of 0-3 (“not at all” to “a lot”) was found to be sufficient to encourage children to discuss difference in behaviours but not so complicated as to make the task impossible or tedious. In the study the rating on the Salmon Lines is not reported as it was found that what was important was the qualitative information discussed. The children

used mostly 0 and 3 with little use of the gradation scale. This was found not to add any useful information to the study.

There was no pressure to produce a certain number of constructs during interviews. No judgement was passed at any time and no comments were made that could imply any kind of criticism. When the children had finished, they were asked whether they would like to hear the recording. They were then accompanied back to class.

Interviews explored the words children used to ensure clarity of meaning. For example, Nemy said: **doing hard things makes you learn** while Susan said: **easy things but they can be boring**. Allowing further time for elaboration elicited that Susan wanted some challenges (hard things) during the day to enable her to feel that she was learning something new and to keep boredom at bay. This established that the two constructs that were initially produced held the same main idea but could easily have been misrepresented. It was important to take time and effort to become as clear as possible about what the children meant when they produced their constructs.

In each year of the study, individual child interviews took place in September, March and July to explore children's understandings of what they considered helped their learning. My position during the children's interviews was of "being with the child", providing the context and to support him/her while consistently avoiding as much as possible being a main player or having a voice. My role was to endeavour to construe an understanding of the children's words. Results are reported in Chapter 6.

4.5.2 Classroom observations of CA/mathematics lessons

In order to understand how the experience of the CA Programme impacts upon children's personal constructs it was important to become familiar with the way the lessons were conducted. When children discussed their constructs it would then be possible to make sense of where they originated. Knowing the context would also enable appropriate questioning and probing to elicit more detail. Therefore, regular lesson observation was necessary.

Trial observations to investigate the most appropriate method for recording accurate information were undertaken. CA lessons involve a small group of six children and their teacher while the rest of the class work independently. Children are encouraged to speak in a voice audible only to their group. The use of a video camera for observations was considered, however, because the naturalistic context was important, it was thought that a camera might be intrusive. Various methods of recording were tried during the pilot phase. A microphone on the table where children were working was a constant distraction as it interfered with the way the equipment was manipulated. A microphone placed just outside the group was strong enough to record children's voices in the group but it also recorded the noise from the rest of the class. This made lesson transcriptions very difficult and frequently impossible.

It was decided, therefore, to take detailed notes of all that was said in the group; it was important to develop a system quick to record and easy to read later. At the beginning of each lesson a diagram

recorded the group position of each child 1-6 in a clockwise direction from the teacher. Each child's contribution was, therefore, identified. When the lesson was transcribed contributions could be re-ascribed to the appropriate children. The most challenging aspect of this method of recording was several children speaking at once. However, as CA pedagogy encourages children to listen to one another explaining and giving reasons, the teacher expected that each child wait their turn to speak.

A further consideration during the pilot phase was the distraction to children and teacher of the outside presence. Teachers found the use of the recording equipment intrusive and a source of anxiety and distraction. Children were also distracted. When the tape recorder was removed, teachers expressed relief and reported that they soon forgot the presence of the researcher. Children also appeared to acclimatise to my presence and rarely looked in my direction, although it was noted that some children consistently found this more difficult.

Various seating positions were, also, tried during the pilot phase. It was important to be near enough to hear what was taking place without being intrusive and, also, able to see what was happening to the lesson equipment. Eventually, it became clear that a seating arrangement had to be decided upon according to each group; it usually involved my being slightly behind and to one side of the teacher and preferably behind the child who was usually most distracted.

Regular lesson observations of the participant groups provided the evidence of the context through which children's perceptions were elicited. In the first year, four CA and two non-CA groups were chosen. It was agreed with the teachers that the lesson to observe in non-CA classes was mathematics as this subject afforded opportunities to discuss and solve problems. It was considered for purposes of comparison that this context was nearest to the CA context. It was important that differences within the learning experience of CA could be identified after teachers' awareness of children's constructs had been raised. Therefore, in the second year, observations of CA lessons took place with the same teachers as in the previous year. Results are reported in Chapter 7.

My role during lesson observations was, on the whole, non-participatory and at all times the locus of control remained with the teacher. I took the stance, as far as possible, of an observant presence, speaking only when necessary to minimise distraction. The spotlight was to be held firmly on the children and the teacher interacting with one another and with the activity. However, when addressed by the children or teachers I gave a brief response. I took field notes throughout the lessons and tried to remain unobtrusive; all these precautions were an attempt to keep the observation as naturalistic as possible. Teachers ensured that the participant group was being taught on the days of scheduled observation visits.

4.5.3 Teacher interviews

Towards the end of the pilot phase, I spoke to teachers who were leaving the LA at the end of the academic year. We discussed various ways of gathering information from teachers and also ways of

engaging them in the research. Having been involved in developing the CA Programme they thought that this was important for the success of the research. In order to investigate the key differences in teachers' constructs with regard to learning, a preparatory tool for a subsequent semi-structured interview was prepared. These were piloted with the teachers who were leaving the local area and the final version agreed (Appendix 4.1). The preparation encouraged teachers to consider their beliefs regarding how children learn and what helps /hinders learning within the CA/mathematics context. The preparation work during the pilot gave teachers the opportunity to identify themes which were then explored in interviews. The teachers reported that this work was straightforward and gave them the opportunity to consider the issues for discussion in the forthcoming interview. The teachers reported that it was helpful to have thought about the areas in advance and so this was planned to be repeated in the study. It was anticipated that teachers having time to reflect in advance would enable them to bring to the interview the most relevant information. The teacher interviews were piloted with the same teachers. The aim was to elicit constructs regarding their beliefs about how children learn and what helps/hinders learning in the CA/mathematics context. A semi-structured interview was considered appropriate for data collection in this study because the questions focused on the relevant areas while allowing some flexibility to pursue aspects specific to each teacher: individual experiences, personal training and interests (Interview Schedule: Appendix 4.2). Permission to record each interview was received. Teachers received a transcript within three days and were asked to make any necessary amendments. Following the interviews, the teachers met as a group and discussed some anonymised children's personal constructs. The teachers agreed that issues mentioned by the children concerned them and they would have liked to explore them further were they not leaving the LA.

It was decided that in September of the first year of the study, teachers' constructs would be collected as a baseline before the CA Programme began. The teachers were asked: What do you think helps children to learn? In July of the first year the six teachers completed the preparation (Appendix 4.1) which was sent to each teacher two weeks prior to the interview. The aim was to provide firstly, a tool for reflection and secondly, interview structure and focus.

The six teachers were interviewed individually in July of the first year of the study. These semi-structured interviews offered scope to probe further the teachers' views of the issues broached in the preparation. The interviews were scheduled for part of a PD day at the end of the academic year. Each interview lasted thirty minutes, was recorded with permission and transcribed. A copy of the transcript was sent to each teacher for verification and possible modification where necessary. The interview provided opportunities for elicitation of teacher constructs and for triangulation for interpretation purposes.

As discussed during the pilot phase, a short intervention with the four CA teachers, the group met four times for an hour on each occasion, took place between the end of the first year and the beginning of the second. The meetings were recorded and transcribed. Each teacher received a copy of the transcript within three days of each meeting. Results are reported in Chapter 5.

4.6 The participants of the study

Of the schools using CA at the time, two schools were most closely matched and a nearby school was willing to act as a control school. The three schools involved in this study were within the same LA and were chosen because of their proximity to one another, less than half a mile apart, thereby having children from the same housing estate, thus providing children from similar backgrounds. Most children attending the schools lived on the estate, although a very small number may have travelled from just beyond. Many residents, mostly from Eastern European countries, had recently arrived in Britain. However, there were a number of families who had lived in the area all their lives and a small proportion came from outside Europe. In addition, the three schools had two Year 1 classes of a similar size. The schools had similar equipment and resources. The two CA schools were Larch School and Pine School and the non-CA school was Hazel School. CA lessons were taught at 9.00am in Larch School throughout the year and in Pine School they were timetabled immediately after lunch.

CA lessons in Year 1 are taught in small mixed groups. During the first half of the autumn term, teachers were encouraged to try various combinations of children in groups of six taking account of gender, ethnicity, ability and personality. So the study could be conducted in as naturalistic a way as possible the groups designated were those being taught CA/mathematics on the day of the first observation. Pre-selecting particular groups would have been inconsistent with the methodology.

The groups of six children in each class were observed regularly and in this study are identified by the initial of the teacher's name (Miss ... **A**rum, **B**ramble, **C**omfrey, **D**aisy, **E**rica or **F**oxglove) - and the year of the study (Group A1, Group A2, etc).

Table 4.1 indicates these groups and the key for codes used to identify some key points relevant to the children at the beginning of each academic year:

Key to codes for Girls and Boys

- EAL1 English as an additional language (access to English less than 6 months)
 EAL2 English as an additional language (access to English for between 6 months –1 year)
 SEN Special Educational Need
 EM Elective mute

School	Teacher	Group	Girls	Boys
Larch	Miss Arum	A1	Angela Grace Tiffany (EAL2) Soha (arrives in May)	Jack Nurad (EAL1) Muhad (EAL1, had not been to school before, left in Dec)
		A2	Anna Philomena Jackie (EAL1, had not been to school before)	James Tahmid (EAL1, had not been to school before) Abda (EAL2)
	Miss Bramble	B1	Sacha (EAL2) Margarite (EAL2) Nania (EAL1)	Abdul (EAL2) John Claudio (EAL2, frequent absence)
		B2	Sakia (EAL2, had not been to school before) Meenah (EAL1) Renata (EAL1, had been to kindergarten in France)	Thomas Gavin Georgio (EAL2, had not been to school before)
Pine	Miss Comfrey	C1	Polly Joleen Weena (EM)	Mark Lewis(EAL1) Tom
		C2	Stacey Cathie Magata (EAL1, had not been to school before)	Matthew Talmi (EAL1, had not been to school before) Mohammed (EAL2)
	Miss Daisy	D1	Dawn Susan Karen (SEN, only class with teaching assisitant, 20 hours)	Nemy Tamu Mooni (EAL1)
		D2	Aurora Bernie Pauline	Joshua Rakhmi (EAL2) Keendi (EAL1, had not been to school before)
Hazel	Miss Erica	E	Roberta Isa (EAL1) Tute	Marid Ayar (EAL1) Sacki
	Miss Foxglove	F	Lisa Jodie Pat	Chris (Identical twins) Joseph(Identical twins) Nooli (EAL1)

Table 4:1: Participants in the study

First Year (2001-02)

Table 4.1 illustrates that in September there were eight children who were just beginning to learn English (EAL1) with a higher proportion of children identified as EAL in Miss Bramble's class than any other in the study.

There was one child who was an elective mute (EM) and one who had a Statement of Special Educational Need (SEN). Five children, all in Larch School, had been living in Britain for about six months and had been learning English for that amount of time (EAL2).

In September each group was made up of three boys and three girls. Each group had a mix of ethnic origin with children who had had different degrees of access to English. This was important in this context as children were required to provide their personal constructs so their degree of verbal facility needed to be taken into account. Also, CA depended on children being able to understand what was being discussed during activities in order to develop their thinking.

Group A1 was the only group that experienced disruption when Muhad left in December and it was May before Soha joined this group.

Second Year (2002-03)

Table 4.1 illustrates that in September there were seven children who were just beginning to learn English (EAL1). Five children had been living in Britain for about six months and had been learning English for that amount of time (EAL2).

Each group was made up of three boys and three girls and the groups stayed stable all year.

4.7 Data analysis

4.7.1 Data collected from children

The individual interviews in September, March and July took the form of conversations with a view to eliciting children's constructs regarding what helps learning during a CA/mathematics lesson.

In September the intention of the initial interview was to gain a sense of how children construed learning at that stage before the CA Programme began. Children mostly used short phrases and single words during this interview. For example:

R: *What do you think helps you learn?*

Grace: Your mum.

R: *Your mum helps you learn?*

Grace: Yes, you need a mum.

The construct in this case was identified as **your mum**.

In March and July, the interviews were repeated in the same way in order to get a sense of how the children's understanding of what helps them to learn was developing. The children were able to give details and explanations as they discussed their constructs.

Kelly (1955) insists that to understand a construct, the individual must recognise the similarities between people/objects/experiences and also the differences as constructs are dichotomous or bi-polar. So the children were asked to identify the opposite pole of their constructs. For example:

R: Do you all **talk** the same?

Sacha: No, I **talk** the most 'cos I have the ideas, Abdul and John **talk a bit** and Margarite but Nania **don't talk much** and Claudio 'cos he **don't know what to say**. So some **talk** and some **don't** really.

The constructs and their opposite poles are indicated in bold in these examples. Original words are retained as far as possible. However, in the construction of tables for collation, where words were clearly understood to have the same meaning, they are classified together. For example:

"Have to work", "do work sheets", "do lessons" are all classified as **have to work**.

"Explain", "tell someone what your idea means", "give a reason" are all classified as **explain**.

"Solve a problem", "work a hard thing", "sort a problem" are all classified as **solve a problem**.

Each different suggestion of opposite pole is recorded.

All the constructs provided were collated and analysed by school, group and individual child.

4.7.2 Data collected through interviews

A short conversation with each participant teacher elicited constructs in September in response to the question, "What do you think helps children to learn?" These constructs are given in a table (Chapter 5: Table 5:2)

The constructs provided through the interview in July of the first year are summarised by question and shown in a table (Chapter 5: Table 5:3). The constructs provided through the interview in July of the second year are summarised by question and shown in a table (Chapter 5: Table 5:4).

4.7.3 Data collected through intervention group meetings

During July and the beginning of August at the end of the first year, the four teachers met with me on four occasions to discuss their CA experience, hear the children's constructs and consider how they could improve their pedagogy as a result of the children's experiences as reported through the constructs and explanations provided during interviews. A brief summary of these four meetings with the teachers is provided in Chapter 5: section 5:5. Through listening to the children's experiences, the teachers identified

four themes that seemed significant. From these four identified themes, the teachers agreed on three common targets and one individual target to work on in order to develop their expertise.

4.7.4 Data collected through lesson observations

Examination of transcripts following a number of lesson observations explored ways of analysing the transcripts. The lessons were examined from the perspective of CA pedagogy. In the first instance, the schema being used was highlighted. Then the pillars of concrete preparation, cognitive challenge, metacognition and bridging were identified in each lesson. There were lessons where concrete preparation returned within cognitive challenge and a moment of metacognition or bridging appeared within cognitive challenge. It was important to recognise the pillars within each lesson as they determine the intention of any teacher action, for example, asking a question about the task.

Verbal contributions were grouped according to teacher or child intervention and according to the type of contribution. For example, question, statement, direction. Following this, each intervention was grouped according to the intent of the contribution in line with CA pedagogy. For example, question intended to challenge children, statement intended to encourage metacognition.

The next step was to identify each occasion when a child, teacher or group of children spoke. This was a word, a phrase or a sentence. Each of these occasions was classified as an “event” on the transcripts. Each event in all the observed lessons was then examined and described by answering the question: What is this event? The types of event that were identified from this initial examination were questions, instructions, statements, descriptions and explanations. In order to develop the analysis in line with the underlying Piagetian/Vygotskian theory, these types of event were further categorised.

A coding system was trialled following this initial identification. Several transcripts and the code were given to two fellow colleagues. After a discussion explaining the code, the two colleagues coded the transcripts. A further discussion identified several groups which were unclear. For example, identifying the ways children provided descriptions gave rise to confusion. Also, the nature of teachers’ instructions was discussed. The codes were reduced from seventeen to twelve. These twelve codes were then used on a further set of transcripts when 99% accuracy was achieved between the three colleagues. This method checked that the coding was robust and reliable.

The twelve codes

Many questions were asked by teachers and children during the lessons. Two types of questions were identified. One concerned the task itself. For example, “*Can you put the boxes in order?*” (Group A1, Lesson 11, event 5) These were mainly found within the cognitive challenge sections of lessons and sometimes within bridging and were categorised as: **Ask a question at task level**. The second type of question were those intended to encourage metacognition and were asked by the teachers. For example, “*What helped you make the story?*” (Group B1, Lesson 8, event 162) These were found only in metacognition sections of lessons and were categorised as: **Ask a question at metacognitive level**.

Within the cognitive challenge section of lessons, teachers sometimes made a statement about what they wanted children to do for the challenge. For example: “*I want living things there and non-living things here.*” (Group A1, Lesson 13, event 65). These events were categorised as: **Express a challenge.**

Instruction giving was the next type of event to be identified. Teachers gave two types of instructions. The first was suggesting a particular procedure to be followed. For example: “*Put them back in the car park.*” (Group A1, Lesson 9, event 18). These events were categorised as: **Procedural management instruction.** These events were usually found in the concrete preparation section and at the end of the lesson but could also be found within the cognitive challenge section especially where one challenge finished and a new one was about to be given. The second type of instruction did not relate to learning directly but concerned the children’s behaviour. For example: “*Put your hands in your laps.*” (Group C1, Lesson 10, event 20). These were found in every section of lessons and were categorised as: **Behavioural management instruction.**

Within the cognitive challenge and bridging sections, children responded to task level questions with words/phrases/sentences which were either descriptions or explanations. The descriptions were often one word responses. These were categorised as: **Give a one word description.** For example: “*Light.*” (Group C1, Lesson 20, event 51) The second type of description in cognitive challenge and bridging sections were identified as phrase/sentence descriptions, when more than one word was used. These were categorised as: **Give a task level phrase description.** For example: “*It’s the rain.*” (Group D1, Lesson 25, event 32)

In metacognitive sections of lessons children responded to questions with phrases/sentences that went beyond describing the task and touched on metacognitive aspects. For example: “*Thought in my head.*” (Group C1, Lesson 18, event 86). These were categorised as: **Give a metacognitive description.**

Sometimes during the cognitive challenge or bridging sections of lessons, children were able to go beyond description and provide an explanation about the task. For example,

- D: I’m happy but this needs swapped.
T: Can you explain?
S: ‘Cos he’s in his bedroom.

(Group D1, Lesson 8, events 111-113)

The contribution from S was categorised as: **Give a task level explanation.**

Occasionally, during the metacognitive sections of lessons, children provided an explanation. For example: “*It was tricky ‘cos people said different things and then changed their minds.*” (Group A1, Lesson 25, event 128). This was categorised as: **Give a metacognitive level explanation.**

Sometimes the children agreed or disagreed with a suggestion with just a “Yes” or “No”. This was categorised as: **Agree/disagree with a suggestion.**

There were some events left on the transcripts that did not relate directly to the learning. These were remarks mostly made by children and were important as they were relevant when analysing their constructs about themselves and learning. For the purposes of this analysis they were identified as:

Other.

At the end of each year of study, all the talk in the observed lessons was coded using the categories identified as categories of speech (1-12). All the categories are identified in Table 7.2 with an example of each one alongside the pillar of CA where the categories are found.

Before the research design was finalised basic principles of conducting research were established and agreed. The next section describes what was put in place to achieve a study considered trustworthy and conducted according to ethical guidelines.

4.7.5 Data examined from the test results.

Section 2.7.1 in Chapter 2 and Appendix 2.3 describe the pre and post tests conducted as part of the large CA study. All of the children in this study were given the same pre and post tests within the same time frame as children in the main study (September and July in each academic year). Pre and post tests are an integral part of the CA methodology so that the programme teams are able to use the quantitative data as evidence of raised intellectual development compared to non-participant children. The pre and post test results from each of the participant children were examined. The results from each participant group of children of the test of Spatial Perception and Conservation were averaged to compare the differences between the two years. These results are shown in Chapter 7, section 7.6. Although the numbers of participant children in this study are small compared to the numbers in the main study, the interest is in any general pattern of difference between the main study and this small scale study.

4.8 Ethical framework and issues of validity and reliability

This research is in line with all the ethical guidelines detailed in BERA's *Revised Ethical Guidelines for Educational Research* (2004) and BERA's *Ethical Guidelines for Educational Research* (2011).

According to Lincoln and Guba (1989) trustworthiness is a basic priority to show that a piece of research undertaken is worthy of attention and the criteria considered apt for the purpose of evaluating interpretive, qualitative work are credibility, transferability, dependability and confirmability. The basic principles of honesty and integrity underpin each set of criteria but the latter are those being specifically used to evaluate this research as the work was mainly qualitative in a naturalistic setting. Lincoln and Guba (1989) suggest that the researcher must show that the many constructions and re-constructions arrived at during the data collection and interpretation phases are credible to the original constructors; in this case, the participant children and teachers. Credibility, therefore, replaced the conventional criteria of internal validity. It was important therefore that the inquiry be carried out so as to enhance the probability that the findings were found to be credible. Credibility can be demonstrated by showing that the original constructors recognise and approve the re-constructions and interpretations. It was important, therefore, to

check understandings with participants. In this study, the teacher participants were given every opportunity to check transcripts and make changes as necessary. It was more difficult to check understandings with the children. This was done orally within interviews as each interview progressed.

Several methods to enhance credibility suggested by Maykut and Morehouse (1994) are that the whole process be transparent, verified through an audit trail, use of multiple methods of data collection as in this way understandings can be checked from a number of perspectives and working with a team. To help make the process transparent, detailed reporting of the research process allows readers to closely examine all aspects of the study. This transparency provides a basis upon which to form a judgement of credibility. The account of the study following this chapter endeavours to provide all the detail required for a reader to make a balanced and sound judgement on the issue of credibility.

The literature generally refers to the use of multiple methods of data collection as triangulation. Cohen and Manion (1994:223) define triangulation as “the use of two or more methods of data collection in the study of some aspect of human behaviour”. They go on to explain that triangular techniques endeavour to chart the complexity of human behaviour by investigating it from more than one viewpoint. Denzin and Lincoln (1998) describe triangulation as an attempt to secure an in-depth understanding of the phenomenon in question. They add that triangulation is not a tool of validity but, rather, an alternative to validation. Two advantages in using triangulation have been suggested by Cohen and Manion (1994).

Firstly, a constructivist investigates and interprets human behaviour through a personal and professional backcloth. Research methods also delimit the experiences observed. Reliance on one method, therefore, may only provide one particular slant on the issues being explored. The interpretation construed from this angle would, at best, be limited but could also be biased.

Secondly, triangulation acts as a buffer against the threat of method-boundedness. This is a term used to indicate a position whereby a researcher employs only one method either because knowledge is limited or because the method is thought to be superior. The methods of data collection used in this study aimed at a cohesive interpretation of how the CA Programme impacts upon children’s understanding of their learning, and how teachers’ awareness of children’s understandings is raised. The method of data collection also had to allow for an interpretation of how children in the second year understand learning in order to examine differences following the raising of teacher awareness of children’s constructs.

Triangulation was considered important with regard to the trustworthiness of this study, therefore several types of triangulation were planned. Combined levels of triangulation were used as more than one level of analysis took place: analyses of groups and analyses of individuals from different perspectives, that of the child, the teacher and the observer.

Theoretical triangulation was also used where constructions were investigated from several different theoretical standpoints; in this case, PCT and CA theories. Investigator triangulation was used when a member of the CA team also observed CA lessons and observed some child interviews. Scripts and interpretations were compared for accuracy. In addition, two colleagues on the CA team used the code

devised for analysing lessons and in this way the code was refined and checked for accuracy. Methodological triangulation was used as different methods were employed to investigate child and teacher understandings.

The audit trail consisting of all the documentation of the study is accessible to any interested party. A full evaluation of the methods, process, interpretations and conclusions can be undertaken. During the time the data collection took place I was a member of the team developing CA pedagogy in schools. Team meetings offered opportunities to describe the area of interest and methodology being proposed, data collection methods and progress, colleague examinations of findings and interpretations. This was particularly useful when setting up the study and during the Pilot Study of the methods of data collection. In addition to the peer review from colleagues at King's College, I am supervised by academics from the Institute of Education, University of London and have presented aspects of the methodology and interpretations at research and education conferences. These activities allow the findings to be open to scrutiny at all stages of the process.

Evaluating findings of a study within a constructivist approach uses the construct of transferability which is based on evaluating the degree of similarity between two contexts: that of the study and that to which judgements are to be transferred (Guba and Lincoln, 1994).

To facilitate transferability, a detailed description of the process and of the analysis is provided throughout this study. The second year of the study was conducted in such a way as to make comparison possible between the findings of each of the two years. For this reason, the schools, teachers and the methods of data collection were identical. The information provided makes it possible to establish the degree of similarity between the two years (Schwandt, 1997).

The notion of dependability has been substituted by Lincoln and Guba (1989) to replace consistency in the positivist paradigm. Consistency is demonstrated by reliability when a study is replicated. This relies on a naïve realism; something tangible and unchanging to serve as a benchmark. In a study within the constructivist paradigm, this criterion is inappropriate. Lincoln and Guba (1989) suggest that, in a naturalistic, qualitative study reliability forms part of a larger set of factors associated with observed changes. Dependability reflects the means for taking into account factors both of instability or design induced change. The criteria for dependability echo those of credibility as outlined above. In this study those criteria were respected in all ways. The key factor of change in this study was a teacher intervention that took place between the two years. The study took account too of the fact that in the second year, the child participants were a new group of Year 1 children bringing with them their own unique constructs. The other major factor influencing results is that during the first year of the study the teachers attended the PD programme so that by the beginning of the second year they were familiar with all aspects of the CA pedagogy and felt competent to teach CA.

In a naturalistic study it is appropriate to establish that the characteristics of the data can be confirmed (Guba and Lincoln, 1994). Schwandt (1997) maintains that, to enable evaluators to uphold confirmability, it

must be possible for them to recognise that the researcher has linked assertions, findings and interpretations in readily discernible ways. This study demonstrates that a clear transparent journey is in place throughout.

In 1994 Guba and Lincoln re-evaluated their work in the field of methodology. They came to the conclusion that the trustworthiness criteria held good for methodological criteria. However, they were concerned that these criteria largely ignored aspects of the inquiry surrounding the quality of the outcome. To deal with this difficulty, they proposed a further set of criteria; the authenticity criteria. They maintained that these criteria were better aligned to constructivist epistemology.

The first important aspect of the authenticity criteria is fairness. This takes account of the balanced, even-handed way that the inquirer represents the views and constructions of the participants. The second aspect to consider is ontological authenticity which allows the participants' own constructions to be enhanced or become more informed as a result of their having participated. The third aspect is educative authenticity which facilitates participants' development of greater understanding of and appreciation for the constructions of others. The fourth element is catalytic authenticity which refers to the extent action is stimulated and facilitated by the inquiry process. Lastly tactical authenticity encourages the empowerment of the participants.

These five aspects were taken seriously within this study. When interviewing children, care was taken to understand the constructs being verbalised so that the analyses and interpretations of these constructs were as close to the children's meanings as possible. In this regard, fairness was being respected. The other aspects were more difficult to evaluate from the children's perspective. These are discussed in Chapter 8: Methodological Discussion. The children were five years of age and assessing causes of change as a result of participation is complex.

All aspects can be evaluated more easily from the participant teachers' perspective. All transcripts were given to the teachers for verification indicating that they can ensure that they were being represented fairly. The evaluation of the focus group and the second year of the study demonstrate how the teachers were affected by the study and therefore it forms part of the assessment of all other aspects of authenticity. The authenticity code was respected in relation to all participants in this study. Evidence of this can be seen throughout the presentation of results (Chapters 5, 6 and 7) and the discussion (Chapter 8).

The intent to investigate with rigour in order to arrive at some truth must never override how the researcher acts towards participants. Ethics can be considered at a common sense level where caring, fairness, openness and truth are taken into account and, also, at a technical level where the principles of informed consent, dialogue and anonymity are considered. Theoretically, if the issues at the technical level are put in place as a matter of priority, the common sense issues fall into place with ease. He outlines ethical principles to be taken into consideration when conducting research. Principles considered here are informed consent, dialogue and anonymity. The principle of informed consent arises from each

participant's right to freedom, fundamental within a democracy. This consent respects and protects the right of self-determination. Consent also implies the right to refuse to take part and the right to withdraw even during the process (Frankfort- Nachmias and Nachmias, 1992). Informed consent has been defined as "the procedures which individuals choose whether to participate in an investigation after being informed of facts that would be likely to influence their decisions" (Diener and Crandall, 1978).

This study was guided by this principle throughout every process. The head teachers of the schools involved in this study were approached individually. The nature of the study and proposed methodology were explained. The teachers were then invited by the researcher to participate in the research and the methodology explained. Each participant teacher's permission was sought to tape record interviews. These were transcribed and sent to teachers within three days for amendment, if necessary.

All parents and carers were informed about the project by letter. This was sent from the LA in accordance with local guidelines. The purpose of the research and the proposal that their child could be involved was outlined. It was explained that child interviews were voluntary and that they or their child could at any point ask not to participate. Before every interview, each child was asked whether they would like to participate. Interviews always followed a lesson that I had witnessed, so that the experience was fresh in children's minds and that they were aware that I had seen the lesson in action. Appropriate explanations of the interview purpose were given. Each child's permission to conduct and tape record interviews was sought and willingly given on each occasion. Children were allowed to experiment with the tape recorder before they decided whether or not they would switch it on for the interview. It was important that the children felt as confident and relaxed as possible so that they spoke and shared their ideas. Each participant agreed to participate at key points during the two year study. Teachers and children could withdraw at any stage.

The principle of dialogue arises from each participant's right to be engaged at all points in the research process. This means that issues and procedures are discussed in advance, schedules are maintained and participants have the possibility to withdraw or to decline from participating in particular aspects of the research. Openness and honesty are integral to this principle as well as being well planned so that discussions can take place in advance of any procedure. Following discussion, teachers were sent a programme of proposed visits at the beginning of each term. These were accepted or re-negotiated according to curriculum requirements and teachers' timetables. In this way teachers had control over when they had a visitor in their classroom and when children were withdrawn from class. Consequently, some classes had more visits than others, which make data analysis more complex. However, the overriding principle of respect for teachers' freedom was considered to be of greater importance. Once the scheduled dates for visits were agreed, a copy was sent to each teacher and head teacher.

The principle of dialogue was maintained throughout this study. Teachers were provided with information in several ways. Immediately after a lesson observation, teachers wanted feedback on how they were integrating the pedagogy. Informal feedback was usually given on the CA pedagogy but anything particular to that group was avoided. All lesson transcripts were sent to the teachers. Occasionally, these

were used by teachers as evaluation tools. Sometimes, on a subsequent visit, a teacher shared the content of this reflection. Interview transcripts were sent to teachers for verification and modification. Summaries of analyses were shared with teachers. After the second year of the study, the teachers were invited to and attended educational conferences where the research was presented. A key aspect of the study is to inform teachers and to give them the opportunity to discover more about their impact on child learning. Consequently, all of these measures were considered important.

During child interviews several opportunities were taken to check understanding so that accurate representation of their views took place. Discussion with children of interpretations of their constructs was more difficult. I clarified meaning during the interview as much as possible. Removing children from classrooms to discuss interpretation of interviews has ethical and educational implications. Also, it was considered inappropriate to discuss interpretations of interviews days later. In conjunction with supervisors it was decided that the method of checking interpretations of words and actions during the interviews was the most appropriate.

The principle of anonymity arises from each participant's right to remain anonymous throughout the study. All forms of identification have been removed or disguised appropriately. Confidentiality was considered essential in this study. Observations of lessons are a major aspect and much could be inferred about a teacher were access given to lesson transcripts. Also personal issues were being investigated in teacher and child interviews. From the outset, one issue of great importance to teachers was the assurance that no findings relating directly to them as individuals would be shared with inspectors nor interfere in any appraisal process. This guarantee has been strictly respected throughout. All names have been anonymised. Child names reflect gender and ethnicity. Transcripts are stored in a safe and private place and printed with code names only. The record of coding is kept on a separate computer system accessible only to me. However, given the nature of the major project's funding, it is not possible to disguise the LA involved, as finance was given only to this one LA during the years of the study.

The issues covered by the common sense level are those of caring, fairness, openness and truth. These attitudes are demonstrated throughout this study. Another ethical approach is the principle of trustworthiness. Trustworthiness in this context considers rigour in the methodology as well as in the findings. Trustworthiness has been described above.

The ethical considerations are of prime importance throughout this study. Understanding the participants was a key element of this study, therefore, the quality of these relationships reflects the quality of the interpretations of the findings. The attitudes lived reflect Gilligan's belief that justice and caring have to be part of one's thinking and action in concrete and complex ways (1982).

In conclusion, the section entitled Methodological Discussion, Chapter 8 includes evaluation of the ways in which rigour and thoroughness ensure the principles outlined above and were implemented throughout the whole process of this study. All the means used within this study to establish trustworthiness, dependability and confirmability allow reviewers to follow the inquiry at every stage, to pursue their own

interpretation process and draw their own conclusions regarding credibility, transferability, dependability and confirmability.

Chapter 5: The participant teachers

I've learnt more about how children learn during Let's Think than from any other aspect of my professional development (Miss Daisy).

Summary

This chapter describes the involvement of the participant teachers in this study. It presents the teachers' constructs about what they think children need to learn effectively at the beginning and end of the year. It briefly describes four group meetings which took place between the end of the teaching of the first year and before the beginning of the second year. It identifies four themes the teachers decided were priorities to improve upon in the second year of the study.

5.1 Introduction

According to CA theory, the class teacher is very important in facilitating the learning during CA lessons. Teachers are given PD so that they understand the pedagogy required to increase children's cognitive abilities. Teachers interpret and integrate CA pedagogy into their classroom practice according to their own understandings and skills. The pedagogical strategies that teachers employ are influenced by their training and subsequent PD as well as by their experience of teaching. Teachers learn to operate within the amazing complexity of interactions of the normal classroom through experience and by the underlying philosophy of the nature and purpose of teaching and learning (Adey, 2008). Craft (1996) highlighted the importance of PD for teachers and suggested that the best PD should make an impact upon practice and on children's attainment.

PD literature identifies key features of programmes which make for success in terms of change within teachers' practice and impact on children (Loucks-Horsley, 1987; Craft, 1996; Adey, 2004, Zohar, 2010). Key characteristics identified in the literature relevant to this study are the involvement of teachers in the development of the programme, appropriate participant involvement, collaboration and collegiality so that over a period of time CA can take place in a positive climate to take place over time.

Adey (2002) was attentive to the recommendations so teachers were fully involved in designing this CA Programme for Year 1 children. Some also participated in piloting the activities in their classrooms so they could observe the lessons being taught and offer their view on the activities' suitability. During days out of class the theory and its implementation were discussed as was the management of the programme. This was to be taught to one group of children each day. The PD

included coaching with teachers and children in their own classrooms so that improvement in teachers' practice was an integrated and essential part of the programme to make an impact upon children's learning.

The four participant teachers in this study participated in the PD for the programme. None of the four were familiar with PCT but were open to learning whether this theory could enhance their work with children. Because a key aspect of this study was to give the children a voice, the children's constructs collected during the first year were the key aspect of the teacher intervention at the end of the year. Lesson observations would demonstrate the opportunities for children to articulate their thinking, explain and engage in dialogue in the groups. This study looks at the inter-connectedness of the pedagogical strategies and the development of children's understanding of what helps them to learn in order to improve practice where possible.

Although children's voices are key to this study, teachers' voices are important too as they are vital to each lesson being successful. This chapter is placed at this point in the study so that the context foregrounds the results with the children and, therefore, can be understood within the framework of each class as well as the intervention that took place with the four teachers. As described in the methodology, a summary of the involvement of the participant teachers is as follows. In September of the first year of the study, each teacher was asked what they thought helped children's learning. In the following July, the teachers completed a questionnaire and each one was interviewed individually. In addition, the four CA teachers met with me as a group on four occasions at the end of the first year and before the second year began.

5.2 The teacher participants

The six teachers in this study have between 1-5 years experience as teachers. The following table shows the CA/non-CA schools and the teachers.

School	Teacher	Participation
Larch	Miss Arum and Miss Bramble	CA
Pine	Miss Comfrey and Miss Daisy	CA
Hazel	Miss Erica and Miss Foxglove	Non-CA (control)

Table 5.1: To show teacher participants

During CA lessons, Miss Arum always expected the rest of the class to work in silence while they were engaged in a handwriting, spelling or maths work sheet. One child was appointed as monitor for each table and should any difficulty emerge, that child was expected to help the others to solve the problem. This meant that it was very easy to hear and observe the group and they had peace from interruption.

During CA lessons in Miss Bramble's class the other groups were engaged in a variety of tasks. Children often finished a work sheet within the first ten minutes then they chose from a range of other activities. Their voices became quite loud which frequently made it difficult to hear the CA group. Miss Bramble encouraged independence and had a loose sense of control of the class. She spent a lot of time engaging with individuals allowing children time to talk things through, explaining consequences of particular behaviours and encouraging positive behaviour patterns.

At the beginning of CA lessons, the other children in Miss Comfrey's class were engaged in paired shared reading. Half way through the lesson, Miss Comfrey shook a tambourine and all the children tidied the books and went to another activity previously assigned to them. These ranged from construction activities, art/craft activities, role play, paint or puzzles. Some children worked in the classroom while about ten were usually assigned to the connecting room. The children in this "middle room" were unsupervised, tended to become very noisy and frequent arguments broke out. On a regular basis the noise made it difficult to hear the CA group.

Miss Daisy's class also engaged in paired shared reading at the beginning of CA lessons. Half way through the lesson the children were asked to change activities in much the same way as in Miss Comfrey's class. A range of similar activities were available for children to choose. The children in this class tended not to use the "middle room" as they said it was dominated by children from next door who "*do not play fair*". Miss Daisy provided more activities within the classroom. The CA lesson in this class was the only one of the four conducted on the floor. The children and teacher sat or lay on a section of the carpet in a circle. This class was not so noisy so it was easier to hear the CA group.

In Miss Erica's class Mathematics was taught at 9.00am every day. During the first section of the lesson the children sat on the carpet facing the white board. After 15-20 minutes, the children, except the focus group of the day, were sent to their tables to complete a work sheet. Miss Erica worked with the focus group on a particular aspect of the mathematics concepts being taught that week. The rest of the class were expected to work in silence. When the children went to their tables they were clear about how to complete their work sheets and worked in silence during most of the focus group teaching time. At 10.00am, a bell rang throughout the school at which point all classes were expected to start teaching literacy. In this class Miss Erica timed her lessons to fit with the bell seamlessly.

The context of Miss Foxglove's was similar to Miss Erica's class. However, the children found working in silence difficult and often after five minutes they started to chatter. Miss Foxglove frequently called out reminders to be quiet with little effect. Usually, the children asked their peers what to do and how to complete the work sheet as they seemed confused. At the end of the focus group work, Miss Foxglove asked all the children to return to the carpet where there was a brief recap of the lesson.

This chapter examines some of the constructs held by the teachers in order to try to understand the differences in the way they teach and relate to the children. The data comes from interviews with the six

teachers participating in this study and from a focus group of the four CA teachers which took place before the teachers started the CA Programme in the second year of this study.

5.3 Teacher participation in the first year

In September, once the teachers had agreed to participate, they were asked in a brief interview what they thought helped children’s learning in order to provide a base line of their ideas. The teachers were asked: What do you think most helps children’s learning? In order to create the opposite pole of their constructs, the teachers were asked: Is this the same for all children? In this way, the teachers were able to describe similarities and differences in the way that children learn. For example, “Children **have to behave** if they want to learn. If they **cannot behave** then they don’t learn and they don’t allow others to learn either”. In the interviews neither pole of the constructs was privileged but just the positive pole is provided here for the sake of clarity as this was the one usually discussed. Appendix 5.1 provides a list of both poles of the constructs provided by teachers in September. The initial ideas were collated and are shown in the table below.

Constructs	Frequency
Do what they are told/behave/ keep rules	8
Ability	6
To learn to read	5
Be supported by home	3
Listen/listen to adults	3
Complete set work	2
Be independent	2
Sit quietly	2

Table 5.2: Teachers’ Constructs mentioned more than once

Table 5.2 shows that the most widely reported construct to help learning focussed on children’s behaviour. Teachers Arum, Comfrey, Erica and Foxglove all mentioned children’s behaviour more than once. This is important as this information gives a sense of priorities for teachers in how they run their classes. Of the teachers who did not use a construct around behaviour, Miss Bramble was more concerned with developing independence through a supportive environment and Miss Daisy was more interested in developing creativity within an understanding of the school context. All the teachers mentioned children’s innate ability which provides an insight into how teachers understand attainment and what makes a difference to how successful children can be in school. Five teachers mentioned that the children must learn to read and they clearly see that as a priority in their teaching. Three teachers stated that children

need support from home whereas this is not mentioned by the others. Of the six teachers only Miss Arum and Miss Daisy refer to some teacher competencies. As each teacher was keen to participate and had said she wanted the project to help her be a better teacher it is perhaps surprising that more pedagogical strategies were not mentioned. Miss Bramble referred to emotional development and stability and ran her class with this as her priority. She was also the teacher who referred to boys requiring more time and support while Miss Arum mentioned that boys needed to be pushed (Appendix 5.1 and Appendix 5.4).

The rationale for the preparation sheet given in June was to foreground the interview by giving teachers time to prepare for it. The purpose of the sheet was to invite the teachers to consider what they thought affected children's learning generally and what they considered the impact of the children's views of themselves as learners had on learning. Two further areas related to whether the identified group in each class during the first year of the study was typical of the rest of the class and the consideration of how that group worked in the CA/mathematics lesson compared to other lessons. (copy of the preparation sheet is in Appendix 4.2).

Teachers brought their completed sheets to the interviews and used them as prompts for their thinking. The interviews sought to expose each teacher's constructs regarding their responses to the questions. The teachers were asked to write their constructs in response to the question: "Can you say what you believe to be the general factors affecting children's learning?" Once the list had been created the teachers were asked to consider their own class and to think about similarities and differences between the children. For example:

You have **ability** as your first construct. Can you choose five children. Identify some whose ability is the same and some where there are differences. Tell me about the similarities and differences between these two groups.

The discussion which followed enabled the teacher to provide the opposite pole of each construct as they considered similarities and differences between children in their classes. Following this the teachers were asked: How does a child's view of him/herself as a learner affect their learning? The teachers used the same children to discuss how each one's self view affected the learning. In this way similarities and differences between children were again discussed and the opposite pole of each construct provided.

Table 5.3 provides a list of the constructs with the frequency mentioned. A list of constructs with the opposite poles is provided in Appendix 5.2. The positive pole is provided here as it was most frequently used in discussion.

	Constructs	Frequency
Constructs from: What general factors affect children's learning?	Child ability	6
	They want to behave	6
	They are mature	6
	Positive attitudes to school from home	6
	Positive parenting	6
	Gender	6
	Emotional solidity	5
	Positive attitude to learning	5
	Biology/genetic	3
	Controlled TV time	3
	Conform to school discipline	3
	Some cultures have different attitudes	2
	Positive environment	2
	Lived in peaceful place	1
Constructs from: How does the child's view of him/herself as learner affect his/her learning?	Teacher has responsibility in developing children's views	3
	Child view affects achievement	3
	View of high ability has positive effect	3
	Their view impacts on everything	2
	Their view of high ability has positive effect on effort	2
	Positive view is developed from what teacher says	2
	High ability view has positive effect on risk taking	2
	Their view has huge impact upon learning	1
	Their view is linked to how others view child	1
	Child has to have power	1
	Child has to understand that they are responsible	1
	They can get better if they try	1
	School is positive effect	1
	Teachers have no effect on children's views of themselves as learners	1

Table 5.3: To show the constructs produced in July of the first year of the study.

With regard to what teachers considered generally affected children's learning all six teachers mentioned six specific constructs and two more were mentioned by five of the teachers. The first construct mentioned by all the teachers was child ability. They each held the view that ability was the most important factor influencing learning. Three of the six teachers backed this construct with a further construct about genetic

or **biological endowment** convinced that this was a crucial factor influencing learning. This was somewhat surprising as it had been stressed frequently during the CA PD that effort and motivation alongside appropriate pedagogy were more important aspects to prioritise and consider than ability.

Each teacher mentioned **behaviour** as a key to learning. Teachers discussed children's behaviour at length and stressed the importance of children wanting to work with teachers and peers. Four of the teachers' views were that motivation to co-operate was the most important factor in this construct affecting children's learning. Three teachers added that conforming to school behaviour policies was an important attitude necessary to support learning. This emphasis on behaviour could lead teachers to be too worried to allow children the freedom to work collaboratively and engage in discussions in case the behaviour became unruly or out of hand. However the literature shows that when children are involved in collaborative work they engage more with learning and, therefore, behaviour management is not a concern (Pollard, 2002).

Positive attitudes from home about school and **positive parenting** were also considered important by teachers. They experienced a range of attitudes from parents and were concerned when parents gave children a negative perspective of school or of the teachers themselves. Miss Bramble was very keen for the children to have the power to choose how to behave and to be given responsibility for their learning whereas Miss Comfrey was completely focused on the children conforming to the behaviour rules set up in class. Analyses of children's constructs (Chapter 6) alongside lesson transcripts (Chapter 7) illustrate differences in approach to behaviour management in the four classes and the impact of these differences is discussed in Chapter 8.

The second question asked teachers how children's views of themselves as learners impacted upon learning. Table 5.3 illustrates that the teachers are less consistent in the constructs provided. No construct was provided by more than three teachers. However, although expressed differently, each teacher believed that the **child's view has an impact upon learning**. The table shows that three teachers believed that the teacher had a **responsibility in shaping the children's view** of themselves as learners whereas one teacher held the opposite view. Four teachers held the view that there was a link between children who have a positive view of themselves as being high ability children and the effort they then put into their work. According to two teachers these children are also more likely to take risks in the activities and in sharing ideas. Miss Bramble provided constructs regarding the responsibility of adults to ensure that children are made to realise that they are responsible for their learning, giving them the power and helping them to understand that they can learn if they try. Miss Arum and Miss Comfrey were more concerned with helping the children to co-operate with teachers. Miss Arum and Miss Bramble were clear that the link between high ability and effort was very important. These differences are examined through analyses within later chapters to explore the impact on children's constructs and their engagement within CA lessons.

The four CA teachers were asked how the observed group in their class compared to the other CA groups. Groups A1, B1 and C1 were described by their teachers as typical of the rest of the class in that they were a mix of abilities and types of characters and personalities. Group D1 was described as atypical. Miss Daisy believed that the other groups in her class had developed the ability to discuss and reason more effectively and were therefore better at collaborative work. The two non-CA teachers were asked how their observed groups compared with other groups during mathematics. Both said that they thought their identified group was typical of the rest of the class in the way the children worked and behaved. However, neither teacher planned for nor engaged children in collaborative work so no comparison could be made from the perspective of collaborative group work. The differences between children who engage in collaborative work and those who do not are examined as constructs between CA and non-CA children are explored in Chapter 6. The literature suggests that children who engage in discussion and collaboration in solving tasks are more able to articulate their thinking and may therefore be the children who can verbalise what helps their learning (Vygotsky, 1978, Mercer, 2000)

The last question asked the teachers about the similarities and differences of the children's interactions during CA/mathematics and during other lessons. Miss Bramble and Miss Daisy explained that they thought the children behaved in similar ways across the curriculum throughout the week. Miss Comfrey said that in her class the children had no other opportunity to collaborate so it was difficult to comment on any comparison between CA and other subjects. Miss Arum explained that she perceived that Jack and Angela were the children who worked hardest to solve the challenge in CA and that they did not come together in any other area of the curriculum so it was difficult to compare the work of CA with other subjects. Miss Erica and Miss Foxglove both said that they could not identify any differences with how the children behaved in mathematics and in all other subjects. This question was asked to provide a backcloth to how the teachers viewed their classes and to identify any particular differences of which the teachers were aware. The responses also indicated the general context of learning in each class so differences may be identified between children who experience collaboration across the curriculum (Miss Bramble and Miss Daisy), those who experience collaboration during CA (Miss Arum and Miss Comfrey) and those who do not experience working collaboratively (Miss Erica and Miss Foxglove).

5.4 Interviews at the end of the second year

At the end of the second year the four CA teachers were interviewed individually again. The teachers were asked to note down all their constructs in response to the questions: What helps children to learn? What most influences their learning? When the teachers had completed their list they were asked to consider the children in the observed CA group to identify similarities and differences as before. All the constructs provided are given in the following table. The constructs are divided between considering the needs of the children and then what teachers do to meet those needs. The table shows only the positive pole as it was these that teachers used to discuss during interviews. The full list of constructs with their opposite poles is provided in Appendix 5.3.

Table 5.4 illustrates that a major shift had taken place within the teachers. The majority of the constructs now focus on thinking and learning activities and attitudes instead of children's behaviour as at the beginning. Three teachers provided examples of how they had adapted their planning, teaching and assessment to accommodate challenging and collaborative activities. They were all also able to provide examples of how they had adapted their teaching of other aspects of the curriculum to ensure that children were regularly given challenges, collaborative opportunities and lessons where they were encouraged to raise questions. **Ability** which was a key characteristic for all four teachers in the beginning was now not mentioned at all.

Constructs	Frequency
They need to learn from others and collaborate	4
They need to have their ideas challenged	4
They need to be allowed to think	3
They need to express their ideas and make suggestions	3
They need to behave	3
They need to become independent	2
They need to be able to read independently	2
They need to be prepared to adapt their ideas	2
They need to think about how to think	2
They need to ask questions	2
They need to become self controlled	2
They need to think about the learning process	1
They need to think about the challenges	1
They need to want to learn	1
They need clear explanations	1
They need to be able to explain things so they need time	1
They need support from home	1
They need to discuss things	1
They need as many different type of experiences as we can give them	1
They need to be emotionally strong	1
They need to be aware of others	1
They need to accept that things are difficult but they can go through that to learn	1
I need to plan well for learning	2
I need to be able to help them love learning	2
I need to assess the learning and keep ahead of where they are at	1
I need to be allowed to be a professional who can make decisions for their good	1

Constructs	Frequency
I need to know what they think	1
I need to hear what would help them more	1
I need to listen to what they think helps learning	1
I need to listen to them and hear what they need	1
I need to stand back and let them learn	1
I need to realise that they are not just dependent on me	1
I need to evaluate my work by listening to them more	1
I have to give them tasks that challenge	1
I need to give them lots of experiences	1
I need to provide creative activities	1
I need to give them time	1
I need to teach them how to discuss	1
I need to teach them how to listen and then use what they hear	1
I need to motivate them	1
I need to provide fun	1
I need to know what they think helps them	1
I need to give time to really hear their views	1
I need to act upon what they think helps them to learn	1

Table 5.4: To show constructs provided by teachers in interviews in the July of the second year of the study

5.5 Intervention group meetings

The teachers in the pilot study of the previous year had indicated that belonging to a group to hear what the children thought helped them learn and discussing some of the teaching strategies encouraged by the CA pedagogy was helpful to their development. Learning from this, therefore, group meetings were included in the methodology of this study.

The group met four times between the last PD day in July and the beginning of term in September. The teachers agreed to participate and agreed four dates and times. These meetings took place in their own time and all four attended all four meetings. It was quite difficult to ensure that the meetings stopped at the agreed time as discussions were animated and the teachers showed no signs of wanting to stop. In advance of the meetings they stated that they wanted to hear what constructs the children provided and any information about the children's experience of CA as this would be interesting. They also said that they would like to discuss some of the transcripts of their lessons so that they could consider how better to teach CA the following year. It was agreed that the first two sessions would be spent discussing children's constructs and the next one in looking at transcripts and the last session, at Miss Daisy's suggestion, examining where the lessons could have been more effective by taking account of the children's

constructs. The children's constructs are provided in detail in the next chapter and the CA lessons are analysed in Chapter 7. An outline of the discussions held in the group is given below. Key themes that the teachers identified and wanted to address in the second year are provided below and followed through in the next chapters.

Meeting 1

I began the meeting by explaining the procedure for collecting constructs from the children. I followed this by playing one of the tapes of the interviews without identifying the child (interview 2 with Nemy). This introduction was important firstly so that the teachers understood the method but also to ensure that they respected the validity of the method. It was important that they heard the children being given a voice in an authentic and child-friendly context and that they understood that the words really came from the children. I then provided a table with the collated constructs provided by the children in September and March.

The teachers found the method interesting and asked questions clarifying the process. After hearing the tape, they expressed surprise that the child was given so much opportunity to speak. They were all amazed at the clarity with which the child expressed what helped his learning and the way in which he gave reasons and explanations for the constructs provided. Miss Arum said that had she not heard the tape and had just been handed a transcript she may not have believed that the child had really said all that he did. Miss Daisy concurred and expressed her humility that a child could give such insights. Miss Comfrey said that she never could have imagined that a child could have come up with this information. They all nodded when Miss Bramble said that she was in awe of the way the child articulated his thinking.

The group then looked at the table of constructs provided by the children in September and March. The changes in constructs and what could have led to the changes were discussed. The teachers concentrated on the constructs provided by the greatest number of children – **listen, talk, explain and share** in March. They discussed the fact that none of these constructs appeared in September so assumed that something they were doing must have brought the change. Three of them, Miss Arum, Miss Bramble and Miss Daisy, all considered how frequently they may have encouraged children to use these behaviours. Miss Daisy asked to hear some of the details that the children gave explaining how the constructs helped their learning.

Meeting 2

The meeting began by giving the teachers an opportunity to mention anything that remained with them as important from the last meeting. They all said how struck they were by the quality of the information given by the children. Then I provided a table with the collated constructs from the children's interviews in July.

The teachers discussed the constructs and what could have led to the changes. The group then looked at the constructs across the year, noting the development and discussed the effects of the CA lessons. The teachers were very interested in hearing details of the explanations which the children provided. The teachers were most interested in the consolidation of certain constructs from March to June. They read

explanations provided by the children regarding how **listening** to each other helps by “*giving you more ideas*” (Tiffany, March). They were keen to consider how connections were made between constructs. For example, “*When you talk you say things and the others can hear by listening and then that can make them think up something else what has not been said yet*”, (Margarite, July).

The teachers realised that metacognition was slow to develop and considered that had they used it more frequently and drew attention to it more fully, perhaps the children would have integrated this aspect more effectively. “*It may not be that metacognition just develops more slowly, it may be our responsibility. Maybe we are not using it enough.*” (Miss Daisy)

Meeting 3

The teachers decided to focus on the lessons for which they all had transcripts so that they could discuss the same material. From among all the observed lessons, there were eight which had been observed in each class (Table 5.5). These were the ones discussed during the meetings and therefore those used for quantitative analysis in this study, discussed in Chapter 7. It was useful that these lessons were spread from Lesson 8 to Lesson 26 so development in using CA pedagogy through the year could be explored.

Name of lesson	Lesson number
Lost Boot	8
Cars	9
Stones	10
Bottles	20
Shadows	22
In the town	23
Transformations	25
Farmyard	26

Table 5.5: To show which lessons were discussed

The teachers distributed copies of their own transcripts and were interested and at ease with comments and feedback about their interactions during the lessons. They were quick to notice where children were challenged, who dominated, who was ignored, who listened and used other children’s contributions and the small number of occasions where metacognition was encouraged. They identified that towards the end of the year, from Lesson 20, they felt more competent in teaching CA but that there was an imbalance in the use of CA pillars. They identified that sometimes the concrete preparation of the lesson was very long, sometimes they did not challenge the children clearly and that their encouragement of metacognition was limited. They offered each other suggestions as to how and where they could teach each lesson differently. Miss Daisy commented that the coaching they had received had been helpful and suggested that it would be useful for them to do this for each other the following year thus providing feedback

following lessons. The teachers agreed to do this as they concurred that this would be helpful “now that we know more about teaching CA”.

Meeting 4

This meeting was spent with the teachers considering the children’s constructs in the light of lesson transcripts, discussing the opportunities missed to challenge the children more effectively and possible ways to encourage metacognition. The teachers were open with each other and appeared to welcome feedback and suggestions in an easy and trusting manner. This meeting concentrated on practising using challenge at appropriate points and then following that up within the same lesson with examples of how to use metacognition. In pairs, the teachers used their transcripts to role play parts of the lessons changing them where they felt they could make improvements by being more challenging and drawing attention to focus on the kind of thinking being used, evaluating the thinking and considering better ways to think about the challenge. Miss Comfrey found it difficult to use her scripts as she became acutely aware that her lessons lacked challenge and concentrated more on encouraging the children to behave in the way she wanted them rather than engage in the challenge and discussion that the lessons afforded. Her partner encouraged her to worry less about behaviour and concentrate more on encouraging the children to put forward their ideas and explain their thinking. In a group discussion, the teachers mentioned that from what the children said and from the PD they had attended they thought that aspects of challenge and metacognition should be highlighted more fully by them during the lessons. They were also very struck by the comments made by the children regarding how they related to each other. Miss Comfrey was concerned about the lack of exploratory talk in her lessons and the teachers discussed how she could develop this aspect. From this discussion, the teachers identified four main themes that they agreed to work on to improve the quality of the CA lessons:

1. Create opportunities to challenge the children frequently throughout the lessons.
2. Facilitate opportunities for the children to engage in metacognition.
3. Develop the children’s possibilities to engage in exploratory talk.
4. Consider carefully the social context during each lesson.

Miss Arum- agreed to consider gender and race issues between children in each group.

Miss Bramble- agreed to give each child in all groups appropriate space to speak and not allow anyone to dominate.

Miss Comfrey- agreed to allow children to engage in discussion.

Miss Daisy- agreed to encourage the children to discuss possible solutions and try out suggestions rather than voting.

The teachers evaluated the group meetings as useful and informative. They appreciated hearing children’s views and were shocked at some of the comments made by the children regarding how they had experienced the groups. Each teacher was committed to facilitate the CA lessons more effectively

according to their own identified targets. The following chapter explores the themes identified by the teachers as children's constructs are discussed.

Chapter 6: Let the children speak

To construe is to hear the whisper of recurrent themes in the events that reverberate around us.
(Kelly, 1991:54).

Summary

This chapter demonstrates that children in Year 1 are able to identify the constructs that help them learn and also to articulate how these constructs are actualised in their collaborative groups.

By the end of the year, a substantial difference is noted between CA and non-CA participant constructs.

By July, the CA children are able to demonstrate their part in learning together with several strategies which help them engage in this process.

An analysis of key themes identified by the teachers during the intervention discussed in the previous chapter, illustrates changes in constructs between the first and second year.

6.1 Introduction

This chapter presents the outcomes of interviews with participating children in the two years of the study. As described in the methodology, the research strategy adopted allows for children's constructs to be analysed by year, by school, by group and by individuals. This study explores the impact of the CA Programme on children's understanding of what helps their learning. Interviews take place on three occasions each year tracking the development of children's constructs.

In the first year, constructs are collected from both CA and non-CA children thus allowing for comparison between the two categories. These data provide a response to the research questions:

How do Year 1 children understand what helps their learning during the CA Programme?

What impact does the CA Programme have on children's constructs?

This chapter also examines how, in each of the two years, four groups of CA children construe what helps their learning during CA lessons. This facilitates an analysis supporting the third research question: What differences emerge in CA pedagogy when teachers take account of children's personal constructs during the CA Programme?

The data provide many aspects that could be analysed and discussed. However, this study privileges the analysis of the children's constructs in relation to how they understand the learning process. The constructs provide a window into the children's understanding of what helps their learning and it is this aspect that predominates. Although there are other interesting avenues to explore, for example, the

number of constructs produced, children's familiarity with English, only the prime focus is retained for the purposes of this study.

6.2 Overview of the chapter

Raising attainment is the primary objective of CA Programmes. CA offers teachers professional development to enhance their understanding of cognitive development. The notion of ZPD (Vygotsky, 1978), the facilitation of social construction, challenges all children during each CA lesson and promotes metacognition. This CA conceptual understanding underpins the study. CA theorists believe "normal" development is accelerated by providing cognitive challenges within a framework of social construction where solutions to challenges are discussed together with discussion of the thinking processes involved.

In this study, the children's voices are important and particularly, the children's construction of what helps learning during CA. In its conclusions the study seeks to explore links between children's explicit understanding of what helps their learning, their participation during the programme and the way CA pedagogy is actualised through each teacher's facilitation. CA expects children to discuss the challenges experienced and the thinking processes involved in reaching solutions. Constructs are shaped by all human experience. Inevitable, therefore, that CA experience affects children's view of themselves as learners. An effective CA Programme should raise attainment in accordance with the theory, therefore, becoming more conscious of the learning process and more personally pro-active in that process should increase children's ability to formulate what helps them to learn and participate during CA. Examining non-CA participant constructs contemporaneously enables a comparison providing information on the effects of CA on children's understanding of their learning process. The aim of interviews was to draw out children's perspectives of what facilitates their learning. The next chapter demonstrates through the examination of CA lessons how children actualise their constructs.

In September, before the Programme began, children's views were sought regarding their understanding of what helped their learning. These views were sought again in March and July. Non-CA children were interviewed in the same months.

Section 6.3.1 examines how the participant children of the first year of the study construed what helps them to learn. This general overview provides the constructs given during the first year in September, March and July so that development in understanding could be analysed.

Section 6.3.2 provides constructs at school level in order to examine differences between CA and non-CA children.

The third section (section 6.3.3) addresses the differences between the children's understanding in the second year compared to the first year. Eight groups were used in this process (Pine School: Miss Arum's class: Groups A1, A2 and Miss Bramble's class B1, B2 and Larch School: Miss Comfrey's class: Groups C1, C2 and Miss Daisy's class: D1 and D2). Examination of these data demonstrates any changes in

children's constructs that may result from the teachers' heightened awareness of children's views. However, it is important to remember the backcloth of the teachers' increasing competence in using CA pedagogy which may also impact on the children's experience. The four themes (challenge, metacognition, social construction, group dynamics) identified by the teachers at the end of the intervention and reported in Chapter 5 are used as the framework for the analysis of difference between the two years because the aspects were mentioned by the children as important and identified by the teachers through listening to the children's constructs and through the PD Programme. The fourth section (section 6.3.4) examines the four themes through explanations from individuals during each academic year. These data, therefore, allow for an analysis to be made of the main differences between the two years.

6.3 Children's perceptions of their experiences of learning

The theoretical framework used in this chapter is the well-established and widely used Personal Construct theory (Kelly, 1955) as discussed in Chapter 3.

6.3.1 Constructs provided in the first year

This section provides data pertaining to the research questions:

How do Year 1 children understand what helps their learning during the CA Programme?

What impact does the CA Programme have on children's constructs?

The individual interviews using either the context of a CA or a mathematics lesson aimed to elicit children's constructs regarding what helps their learning. Each child was given the opportunity to complete all s/he wanted to say before the interview was terminated.

Constructs are bi-polar as explained by Kelly (1955) and during the interviews neither the construct nor its opposite pole was privileged as similarities and differences were treated with equal importance and all judgements were suspended. However, for the purpose of this study the positive poles were prioritised in analysis as it was this pole that the children mostly used to engage in discussion. Tables illustrating opposite poles are provided in Appendix 6.1. As described in the Methodology, Chapter 4, each construct and its opposite pole were recorded in a table so that individual child contribution could be easily identified. At the start of the interview, name cards for each child in the group were placed on the table. The cards were read so that the child was clear about whom each card referenced. On each occasion, the child was then asked: "Can you say what you think helps your learning in CA/mathematics?" In order to obtain the opposite pole children were asked after each construct was mentioned: "Do you all do this in the same way?" The children then looked at the name cards and chose children whom they thought were in some way the same and then identified the opposite pole by choosing names of children that were in some way different. Each construct and its opposite pole were written on cards. Children were asked to say how each construct helped their learning. Salmon (1988) maintains that it is our personal construct systems which allow us to read our lives because constructs are essentially interwoven within a personal

system of meaning. This being the case, it was hoped that by hearing the children's constructs it would be possible to interpret their lived experience of learning within their group and identify what was most impacting upon their learning.

The following table indicates the positive pole of each construct provided by children in each interview. The purpose of this table is to note the constructs provided by the children thus showing their development through the year.

Constructs September	Constructs March	Constructs July
Have to work	Listen	Listen
Read	Talk	Talk
The teacher	Explain	Explain
Do numbers	Share	Share
Learn times tables	Solve a problem	Solve a problem
Put your hand up	Look	Look
Go to school	Think	Think
Do what you are told	Ask	Ask
Your mum	Sort	Describe things
Your dad	Discuss	Discuss
	Work hard/sensibly	Put things in order
	Understand	Make sense
	Remember	Agree and disagree
	Kind	Use your brain
	Not argue	Work out what thinking you need
	Helpful	Try
	Get right	Do sums
	Confused	Copy off board
	Play	Put hands up
	Order	Get lots of stars
	Feel objects	Keep quiet
	Difficult	Be bored
	Try	Finish your work
	Give suggestions	Keep work tidy
	Do sums	Learn times tables
	Copy	Be clever
	Hard	Do what teacher says
	Can't do things	Do homework
	Answer questions	Be grown up
	Want to play	Do work sheets
	Get stars	Read
	Get finished	
	Don't be naughty	
	Keep tidy	
	Don't talk	
	Hands up	
	Easy	

Table 6.1: The positive poles of the constructs produced in the first year of the study.

Bi-polar constructs

At each point in the year the children were able to produce constructs in answer to the question of what helped their learning. They were also able to produce the opposite pole of each construct. For example, **have to work** was a construct said by many of the children in September. When the children looked at the name cards, they could separate them and say, “these ones work like me but these ones play or chat all

the time". Children had neither difficulty in producing constructs nor in identifying differences between themselves and others in their group. The opposite poles were always coherent with the construct produced implying that the children understood the task and could identify without difficulty similarities and differences between children in the group. These constructs gave insight into how the children viewed themselves and some of their peers at this early stage of schooling.

Constructs vary over time

The table demonstrates that in September there is little variety in the children's responses. Children appear to realise that they have to work which includes **reading** and **working with numbers**. Adults figure highly in that **mums**, **dads** and **teachers** are mentioned. It may be that children think that co-operating with adults is very important to their learning as they mentioned several constructs that relate to their behaviour ie **going to school**, **doing what you are told**, **putting up your hand**. These are behaviours frequently promoted by significant adults in our society so the children may well have been told to do these things on numerous occasions. The children could not explain how these constructs helped their learning so it may be that they were at the earliest stage of awareness of the process of being a learner and not yet engaged in how to learn. According to Kelly (1955) a person develops hypotheses and tests these out so it may be that the children had not had sufficient explicit experience of being a learner to test these hypotheses in order to make sense of and explain the process of learning.

The table indicates that by March the constructs were very different from those in September. Many of the constructs produced by the children on this occasion were active verbs thus suggesting an initial understanding of their participation in the learning process. The children distinguished between not doing something and being unable to do something. For example, some children said that they needed to **understand** the problem in order to learn but that sometimes children could **not understand**. This indicates that children had already experienced times when they were able to do things and other times even when they tried, they were unable to succeed. This could imply then that children were developing their understanding of their personal part in the learning process experienced that some aspects were difficult for them. According to Barnes and Todd (1978) each of us can only learn by making sense of our experiences and constructing a world for ourselves. It would seem that these children are already constructing a world where some aspects are too difficult or complex for them. The children were unable to provide any solution or way forward but appeared to consider that they were incapable. For example, "I can't understand the problems sometimes so I can't help get them right. You can't do it if you don't understand, can you?" (Tiffany, Group A1).

In March some constructs still relate to exterior behaviours. For example, **Hands up, keep tidy**. These related to classroom management strategies used by the teacher which if not adhered to some form of admonishment took place. The children could not explain how putting their hands up helped them to learn but they could describe their teachers' reactions to their non-co-operation. In these cases children were

constructing a world where management strategies and keeping the teacher happy were interwoven with what it meant to be a learner.

It was expected that by July constructs regarding learning would have become more complex as a result of the normal development that takes place during an academic year as children mature and develop. In July, children indicated the difference between engaging in something (**listening**), not being able to do something (**can't make sense**) and choosing not to do something (**won't talk**). This may indicate that the children were now more aware of their part in learning and also their capacity to choose how to be involved in the learning process. Children were able to discuss their constructs in a way which indicated understanding of them as skills helping their learning. For example, "*you think in your head it gives you ideas because your brain tells you answers*". (Weena, C1) This suggests that Weena has developed and integrated her understanding of "thinking", a process that she may first have heard in the group. This echoes Vygotsky's (1978) notion that children develop understanding of concepts as they integrate language that they hear in the social space. If children integrate concepts in this way it is a reasonable assumption that they integrate skills that facilitate learning. In this case because Weena can explain her constructs it can be assumed that she integrated this skill and used it during lessons.

Summary

In summary, the above table indicates that over time, children's constructs change. From September where there appears to be no real understanding of a personal responsibility through to July where many constructs indicate that children understood that they have an active role in the learning process and choices to make regarding engaging with learning. Children were also aware that some aspects of learning were difficult for them even when fully engaged and making an effort to learn.

The next section looks at these constructs in more detail by providing constructs differentiated by school so that CA and non-CA constructs can be compared.

6.3.2 Constructs provided by each school in the first year

Within the context of the CA Programme children are encouraged to articulate their thinking so it is reasonable to anticipate that these children would become more confident in expressing themselves. Since, in September the constructs from each group were very similar, attributing substantial differences emerging during the year to differing classroom experiences is reasonable.

In addition, having completed a programme designed to develop thinking abilities it may be assumed that CA children should have developed a more comprehensive understanding of what helps their learning since they were given a weekly opportunity to articulate their thinking while being challenged in a collaborative context.

The following chart indicates the September constructs discussed above identified by school. It shows the constructs provided by the two groups in each school including the non-CA children.

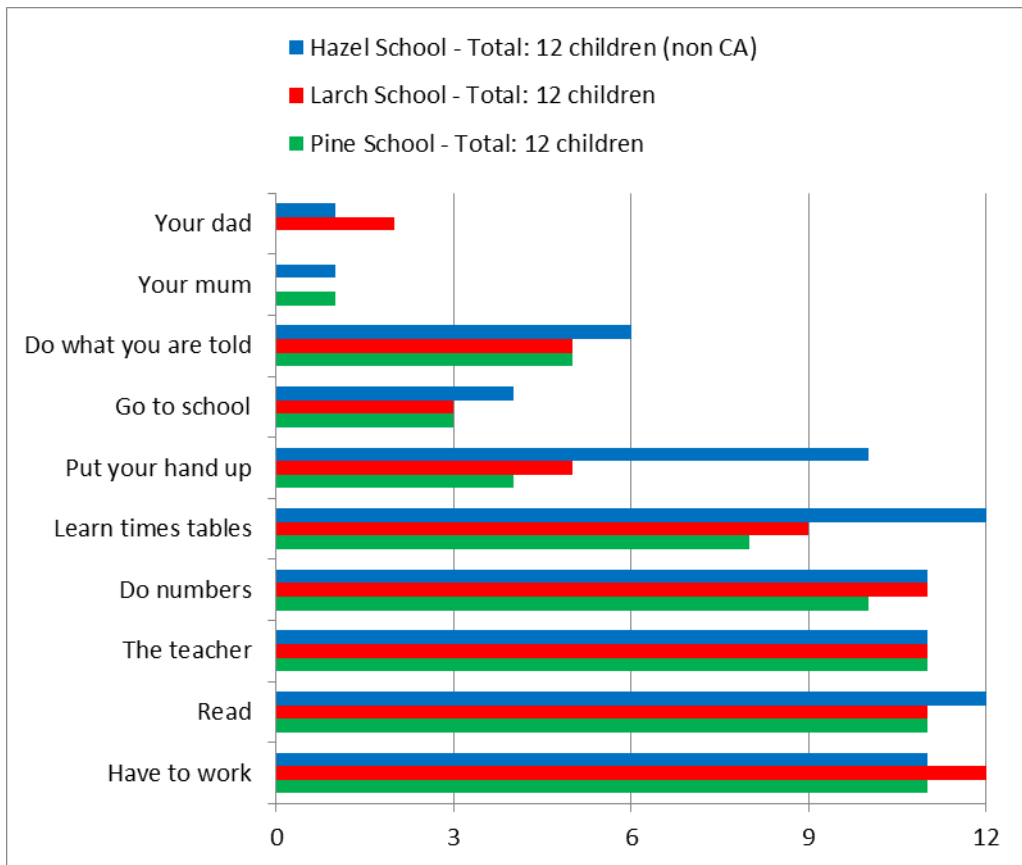


Figure 6.1: Constructs provided in September when children were asked what helped

their learning

The chart indicates much similarity in the children’s constructs in each school at this stage in the year. The children had only had a few weeks in these classes so their constructs of what helps their learning were most likely rooted in their previous experiences of school and home. The construct that shows the most difference is **Put your hand up** which is mentioned more frequently in Hazel School than in either of the other schools. This difference may be due to the way teachers use discipline and manage behaviour in their classrooms.

The following chart shows the March constructs as provided by each school. Six months into the academic year and differences can now be seen between CA and non- CA children’s constructs.

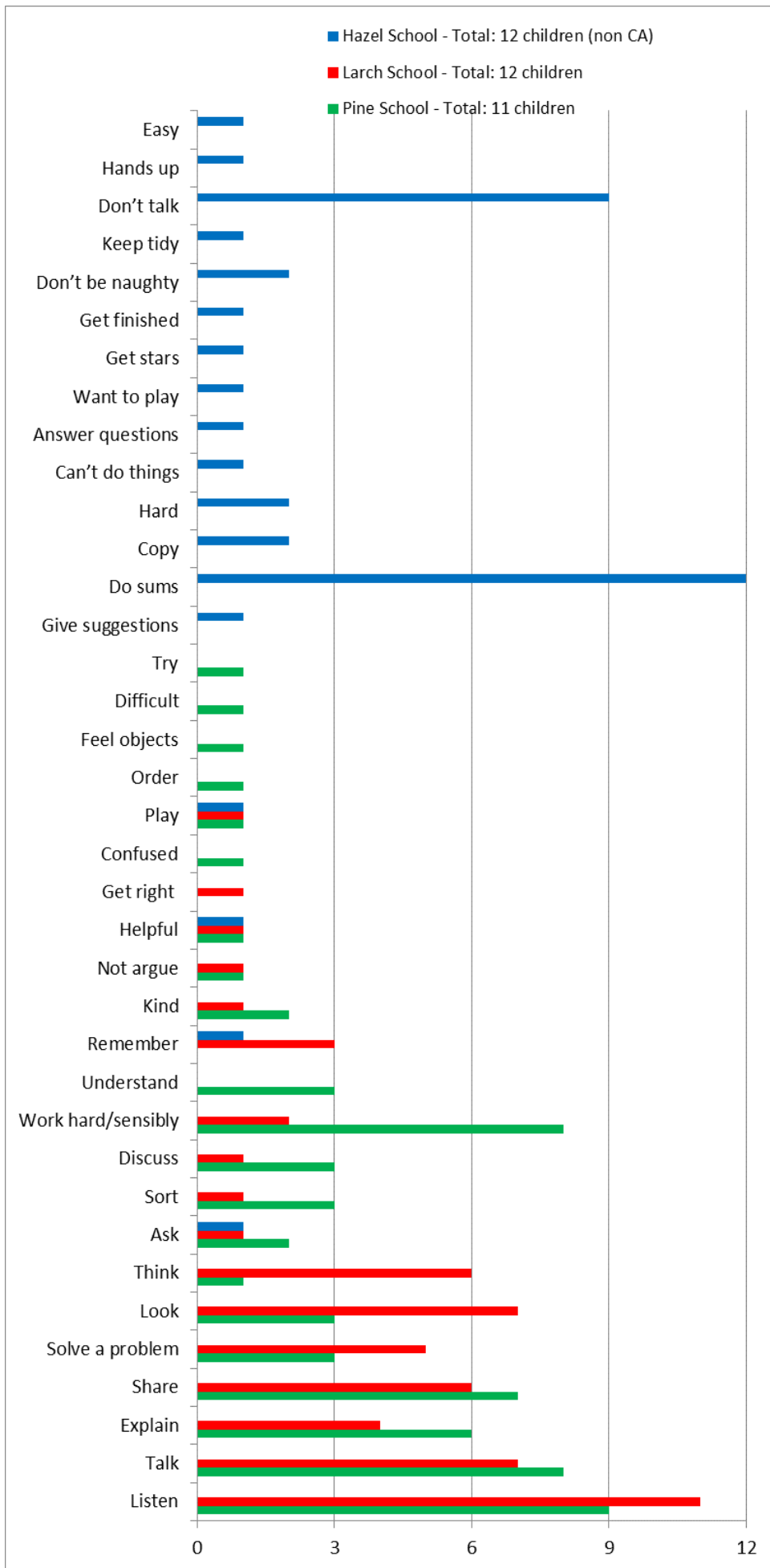


Figure 6.2: Constructs provided in March when children were asked what helped them to learn

At this stage, a clear difference has emerged between the CA and the non-CA children. Most CA children considered **speaking, listening, and sharing** all helpful to learning whereas these are not mentioned by non-CA children. All the non-CA children considered it helpful to **do sums** and 9/12 considered it helpful to **not talk**. CA children were able to explain why their constructs helped their learning and gave examples of how these behaviours helped them. Non-CA children were unable to explain how or why their constructs helped. Their only explanation was "Miss says". The fact that 15/23 CA children provided **talk** and 10/23 provided **explain** implies that a substantial number have integrated explicit use of language as helpful to learn. This confirms Vygotsky's (1978) view that for learning to take place, children need opportunities for discussion in a safe social space. This raises a question about the integration of learning in non-CA classrooms if keeping quiet is what is being promoted. When asked for an explanation for why **doing sums** was helpful some children talked about getting ticks or stars on their worksheets but could not provide any explanation for how doing sums helped their learning. Exterior motivators such as stars have not been shown to necessarily help children towards being self motivated so these may not be helpful to learning in the long term (Sotto, 1994). This concurs with Pollard and Triggs (2000) who found that deep, enduring learning occurs when new knowledge connects meaningfully with the personal narratives through which we make sense of life not when we are mainly trying to pass tests or please the teacher.

The following chart shows the July constructs as provided by each school. Coming towards the end of the academic year, there is now an even bigger difference between CA and non-CA children.

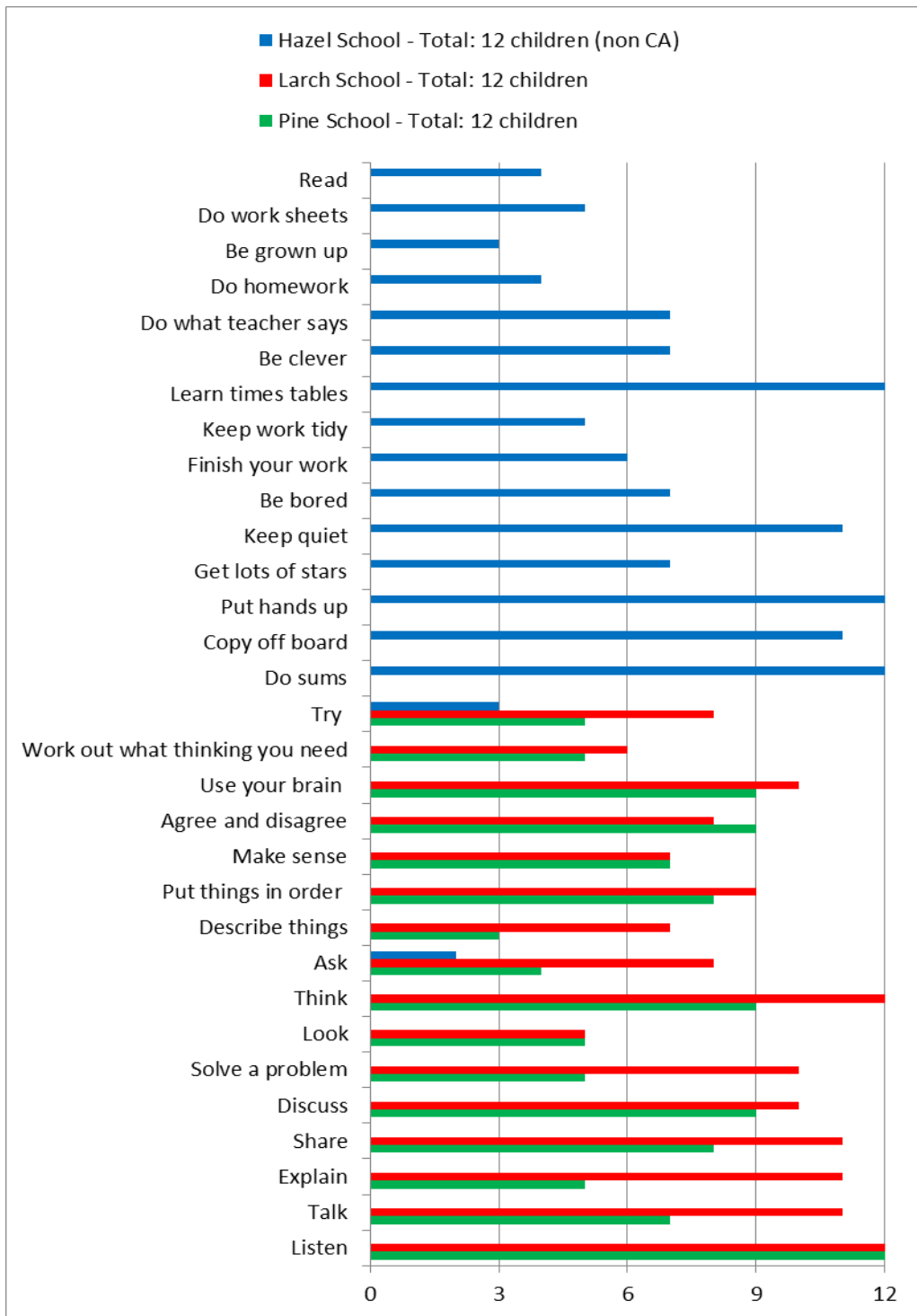


Figure 6.3: Constructs provided in July when children were asked what helped them to learn

The chart indicates that CA children produced very different types of constructs in response to the question about what helps learning as compared to non- CA children. None of the constructs that CA groups reported most frequently (**listen, talk, explain, share, discuss, solve a problem, look, think**) were reported at all by non-CA children. The only two constructs produced in all three schools were **Ask questions** and **Try**. These appear to be the only two constructs mentioned by non-CA children that

involve their active engagement in the learning process, however, because the non-CA children could neither explain their constructs nor provide examples interpretation is less secure. The CA children were all able to explain their constructs and provide examples of when and how these constructs had helped them. For example, Margarite explained why listening helped. *“When I **listen** to John and Abdul, I hear their ideas in my head. They get sort of mixed up with my ideas and then I can say new ideas what help sometimes. If I didn’t listen, I wouldn’t get them new ideas, I don’t think. (B1, March).* It would seem that the weekly CA lessons where children were discussing and listening to each other had made a substantial difference to the world that they were constructing about what it means to be a learner. The non-CA children seemed to be concerned with keeping the teacher happy. It may be that if the focus of children’s attention is on the teacher rather than the learning process then the world they construct about learning is not focussed on their place as the learner. This also relates to understanding brain development where it is known that children are more likely to process things in the amygdala, the seat of emotions rather than the frontal lobe, the seat of reason (Johnson, 2004b). If this is the case the children are more likely to be affected by the teachers’ expressions of pleasure or displeasure and this may impact upon the image they construct of themselves as learners. This confirms the view that the emotion involved can pose a threat to a child’s personal identity, self esteem or social status (Lazarus, 1999). According to Pollard et al (2010) one way of minimising this risk is to become more effective at learning how to learn. Initial evidence suggests then that CA is helping these children to develop an understanding of how to learn thus reducing the effect of the need to please the teacher.

Summary

In summary, this section clarifies how Year 1 children understood what helped their learning during the CA Programme. By July, CA children produced constructs with explanations relating to a personalised understanding of their active place in the learning process. They discussed choices they made about entering into the learning process and they demonstrated awareness of aspects experienced as difficult. This section demonstrates that although the September constructs in both CA and non-CA children were very similar a substantial difference emerged in March and a further difference in July.

In considering the impact that CA has on children’s constructs it is clear that these children provided constructs which articulate their ideas and their thoughts about what helped them complete tasks, learn new concepts and develop their thinking. Furthermore, all the CA children provided explanations for how their constructs helped their learning and examples of when they used these constructs in lessons. Non-CA children produced more constructs relating to exterior behaviours. They were unable to articulate how any of their constructs helped them to learn or provide examples of what they had learnt as a result of any construct provided. In accordance with Vygotsky’s (1978) theory these children appeared to lack any experience of collaborative oral work where ideas and thoughts could be articulated therefore they showed no evidence of a personalised approach to learning.

6.3.3 Constructs provided in the first and second year of the study

This section examines differences in the constructs between the two years of the study, therefore, focuses only on CA. The analysis concentrates on the key themes raised during the teacher intervention discussed in Chapter 5. These themes identified by the teachers in the fourth meeting came from hearing children's constructs and then relating those to their lesson transcripts to identify elements that needed to be changed in the way the pedagogy was used or the groups facilitated. The key themes are: children's positive responses to being challenged, the positive response to metacognition, the development of exploratory talk and the facilitation of the collaborative groups.

So that the main focus of the study is maintained, these themes are analysed in the following sections and followed through into the next chapter.

The table below provides all the September constructs in both years of the study.

September

Table 6.2 indicates the September constructs in the first year (Groups A1, B1, C1, D1) and second year (Groups A2, B2, C2, D2). The table shows the constructs provided by group, by class and by school.

Constructs	September – Years 1 and 2							
	Pine School				Larch School			
	Miss A		Miss B		Miss C		Miss D	
	A1	A2	B1	B2	C1	C2	D1	D2
Have to work	5	6	6	6	6	6	6	6
Read	6	6	5	6	6	6	5	6
The teacher	5	6	6	6	5	6	6	5
Do numbers/sums	5	5	5	6	5	6	6	5
Learn times tables	4	4	4	5	4	5	5	6
Put your hand up	3	0	1	0	4	0	1	0
Go to school	1	3	2	2	1	4	2	5
Do what you are told	1	3	4	4	1	5	4	4
Your mum	1	2	0	3	0	3	0	1
Your dad	0	1	0	2	1	2	1	1
Sit quiet	0	3	0	4	0	4	0	4
Total	31	39	33	44	33	47	36	43

Table 6.2: Constructs in September from CA children in the two years of the study.

Table 6.2 indicates similar constructs provided at this stage of each year. In Groups A1 and C1, **Put your hand up** was mentioned more frequently while in Groups B1 and D1, **Do what you're told** was mentioned more often. This difference may be a response to the way teachers were establishing their classes each year, perhaps emphasising different aspects of behaviour.

Children were unable, even when prompted, to describe how these constructs helped them learn. 46 out of the 48 children mentioned that reading helped their learning but no child was able to explain how or why reading helped them. This implies that the importance of reading had been stressed to the children but is not yet experiential.

March

The following table indicates the constructs provided by the CA children in March of the first and second year of the study.

Constructs	March – Years 1 and 2							
	Pine School				Larch School			
	A1	A2	B1	B2	C1	C2	D1	D2
Listen	4	6	5	6	5	6	6	6
Talk	2	5	6	5	1	5	6	4
Explain	1	4	5	5	1	5	3	5
Share things	2	4	5	4	2	3	4	4
Share ideas	0	4	0	3	0	4	0	6
Solve a problem	1	0	2	0	2	0	3	0
Solve challenges	0	4	0	5	0	5	0	4
Look	1	3	2	3	2	4	5	3
Think	0	6	1	6	2	6	4	6
Ask	0	4	2	5	0	6	1	5
Sort	2	0	1	0	1	0	0	0
Discuss	1	5	2	6	0	5	1	0
Work hard/sensibly	5	0	3	0	1	0	1	0
Understand	1	0	2	0	0	0	0	0
Remember	0	0	0	0	0	0	3	0
Kind	1	0	1	0	0	0	1	0
Not argue	1	0	0	0	1	0	0	0
Helpful	1	0	0	0	0	0	1	0
Get right	0	0	0	0	0	0	1	0
Confused	1	0	0	0	0	0	0	0
Play	0	0	1	0	0	0	1	0
Order	1	0	0	0	0	0	0	0
Feel objects	1	0	0	0	0	0	0	0
Difficult	1	0	0	0	0	0	0	0
Try	1	5	0	4	0	1	0	5
Put things in groups	0	5	0	4	0	2	0	5
See other ways of doing things	0	2	0	4	0	5	0	3
Agree/disagree	0	5	0	6	0	4	0	4
Use your brain	0	5	0	6	0	4	0	3
Work as a team	0	3	0	4	0	3	0	5

Constructs	March – Years 1 and 2							
	Pine School				Larch School			
	A1	A2	B1	B2	C1	C2	D1	D2
Show what to do	0	4	0	2	0	3	0	4
Total	28	74	38	78	18	71	47	72

Table 6.3: Constructs in March from CA children in the two years of the study

Table 6.3 shows that the constructs provided in the second year were more focussed on CA expectations for example, **solve challenges, see other ways of doing things**. More children in the second year mentioned **think, ask, discuss** than in the first year. Some constructs were mentioned frequently in the second year but not previously, for example, **work as a team, use your brain, show what to do, agree/disagree**. This could imply that the teachers were emphasising different aspects of working together in CA lessons. For example, The teachers may mention during lessons aspects of working collaboratively and solving the challenge together.

July

In July of each year of the study, the participant children were again interviewed. Table 6.4 indicates the constructs about learning provided by the children.

Constructs	July– Years 1 and 2							
	Pine School				Larch School			
	A1	A2	B1	B2	C1	C2	D1	D2
Listen	6	6	6	6	6	6	6	6
Talk	2	6	5	6	5	5	6	6
Explain	1	5	4	6	5	6	6	5
Share	4	5	4	5	5	5	6	4
Discuss	3	6	6	6	4	6	6	6
Solve a problem	1	0	4	0	5	0	5	0
Solve challenges	0	5	0	5	0	5	0	6
Look	3	5	2	4	2	5	3	3
Think	3	6	6	6	6	6	6	6
Ask	1	6	3	5	3	4	5	5
Describe things	2	0	1	0	4	0	3	0
Put things in order	4	0	4	0	4	0	5	0
Make sense	2	0	5	0	3	0	4	0
Agree and disagree	3	6	6	6	3	5	5	4
Use your brain	3	6	6	6	4	4	6	6
Work out what thinking you need	1	0	4	0	1	0	5	0
Try	2	5	3	4	3	4	5	4
Share ideas	0	5	0	6	0	6	0	6
Make stories right	0	2	0	3	0	2	0	3

Constructs	July– Years 1 and 2							
	Pine School				Larch School			
	A1	A2	B1	B2	C1	C2	D1	D2
Think of other views	0	4	0	4	0	2	0	3
Work as a team	0	3	0	4	0	5	0	3
Show what to do	0	4	0	2	0	3	0	2
Think of how to think	0	3	0	4	0	2	0	3
Say how you are thinking	0	4	0	4	0	1	0	3
Ask how people think	0	2	0	1	0	1	0	1
Challenge someone	0	1	0	1	0	0	0	2
Say if you remember something like it	0	1	0	1	0	0	0	0
Total	41	96	69	95	63	83	82	87

Table 6.4: Constructs in July from CA children in the two years of the study

Table 6.4 highlights eleven constructs that were not mentioned in July of the first year. Several of these are metacognitive constructs which implies that teachers have emphasised this level of thinking more to the children. One construct appears to relate to the CA pillar – Bridging and that is **say if you remember something like it**. However, it was only said by two children both of whom were in Pine School. This indicates that this pillar is not being used significantly by the teachers. The content of the PD may reflect that Bridging is not prioritised. In order to capitalise on what is known through technology in terms of how the brain works it would be helpful for Bridging to be used more frequently in order to help make links to previous learning.

The next section examines these constructs under the four themes discussed above.

Response to challenge

In the first year two March constructs relate directly to being challenged in lessons (**solve a problem, be confused**) and were mentioned 9 times. In July **solve a problem** was mentioned 15 times. In the second year the constructs referring to challenge (**Solve challenges, challenge someone**) were mentioned 18 times in March and 25 in July. This rise in relevant constructs indicating that the children had experienced challenge as helpful to their learning and were more aware of the need to be challenged as learners implies that the teachers had taken seriously the need to express challenges clearly and explicitly. According to Vygotsky (1978) giving children tasks which are slightly too difficult for them, within their ZPD, where they work collaboratively to come to a solution increases their intelligence.

Response to metacognition

In the first year metacognition did not figure in the March constructs but appeared in July when one construct- **work out what thinking you need** was mentioned six times. In the second year, **use your brain**-appeared in March and may have a bearing on metacognition and by July three other constructs

appear **Think of how to think, say how you are thinking and ask how people think**. In total these three constructs were mentioned 29 times. This is still a small proportion of the total number of constructs but substantially more than in the first year. According to Piaget (1955) becoming more conscious of the thinking process and being able to monitor and evaluate it is an important step in becoming an effective learner.

Exploratory Talk

It is not possible to identify exploratory talk by the constructs as it is necessary to hear the children speak in lessons to be able to clarify the type of talk used. However, the use of exploratory talk requires children to explain their reasoning. In the first year, March constructs mention – **explain** 10 times and in July this rose to 16. In the second year, **explain** was mentioned 19 times in March and 22 times in July. This indicates that children in the second year may be more aware of and experience the value of explaining ideas and reasons to peers and thus have more opportunities to increase their ability to reason.

Collaborative Group Work

The children's understanding of collaboration is difficult to assess from the constructs and is more easily discussed within the analysis from individuals. However, in the first year, relevant constructs- **share things, discuss, be kind, not argue, helpful** - are mentioned 24 times in March and 38 times in July. In the second year in March, **share ideas, discuss, work as a team** are mentioned 48 times and in July **share, share ideas, discuss, work as a team** are mentioned 81 times. This substantial increase in relevant constructs implies that the children had a positive experience within the collaborative group which offered them the chance to explore their thinking in a supportive environment.

Summary

This section indicates that the number of constructs relating to each of the four themes has substantially increased in the second year. The heightened awareness of challenge and metacognition, key aspects of CA, suggests that children are being exposed to a more effective CA pedagogy thus giving the best possible chance to raise attainment. According to Piaget working with material that is a little too difficult stimulates the brain and allows children to increase their cognitive functioning (Piaget, 1955). This also concurs with Vygotsky (1978) encouraging teachers to work within the children's ZPD in collaborative tasks so as to stretch their thinking capacity.

All but two children in July of the second year mentioned –**explaining, listening** and **discussing**- as helpful to learning. If children understand that explaining their reasoning, listening to that of others and discussing their ideas helps them to learn then they have the real possibility of being able to extend their thinking, as Vygotsky suggests in his belief that it is children's interaction with others through language that most strongly influences the level of conceptual understanding (Vygotsky,1978).

The following section examines these four themes in more depth from individual children's perceptions in both years in order to compare their experiences.

6.3.4 Individual children's perceptions of their experiences of learning

The previous sections provide details of all the children's constructs by group. During the interviews, after children provided their constructs, each was prompted to talk about their experience of the constructs to explain how these helped their learning. These explanations gave the most insight into the children's development and their views on their experience of CA in their particular group. This section analyses some of these explanations focussed on the main themes identified in Chapter 5.

This section particularly supports a response to the third research question:

What differences emerge in CA pedagogy when teachers take account of children's personal constructs during the CA Programme?

This question can only be fully answered following analysis of classroom observations but this section paves the way for that analysis. Each group's data illustrating all the constructs provided by each child is in Appendix 6.1.

When deciding how to use children's constructs to develop the themes below difficult choices had to be made. Firstly, the content of the 143 interviews that took place yielded masses of information from the children. Clearly, only a portion of this material could be explored in this study. Limiting this section to the themes identified by the teachers was considered appropriate. As the study sought to explore whether teachers used the CA pedagogy differently after taking account of children's constructs it was important to look particularly at the targets the teachers identified and analyse what difference this awareness made to their CA teaching and subsequently to the children's constructs in the second year. It was more likely that changes in constructs would be found in aspects identified by teachers as they were motivated to change in these areas. However, it was difficult to examine the children's constructs under the four themes as in their explanations they tended to link constructs together with explanations falling into several themes. In this case, the initial construct is the identifier of the theme and the explanation shows the links to one or other of the four themes.

Children's response to challenge

As discussed above in the first year the construct **solving problems** was identified as helpful to learning. However, in the second year, the children used the word **challenge – solving challenges and challenge someone**. The fact that the children used the word **challenge** in the second year rather than **problem** may indicate that they are aware of struggle as a positive experience and this may help to build resilience and persistence in solving something difficult. In July of the first year, the children were able to discuss their construct – **solving problems** in a number of ways. They mostly linked this construct to **listening, explaining and thinking**. This indicated that they had become aware of the learning process, their part in it and some essential behaviours that helped their learning. For example, Tamu (D1) explained how

thinking helped him to solve the tasks, “If you **look** at all the things what are on the table and **listen** to what people have to say and then if you let your brain be sort oflet everything go in, you know, then some different things come out like ideas what weren’t there before and they help you **solve the problems**.” This indicated that he understood that there was some process in his brain that required time and perhaps quiet in order for him to come up with a suggestion following the hearing of ideas within the group. It also indicated that he had had some success in contributing towards solutions.

In the second year children mentioned **solving challenges** by March. This earlier awareness may offer a greater possibility of the development of increased understanding that doing tasks which are somewhat difficult are helpful to learning. For example, Sakia (B2) said that *if you **explain** your ideas, you hear them out loud and in your brain and that helps you think what they really are and others think they’re good and then that gives them ideas. After that, they **share their ideas** and all the ideas go together and we get the answer like ..umm we **solve the puzzles**”.* She demonstrated in this way that she understood what helped her and her peers. She also showed that she understood how the activities linked together to work to progress learning.

In a different example, in March, Renata (B2) explained “**sharing things** helps you do the challenge ‘cos when you see what the others do with the things it makes you **think** of more”. In July, she added to this explanation when she reported, “**sharing ideas** helps everybody to learn if they **listen** and **think** ‘cos we all have good ideas and you can put them all together to use them to **solve the challenges**”. When prompted to explain, Renata said that she had some understanding that through participating in the group tasks she was developing her intellect which would help her later in life. “I can learn to think better and then I’ll get a good job if I can do hard things like challenges.” (Renata, Group B2, July)

Relevant to responding to challenge is the construct – **try**. In the first year, this was mentioned once in March and 15 times in July. This increased to 13 times in March the following year and 17 in July. Jack (A1) provided **try** as helpful to learning and explained, “if you do not **try** then you will not know anything that is going on but if you **try** to **listen**, **think** and **use your brain** you may get ideas and then it will make sense”. In this example, Jack showed some understanding that effort was required in the learning process and linked several constructs together in order to demonstrate how he was experiencing learning. He did not use the word **challenge** in his use of linking the three constructs but he implies that some difficulty is involved to get the ideas in order to make sense of the tasks.

By July of the second year, four children mentioned a construct –**challenge someone**. This indicated that they understood that by requesting further explanation or discussion they were enabling their peers to learn more fully. This is a step beyond understanding that their personal engagement in solving challenges was helpful to themselves because this incorporates choosing to actively help others.

Children experiencing challenge as helpful to learning is a positive way forward for developing intellectual capacity (Vygotsky, 1978), however, to be open and willing to challenge a peer demonstrates confidence in the environment as well as the learning process. If the environment was not safe, the risk would be that

a child would not challenge other children. If they did not believe in the learning process in that being challenged was helpful it seems unlikely that they would challenge each other in this way.

When Anna (A2) was asked how challenging someone helped her learning she said, *“Well, if they say an idea what you don’t understand, you can challenge and say you don’t agree or you don’t understand and that makes them fight for their idea and say more about it and then you can understand it more and learn about it – but sometimes they learn too if their idea is wrong, maybe.”*

Bernie (D2) also reported that **challenging someone** helped her to learn and when asked about this, replied, *“If you say ‘why do you think that?’ then sometimes they see they are wrong and they change their mind and say a different thing but sometimes they know they’re right and so they fight for their idea. It helps me if they change their mind if they’re wrong ‘cos then I would be wrong too and if they’re right ‘cos then I can be right too.”* This demonstrated that Bernie had been confident enough to challenge a peer and found the result helpful to her in moving forward in solving the challenge.

To the same question, Aurora reported, *“Well, if you say I **don’t agree** with you you have to argue like tell them why you don’t agree and **explain** your idea. They have to **listen** and see if they **think** you are right or they are right and **say back their ideas**. Then everybody else has to **think** who they agree with and say why they **agree or disagree** and then we’ll work out how to do the problem”.* This demonstrated that Aurora also found challenging peers helpful to her learning and a positive experience in the group. It was clear too in this example that Aurora was connecting constructs and making sense of the strategies being used to help solve difficult challenges.

A further aspect to which these children refer was being sufficiently resilient and confident to “fight for their idea” and yet open enough to let go of it when they discovered they may not be entirely accurate. This resilience and openness are both important aspects in the learning process and ultimately, if developed, may result in children being more effective learners.

Summary

In July of the first year, then, there is a limited understanding that doing something difficult is helpful to learning however, solving problems was mentioned and discussed alongside listening, explaining and thinking which indicated that the children understood that these behaviours were necessary to solve difficult tasks. These explanations demonstrated that the children had become aware of the learning process and their part in it to some degree. In the second year, constructs about challenge appeared earlier in the year and by July more were mentioned. Effort was mentioned many more times and much earlier in the second year so this may increase the possibility of developing persistence in fulfilling difficult tasks. In the second year, children mentioned challenging each other and were able to explain how helpful this was to their learning.

Children’s response to metacognition

In July of the first year, three groups provided one construct relating to metacognition- **work out what thinking you need**. The children had various ways of describing how helpful this construct was to their learning. Grace (A1) explained that if “you knew how to *think about the problem that would help you, like if you have to work out groups of things, or sorting in order or looking for reasons*”. She went on to say that the “*others were not good at thinking first about what kind of thinking to do and that didn’t help them*” From this it appeared that Grace had begun to consider and reflect at the outset of solving a challenge how to go about the task.

Other children discussed the importance of considering which schema to use before embarking on the task. For example, in Group B1, Sacha, Abdul, John and Margarite all provided **work out what kind of thinking you need**. Sacha found it difficult to explain how this helped her to learn. However, she ended with, “*like if you know if you are to think of groups or lines of things then it helps you so you do the right thing and the right thinking.*” John said that if you could **work out what kind of thinking** you needed, it would help you to do the puzzle quicker because you would not be making lots of wrong starts. Margarite also tried to explain this, “*when you look at the game, you should think in your head what kind of game is it and **what kind of thinking** you need so you can work out if it’s groups or rules or orders of things, If you don’t not do that you won’t get it right really ‘cos your head’ll be all wrong, like Sacha’s.*” My understanding of this explanation is that Margarite had experienced the value of thinking about the schema that was required to solve the task and that when the group gave consideration to this activity they were successful. However, she pointed out that Sacha did not participate in this metacognitive aspect and, therefore, Sacha used the wrong schema to tell them how to do the task. Abdul linked the construct, **work out what kind of thinking you need** with the constructs **think** and **use your brain**. He said if “*you **use your brain** and **think** in it then you could work out **what kind of thinking you need** and if you do that it means that you will get the puzzle right but if you don’t think in your head to let your brain tell you about the thinking you won’t.*” Abdul discusses thinking, using his brain and working out what kind of thinking he needed as separate activities. This may characterise metacognition for him in that it appeared that as he was looking at the thinking through using his brain, he was recognising it as standing back from the task to use his brain at another level.

Also, Tamu (D1) showed some insight into this construct when he explained, “*If you think in your brain what you have to do like groups or orders or getting things right then you’ll know what **kind of thinking** to start and then you can go and maybe get it right or you can change your mind and maybe try another kind of thinking and see if that helps you.*” In this example, Tamu demonstrated that he understood an evaluative aspect of metacognition.

In March, Weena (C1) considered that if *you think in your head it gives you ideas because your brain tells you answers*. In July this had developed to *if you **listen** and then **think hard** in your brain, ideas come into your mind and if you can use them they help to solve the puzzles*. When probed she added, “*Once you have thought it helps you to make sense and then people can **agree or disagree** if they **talk** and **explain**. I use my brain to work out what kind of thinking you need and then I work it out and then I know the*

answer.” My understanding of her explanation led me to believe that she tended to separate herself from the discussion, indicated by the use of “they”, but had experience of thinking and seeing how to solve the challenges. It was unclear whether she had had a real experience of talking as being helpful to her.

In the second year, a construct which may be understood as referring to metacognition- **see other ways of doing things** appeared. To try to understand whether this referred to metacognitive functions children were asked to say more about this construct. Aurora (D2) explained, *“Well, if you think about a problem one way you might try to do it the wrong way but if you think of lots of ways of doing it then you can maybe choose the right one.”*

By July, Aurora said that she liked to **think of other views** and this seemed to replace the March construct – **see other ways of doing things**. When asked how this helped her to learn she said, *“If you look at things from different ways you’ll probably find a best way of looking at it. Then if you tell the others like what you’re thinking then that helps too ‘cos they share and you see lots of different ideas then. When we do that we always sort our puzzles out.”* From this I understood Aurora to have had positive experiences of sharing at a metacognitive level in her group so not only did she experience metacognition as helpful to herself but she saw it as helpful to the whole group.

Joshua (D2) reported, *“When I think about a puzzle, I **look** and see which way will I do it and I **listen** to Aurora and she says something else and I think Oh that’s another way but I don’t think it will work and I tell them and then we say all the ways what might work that we can see in our brains.”* When asked how that helped him to learn he said, *“Well you can **think** about all the ways the next time you have a puzzle and one of them other ways might be the one to go”.* By this I understood that he considered that he was developing a repertoire of strategies to solve challenges and that this repertoire could be dipped into on subsequent occasions. Different strategies suit different challenges so by building his repertoire he was enabling himself, and others, to be able to solve a range of problems.

In July Group A2 produced several insights into how they were working together and using metacognition in the CA lessons. Anna (A2) mentioned several constructs which related to metacognition. She tried to explain how metacognition helped:

Anna: You need to **get like inside your head**, you know, and **think** and **say what you are thinking** and then you need to **like get inside the others’ heads** too and **think what they think** and that helps you to understand.

R: *I wonder how that helps?*

Anna: Well, if you can sort of think what they might think then you can ask them or like a question ‘cos sometimes they don’t say what they think so you get their ideas if you like tell them you want to know ‘cos it helps. If you just try to solve the puzzle without thinking you’re thinking then you probably won’t get it.

In this example, Anna clearly was grappling not only with considering how to work out her own thinking but she was also aware of the importance of understanding other children’s thinking. It would seem that she

had had experience of trying to work out what children were thinking when they were not being explicit about their thinking in the group but then she considered asking them and explaining why she wanted to know. She thought that this was a reasonable and useful strategy.

Philomena (A2) also came up with the strategy of asking others so this may well have been promoted in this particular group. She said, "*I ask what the others think sometimes 'cos then that helps me to know what I think and if you know what you think then you might know if you're thinking the right way or you might need to change your mind about your first idea.*" It seemed as if having confirmation of others' thoughts gave her the confidence to either continue her line of thought or to re-evaluate her thinking and perhaps change to someone else's suggestion. Also Philomena said that all her constructs were connected and that this helped her to learn. She said, "*If you had some string, I could take these cards (with constructs written on) and I could tie them altogether like lines (she drew with her finger on the table connecting lines between all the construct cards) to show that all them ideas what helps me learn are all joined up, like, you know, in a sort of picture thing.*" At that point in the interview, I placed all her construct cards in a pile on a piece of paper and gave her a pencil. She then drew lines to show how she would connect the constructs she had provided. This demonstrated that Philomena considered many of the activities that helped her learning used **talking** as the vehicle to advance both her and the other group members in making progress. She also connected the metacognitive level constructs with **think** and **use your brain** indicating that she understood that these metacognitive activities required a type of thinking that was somewhat different from the thinking identified on the **think** construct.

Abda (A2) provided two constructs which referred to metacognitive functioning. He said that it helped him to **say how he was thinking** "*'cos hearing it out loud helps me to see if I'm right or if I need to change my mind.*" He also said that it helped him to hear of other views because he found that hard. "*I ask Anna what she thinks and what she sees 'cos she thinks hard and thinks of other things than me. So this helps me to think of other things what I can't see myself. It's too hard for me on my own.*" This indicates that he had begun to experience metacognitive behaviours as helpful to his learning. It is clear that Abda was also comparing himself to others, in particular Anna, whom he experienced as helpful to him. Abda's comment above also indicates that he has begun to recognise benefits in collaborative learning.

Sakia (B2) also discussed asking others and using her brain but she introduced the idea of working as a team to solve the challenge. She said, "*If you think about how you think then you can see in your brain what kind of thing you need to do – like sorting out or putting things in orders and then you get the right way of working out the puzzle. Then if you tell them what you think they get it too and then we can work as a team to get it all worked out. Sometimes, you have to ask them what they think 'cos they don't say it, like they don't say their thinks and that means they are not helping us.*" My understanding of this explanation was that Sakia had begun to understand that it was important to consider her thinking as well as that of others in order to decide how to solve the challenges presented to her. Not only had she grasped some of the usefulness of metacognition but also the value of collaborative learning.

Thomas (B2) also showed some insight into the value of metacognition. *“If you **use your brain** you can think inside it. Like what you think in there and when **you think of how you think** it helps you to know, like what to do. If you **tell them what you think** they tell you if they think you might be right and then you can **agree** maybe or not to help us to solve the challenge, right.”* In this example, I understood that Thomas was explaining an evaluative function of the brain in that he was reporting that he can think about a task through his brain. Having done this, Thomas explained that discussion about the thinking is useful in a collaborative setting.

Meenah (B2) said, *“If you think of how to think then that tells you what kind of thing to do like putting in groups or getting things in order or finding out what’s going wrong. If you don’t think about how to think, you’ll probably think all wrong and put the group all wrong too.”* Meenah also demonstrated that her response within the group would affect the learning of the others who were also trying to solve the challenge. Gavin (B2) had a similar way of considering metacognitive functioning. *“When you look at the puzzle, you have to think about how to think of doing it, then you tell the others how you’re thinking and they might go oh yeah and then they can do it too. But if you don’t tell them how you’re thinking or you’re thinking wrong, well, we all get it wrong then, don’t we?”*

Stacey (C2) provided several constructs that related to metacognitive functioning. She explained *if **you think of other views** it helps you to decide which one might be right ‘cos you have some to choose.* She also said that asking other children how they think helped her to know how to think about the puzzle herself. She was unable to give an example but she appeared confident in her description of this activity. Cathie (C2) also said that thinking of other views helped her to solve the challenges *“‘cos that gives me ideas to talk about like if you think it might be like this or this (she moved her hands about in different directions). When probed on this, she said, “Well, if you think about how you are thinking and all the other ways of thinking then sometimes something pops into your head like you never knewed before, don’t it? My understanding of this description was that Cathie had experience of considering various ways of thinking about a challenge and that through doing this other possible ways of finding solutions came into her head.*

Sometimes the children came up with images to express how they understood metacognition. For example, Aurora (D2) said, *“When you want to learn something like new like you don’t know before you need to **think**, like go inside your brain and then it tells you like a voice like new ideas.”* Aurora went on to report that she was able to think and that helped her to learn because *“thinking happens in my brain. My brain listens and looks at the things on the table and people’s ideas and then it whizzes about to make sense of everything. When it’s made sense it puts words in my mouth and then I say ideas what help to solve the problems. Then the others can agree or disagree and we keep going until we get to the end of the puzzles.”*

Joshua (D2) reported that his brain helped him to think about all he heard and saw and tried to work out because *“that’s what brains are supposed to do – **think**, you know”.* He also had his own image, *“You see,*

*if you **think**, well, you can do anything 'cos you have a brain and it thinks you know like it goes bzzzz in your head and all the ideas go bzzz and move around until they get the ideas sorted out and then your brain tells you what to do or say next. It's clever my brain and that means I'm clever."* Joshua also experienced metacognition as helpful. *"If you think how am I thinking oh yeah I know it's like rules and then say how are you thinking and they say well it's tricky but I think it's rules then you say oh yeah let's follow rules and we'll find out the answer. If you do that and it works it means that asking about how they were thinking has helped you but if it's wrong then you have to ask another people how are you thinking and they'll say groups and then that'll help you maybe. Aurora and Bernie help me 'cos they say what are you thinking too and we all say. But Rakhmi and Keendi don't say much ideas so we tell them our ideas and that helps them and they can get the puzzle too."* In this example, Joshua demonstrates that he has had positive experiences of metacognition in a collaborative approach. He was also confident to explain that when the group did not get the method right first time they were prepared to discuss their ideas again. He also noted that some of the children required more help than others. In his explanation, there was no negative judgement made of children but the situation was simply reported as fact.

According to Hartman (1998) metacognition is especially important to learning because it affects acquisition, comprehension, retention and application of what is learned. Metacognitive awareness enables control or self-regulation over thinking and learning processes and has an effect on efficiency, critical reflection and solving challenges. It is clear from the children's explanations that they have integrated an understanding of how consideration of their thinking affects how they set about the task which impacts on their efficiency, how discussing their ideas involves reflection and evaluation and how they are more successful in solving the tasks when they engage each other by sharing ideas and agreeing on the best strategies. It would appear that they have discussed all the main elements of the metacognitive process as outlined by Hartman (1998). Swanson (1990) found that children who were strong at processing metacognitively performed better than children who did not use metacognition so effectively so, according to this model, these children have every possible chance to become successful learners.

Summary

The children in the first year were able to express some ideas in July to demonstrate their understanding of metacognition. However, in the second year, their expressions regarding working at a metacognitive level were more numerous, more detailed and also more picturesque. The children were very confident about expressing these ideas and were able to identify several aspects of metacognition: reflection, critical thinking, evaluation. They linked metacognitive functioning with collaborative learning as well as other behaviours such as listening and explaining.

Exploratory talk

Exploratory talk can only be actually identified in the group lesson situation. However, to engage in this as a group, it is necessary to discuss, explain and examine possible solutions together. In this chapter, each

group has demonstrated that talking, explaining and discussing were helpful to their learning. Also, particularly the children in the second year, have demonstrated their understanding that working collaboratively through engaging in metacognition was helpful to learning. It was not difficult, therefore, to imagine the exploratory talk taking place during CA lessons. This is verified in the following chapter where the observation of lessons is analysed. Some examples of children discussing their constructs give further insights into how exploratory talk worked to help children progress in their learning.

Grace (A1) was very positive about learning in CA and explained that if you talk out your ideas you often get more ideas or you change your ideas a bit once you discuss and listen to others. She reported, *“Sometimes you get the right answer after you discuss like when we got the right colours on the wall. I didn’t get it but Angela said she knew and I asked her how it worked and she told me her idea of diagonals and explained it and then I got it. I asked her if that’s what she meant and showed her and it made sense and it was right. She learnt what diagonal was too ‘cos she didn’t know that word so the discussion helped both of us”* (Appendix 6.3). This sounded like the two girls had engaged in a discussion regarding a possible solution to a task. Angela had had an idea of how to solve the problem, demonstrated it to Grace who then took it further to introduce the word “diagonal” which was new to Angela.

Another example that focussed on the value of explaining to each other came when Abdul (B1) expanded upon **explain** he said, *“If you **explain** a clue to them then others’ll get the next bit of the puzzle. When they do that bit, they can explain what they’re doing and then I can maybe learn the next bit. It’s like...umm, you know, hearing new stuff and why it might work like in the farmyard one.”* In this example, it was clear that Abdul had begun to identify the kind of talking which helped to advance learning. Further on in the interview he also identified other sort of talk that he described as *bossy words* which did not help him to learn. The sort of talk where children do not engage positively with each other nor contribute to the intellectual discussion is referred to as Disputational talk in the literature (Wegerif *et al*, 1999) and is discussed in Chapter 8.

In March, Tamu (D1) was also able to provide insights into how talking helped him *and by July*, he used **explain** when he discussed how sharing things helped. *“When you **listen** if Nemy **explains**, it helps you get the right ideas. But sometimes he’s wrong and then I can **explain** my ideas and he says, Oh yeah, and that changes his ideas but if you don’t **share things** what you can **explain** then the others can’t learn too. Like Karen, she can’t explain things ‘cos I think she doesn’t understand much but when I explain she sometimes goes yeah, I get it now.”* In this example, Tamu demonstrated how explaining helped him as well as the group. He also showed that he was aware that different children have different ideas and that sometimes the collaborative working helped those who find the tasks difficult.

In the second year, the children were able to give detailed explanations in March and this may have given them a better opportunity to use the CA programme to best advantage. If the children were able to integrate the elements of being a successful learner earlier in the year then they would have had more opportunities to develop their thinking. In March, Anna (A2) explained that *“if you **talk** and **discuss** ideas*

*you have more chance of getting the puzzle right 'cos more people have ideas so you get to the right one. If you don't **say your ideas**, you might not come to the right one".* In July, she was able to link several constructs in her attempts to explain how the behaviours helped her to learn.

*"You see, if you **talk** to each other and **explain** what you're thinking all the ideas like come out, you know, out loud. Everybody can hear them if they **listen** and they get sort of jumbled up in your head but then if you **think** you can sort them out and then you can come up with a new idea to **try** and it works most times. So **sharing things** like ideas and things to try helps them with not much ideas."*

In order to develop children's thinking in a collaborative context, children need to learn to consider other children's points of view. Piaget (1955) describes this as "theory of mind". According to Mercer (2010) developing a theory of mind is crucial to engaging effectively in dialogue. Through these sections it is clear that the children were able to explain the importance of group discussion, sharing and finding out what group members were thinking. This evidence suggests that children are developing a theory of mind and are learning to think and work together which Mercer (2010) describes as a life skill.

Summary

In summary, children in both years of the study provided constructs with explanations which led me to believe that they had had positive experiences of exploratory talk supporting and enhancing learning. It appeared that more children in the second year were able to engage in explanations earlier in the year which may have afforded them the possibility of making better use of the CA programme. Evidence of this is discussed in the following chapter.

Collaborative group work

All CA programmes require children to work in collaborative groups as explained in Chapter 2. Setting up these groups in Year 1 classes was a challenge to the teachers as they were unused to working that way at the time. They spent time on the PD days discussing how to manage the other children in the class while the CA group was being taught. Children were encouraged to work reasonably quietly and independently so that the CA group could be undisturbed by too much noise or interruption. Within the groups, the teachers also had to work hard at encouraging the children to talk and suggest ideas to solve the challenges while holding back in making suggestions themselves. The teachers' role in the groups was to facilitate the learning by encouraging the children to take the lead in following suggestions and to gradually develop their ability to work harmoniously towards a solution to the challenge.

During interviews, several constructs indicated that children were learning to discuss, share equipment and work towards various solutions. However, in the first year other aspects of group work emerged as relevant. The constructs relating to these aspects did not focus directly on learning, however, the teachers identified these as issues that they needed to take seriously and address differently in the second year. Because, they directly impacted on learning and because the teachers evaluated the issues as serious they are discussed in this section.

Learning together

The construct **listen** was said by most CA children in March and again in July. Teachers generally report that it is difficult to get children to listen to each other. My experience has been that it takes some time for young children to realise that their peers have useful points to make and therefore listening to them can be helpful to their learning. Listening was not mentioned in September and was not said by any of the non-CA children so this implies that the CA programme may be having a substantial impact on the quality of listening in these CA classrooms. Also, when the children were explaining how listening helped their learning, they linked it to a number of other activities with explanations as to how the constructs all helped and how constructs linked together.

For example, in March, Grace (A1) said that **listening** was important because *“it helped you get ideas from the teacher and other children”*. She went on to say that those new ideas sometimes helped you to solve the problem. This indicated that she had experience of using an idea that she had heard from a child in her group to go on to provide a solution to the challenge. By July, Grace reported, *“When you **talk** you share your ideas and if the others are **listening** then they can learn something and maybe add on something then I can learn that bit if I’m **listening** and maybe solve the problem”* (Appendix 6.3). In this example, Grace connected several constructs – **listen, share things, talk**, which may indicate that the learning process and her part in it were beginning to make sense to her. She also made it clear that she realised that personal choices were required in that, for example, she and the others could choose to listen or not. In July, Grace was also able to discuss these choices and made comparisons between her and the other children. *“I have lots of ideas and sometimes I can see how to solve hard things but the others don’t listen to me, especially Jack. He thinks he knows everything but he doesn’t tell us nothing so I don’t think he does know”*. In her explanation, Grace demonstrated that she had experience of listening and subsequently learning from some children but her experience of being listened to was less positive.

In March Sacha (B1) said that *listening helps ‘cos you can get ideas from people- like if they listen to me I can tell them things*. However, when probed regarding how listening actually helped her, she again turned it round to the other children listening to her. *“Well, listening helps. Like I have loads of ideas and I can tell the others everything so they need to listen to me to learn”*. She seemed to understand that if the other children listened to her they may learn something new. However, she appeared to have little or no experience of listening to and learning from others. In July, she said something very similar with regard to listening. *“When the others listen to me they learn lots of things ‘cos I tell them what things are.”* Probing again revealed that she concentrated on what the others learnt by listening to her. On this occasion, she linked **listening** to **talking** and **explaining**. *“I **talk** a lot to tell the others and I **explain** everything so they learn a lot if they **listen** to me when I **talk** and tell them what things they need to know. Miss tells me I have to tell them things.”* Sacha clearly saw herself as someone to whom the others should give attention through listening and following her instructions so that they would learn. However, she seemed unable to consider that she could learn from the other children in any way. Since collaborative learning is seen as a two way process this attitude would seem to be a hindrance to learning effectively.

Abdul (B1) on the other hand was able to explain that he **listened** *so that he could hear new things*. However, he made the point that he did not really listen to Sacha because *“she bosses us all the time but she doesn’t really say much things”*. When probed about this, he explained, *“Well, ummm, she says lots of words but they are all just bossy words, not really telling us things like clues and stuff what could help. She tells us she knows everything but I don’t think she does. She just wants to be the boss”* This indicated that Abdul was able to discern a difference between children who contributed helpful suggestions and tried to work together to come to solutions and Sacha who appeared to want to dominate the group but had little to contribute to the tasks. *This is confirmed in Sacha’s interview when she said that she has to tell the children everything* (Appendix 6.2).

A different slant came from Thomas (B2) who said that **listening** *“helps ‘cos others can tell you things what they know and then you can use those. It’s not like cheating”*. In this example, Thomas was keen to explain that he understood collaboration as opposed to copying an answer in an exercise book which he described as cheating. When asked what made a difference, he explained that *“when you all **talk and explain** it’s to help to **solve the challenges** and that’s OK ‘cos you all do it together. Cheating is if you just take someone else’s idea like stealing but not sharing. If you **work as a team**, it’s not cheating”*. From this explanation, it appeared that Thomas had an understanding of the nature of collaboration which he clearly found helpful to his learning.

Keendi (D2) also provided **listen** as a construct that helped him and reported, *“**Listening** helps ‘cos I hear more words and know the things then.”* I understood from this that Keendi recognised that if he listened to the other children he increased his English vocabulary and was then able to use those words appropriately. He may have considered this the most important piece of learning to him at this stage of development.

However, the examples from one class show that there is little development from March to July in each year. This was the class where the children were least able to discuss how working together really helped their learning. In the first year in March Polly (C1) explained that listening helped you to get ideas from the teacher. When probed about this she did not mention listening to the other children in her group. In the same group, Mark, Joleen and Lewis all said something very similar. However, Weena reported *“**listening** helps everybody but if they argue they don’t learn”*. When probed about this she said, *“If you **not argue** you learn if you **think**”*. At this point, she did not provide any construct relating to talking or discussing. It was unclear whether she considered discussion was a form of argument in which she did not wish to engage but she certainly distanced herself from discussion as seen by the use of “they”. By July all the children in this group provided **listen** as a construct that helped them to learn. Again, the explanations focussed mostly on listening to the teacher as the person who was going to provide ideas that were going to help. Polly and Weena provided **-think-** in March and all the children in C1 mentioned it in July. However, their explanations were not detailed.

With the exception of Weena, it was not clear whether they really understood how thinking helped them. In March, Weena said that *if you think in your head it gives you ideas because your brain tells you answers*. In July this had developed to *if you **listen** and then **think** hard in your brain, ideas come into your mind and if you can use them they help to solve the puzzles*. When probed she added, *“Once you have thought it helps you to make sense and then people can **agree or disagree** if they **talk** and **explain**. I use my brain to work out what kind of thinking you need and then I work it out and then I know the answer.”* My understanding of her explanation led me to believe that she tended to separate herself from the discussion but had experience of thinking and seeing how to solve the challenges. It was unclear whether she had had a real experience of talking as being helpful to her. Polly on the other hand was very clear that talking and explaining helped her. She said, *“If you tell and explain it then it helps you to come up with the right answer and sort out the puzzle*. When probed she added, *“**Discussing** helps you to **make sense** of things and if you **try** hard and **use your brain** then you can do things”*. In her explanations, even when probed, she did not relate **using her brain** and **thinking** so it was not clear that she understood that thinking took place in her brain nor how thinking helped her. In July, Mark also mentioned that thinking helped him to learn. When asked about this, he said, *“Well if you think you sort of ummm be quiet and **look** and then **share things** it helps”*. None of the other children in this group provided any more insights into how they thought thinking helped them. My interpretation of their explanations was that perhaps they understood that thinking was something being promoted as helpful that they understood that they did not talk while they were thinking but how or what to think remained somewhat elusive to them. This was the group least able to explain and discuss the constructs they provided. They did not appear to be reluctant to be interviewed but they seemed to be less able or less confident to converse or engage in a discussion about how the constructs provided helped them.

Stacey (C2) reported in March that listening helped by giving her more ideas that she could then use when she shared her ideas. Cathie (C2) said that listening helped her because she needed the others to give her ideas and Matthew (C2) reported that he got ideas from the others because he did not have any good ones of his own. By July, these same children each said something very similar to these remarks and appeared not to have progressed further in their understanding. For example, Stacey said, *“If I listen to Cathie and Matthew and Miss then I get more ideas what I can use*. As with C1 these children seemed less able to articulate how their constructs helped their learning.

Summary

In summary, children in all eight groups were able to demonstrate and provide examples of how their constructs helped their learning. In six groups, the children showed development between March and July in articulating in detail how their constructs helped. However, Groups C1 and C2 were generally less articulate and less able to provide detailed explanations of how their constructs helped. There seemed very little development between March and July in their accounts. There seemed to be something different about the quality of their reporting compared to the other groups. The analysis of CA lessons provided in the next chapter may provide an understanding of this difference. Differences between classes have

emerged in the constructs provided by the children. These differences become more apparent and explicit as lesson observations are analysed in the next chapter but, already, the difference between C1 and C2 with all other groups raises questions as to what is making the difference in children being able to articulate their ideas more effectively and being more aware of the “thinking behaviours” expected.

Social context issues

Within the explanations about how the constructs helped their learning the children mentioned situations that impacted upon their learning. These were relevant as the teachers considered them very seriously and aimed to change the social context as a result.

In group A1, Angela provided **listening** and **talking** which she said were important. She believed that her brain made her clever and that she used it when explaining her ideas. She reported, *“I am clever and I tell ideas. Jack doesn’t help. He thinks he’s clever but he doesn’t help us. He thinks it’s stupid. He’s always like that. He’s a pain”*. She spent time in her interview in July comparing herself to the other children in the group with particular attention to Jack. While Angela dismissed Jack as *“a pain”* she thought Nurad and Tiffany *“found it hard to learn.”* Grace provided more detailed explanations of some of the behaviours. When discussing differences in how children learn Grace reported that the colour of your skin mattered. When probed she provided a coherent and reasonable explanation as to how the colour of skin does not make a difference to learning in her view but that, for some people, she thought that it made a difference.

Grace: These are black or brownish and these ones have white skin.

R: *Mmm ... I wonder what differences that makes to learning?*

Grace: I don’t think it does ‘cos we can all learn the same but some people think it makes a difference.

R: *I wonder what difference they think it makes?*

Grace: Well some people think black people can’t learn the same – like Jack – he thinks that – and because I’m a girl – so two reasons not to talk to me and just ignore me ‘cos he thinks she’s a girl and a black one so she can’t do nothing. He talks to Nurad – he’s brown but he’s a boy so Jack talks to him – but I can do more thinking than Nurad but Jack just thinks I can’t. He talks a little bit to Angela. He thinks - well she’s a girl so she can’t do much but she’s a white one so it’s not as bad so he talks to her a little bit sometimes. Jack does not like us – Angela and me - so he won’t help. He just wants to work with boys so he won’t share his ideas and he won’t help us solve the problems. He’s just choosing not to listen to us ‘cos he doesn’t like us, ‘cos we’re girls.

Whether any conversation regarding Jack’s behaviour towards Grace and Angela had ever taken place was not mentioned but Grace articulated her thoughts clearly and had worked out an interpretation of Jack’s behaviour. Her understanding of his behaviour appeared not to damage her self-belief in any way as her understanding was the problem lay within Jack. However, she could not engage with different views when asked if she thought that there could be other reasons why Jack treated her the way he did. She dismissed a possible alternative perspective saying that she was sure she knew what Jack thought.

Jack also compared himself to others and this was given more time than explaining how his constructs helped. He reported, *"I listen and that helps. Angela and Grace think they are clever and can do everything but I can do things better than them. They just don't listen"*.

Observations of lessons discussed in the next chapter demonstrate the impact of the relationship between these three children. It was an aspect of concern to the teacher during the intervention and she was determined to address issues of this nature in the second year.

Evidence from the second year indicated that something had changed because the children's conversations were somewhat different. For example, Anna compared herself to others commenting that *"sharing ideas helped children who did not have many ideas, like Tahmid. Well, maybe he has but maybe he just can't say them or he doesn't know the words so sharing might help give some children the words too and thinking."* She did not say at any point that she was clever or that the others were less clever. She did, however, refer to **trying** and explained that if you try you always learn something. She referred to personal choice both in March and in July. For example, in March, she said that *"If you want to learn something you have to try and join in. Sometimes it's hard but we all help. But if you don't want to then you won't learn nothing but it doesn't help the group either. It's a pain when someone does that like at home, my brother does it if mum wants to teach us something. He says he just wants to play and then he won't help with ideas.* By July Anna was clear that *sometimes you can have ideas even when the challenge was hard but you had to want to have them and say them.* In this explanation, Anna took her example from a home situation not a school one so this may imply that children were not being unco-operative in the group.

In group B1 the situation was different but still identified as a social context issue. Abdul, John and Margarite described Sacha as unhelpful to their learning. John described Sacha as a bossy person in the group as he tried to explain why **listening** helped in learning. *"When you **listen** you learn new things what you didn't know in the beginning. Sacha doesn't listen though. She just wants to boss all the time. I think she doesn't learn much 'cos she doesn't listen or speak right, like **explaining** or **discussing**. She just shouts at us all the time."* John explained that when he and Abdul spoke and listened to each other they both learnt new things because they shared ideas that helped to solve the puzzles. Margarite provided an explanation as to why listening helped. *"When I **listen** to John and Abdul, I hear their ideas in my head. They get sort of mixed up with my ideas and then I can say new ideas what help sometimes. If I didn't listen, I wouldn't get them new ideas, I don't think. Sacha listens and she don't get new ideas really. She just shouts but not ideas just bossing."*

Abdul, John, Margarite and Nania all experienced listening as helpful but all expressed frustration with Sacha who in their opinion did not listen to them. From this they assumed Sacha did not learn and cited her shouting, bossy behaviour as evidence of her not learning. It appeared from this that these children had an understanding that not only does listening help in the learning process but also that non-co-operation in a group hinders learning. Abdul and John were clear that not only was Sacha's learning

affected by this but that theirs was also. *"We try to listen. I listen to Abdul but Sacha keeps shouting all the time so we can't get on and use his ideas to fix up the puzzle."* Abdul went further when he said, *"When Sacha isn't there, we can all listen and learn new things and get the game right. When she's there she doesn't listen and we can't learn nothing 'cos of her. We like it when she's off."* This is a very strong message which provided information regarding how Abdul and John believe that listening helped them and how the behaviour of all the participants in a group where collaborative learning is intended is crucial if everyone is to benefit from the experience to the fullest degree. The conversations veered away from the learning as the children discussed their discontent with Sacha. On the other hand, they were very clear about the difference between the way Sacha communicated with them and how they communicated with each other. This indicated that they were very confident in articulating how listening and explaining things to each other helped their learning.

Observations of lessons demonstrate the impact of this tension during lessons. Again, this was an issue identified by the teacher in the intervention that she was determined to address in the second year.

In the second year in B2, the children were all able to explain how some of their constructs helped them to learn. For example, Renata said, *"Well, we have to **work out challenges** and find the puzzle and that helps me 'cos it makes me **think** and that makes me more cleverer"*. This indicated that Renata believed that working at and coming to a solution encouraged her to think and increased her intelligence. This could imply that she experienced learning through CA as worthwhile. In July, all the children were able to provide some explanations with regard to how the constructs helped them to learn.

In July, Georgio said, *"**Listen**, listening helps 'cos you hear ideas and words what you can use too"*. When prompted to say more, he said that *if you use the ideas that you hear then they help you to have more idea of how to solve the challenge*. It was clear from his explanation that he had a sense of having been supported by the others not just in solving the cognitive challenge but also in his language development in speaking English. *"They use words what I don't know but when I **listen** I learn them too"*. At no point during the interviews did the children refer to any child bossing them, refusing to share or pretending to be clever as had happened the previous year with the same teacher.

In group D1 a different issue arose. Tamu explained that when he took time to think of the best way to start solving the problem, often the others started the task and he felt left behind. He also reported that when he tried to tell them that they had started in the wrong way they would not listen. *"Nemy and Dawn just want to take over all the time. They want to boss and Miss lets them vote all the time but that doesn't help 'cos they vote the wrong way and we can't get the puzzle right 'cos of them. If I could be by myself, I'd get it right more better."* He demonstrated some frustration with the collaborative nature of the learning in this example. It seemed that in his case, the group was hindering his learning instead of supporting and enhancing it. Nemy also reported frustration regarding voting but he attributed this to being Dawn's fault. *"Dawn wants to vote all the time. I tell them it's not right but they won't listen. They always vote the wrong way so we can't get it right. Dawn won't listen but she doesn't get the right answer."* Again, there was

frustration at the collaborative aspect that appeared not to be respecting his opinion or trying his ideas. However, Dawn's perspective on this was, *"I have lots of ideas and I do good thinking but the others won't listen to me much so I say we have to vote to be fair and Miss listens and that helps everyone."* When probed whether voting helped to successfully conclude the task, Dawn replied, *"Well, we get to the end 'cos once we've voted that's the end and then we tidy up so it helps us to get to the end."* Dawn appeared to consider that ending the lesson was the important issue not whether they had solved the challenge. It was unclear whether she recognised that a successful conclusion to the challenge may not have been reached I tried to suggest an alternative end to the lesson but she was either unwilling or unable to enter into this possibility.

During the teacher intervention meetings the teacher identified this tension as an issue. When it was discussed the teachers agreed that voting was not helpful to the development of accelerating cognition. Miss Daisy decided that she would never allow that sort of situation again but would always encourage the children to come to an informed decision after discussion of all possible solutions.

In the second year, group D2 provided clear explanations relating to their constructs. No child commented in a judgemental way on their peers but stated facts indicating that they understood that different children have varying needs and that these can be met in the collaborative context. They mentioned explaining, discussing and coming to an agreement so it seemed that the notion of voting as a way to resolve a challenge was no longer being used.

The only group in the first year not discussed under this Social Context heading is group C1. The issue that Miss Comfrey wrestled with during the intervention was one of allowing the children time and possibility to discuss rather than hold control of the social space. There was little difference between C1 and C2 in the way the children explained their constructs. These were the groups that gave the least detail in their explanations for their constructs so it may be that group C2 did not have much opportunity to discuss the challenges within the lessons.

Summary

In summary, three groups in the first year indicated that there were social issues in their groups impacting upon their learning. These were identified also by the teachers during the intervention and all three teachers suggested that they had targets to ensure the social context was better managed in the second year. Similar issues did not arise in discussion of constructs in the second year so it is reasonable to assume that the teachers addressed the issues. This can be verified through the next chapter as the observation of lessons is analysed. The fourth group in the first year were the ones who had least to say and provided little in the way of explanation compared to other groups. The teacher in this case identified that she needed to allow the group more space for discussion and suggesting possible solutions. The discussions during interview were not substantially different in the second year so it was unclear whether more opportunities were provided for the children to engage in discussion.

The four themes followed in the later sections of this chapter are explored through the analysis of CA lessons in the next chapter.

Chapter 7:

Participation during Cognitive Acceleration Lessons

Let's Think is when we can talk and learn to think together with the teacher who helps us with thinking especially when it's hard. (Gavin, Group B2)

Summary

This chapter provides both quantitative and qualitative data. Quantitative data indicate teacher and children events during the CA lessons and the most noticeable change is the increased number of metacognitive events in the second year. Qualitative data examine the issues identified by the teachers in the intervention meetings and the analysis discusses changes in the teaching of CA between the two years.

7.1 Introduction

The previous chapter presented children's constructs regarding what they thought helped their learning particularly within the CA context. Non-CA children were interviewed also and their constructs were presented in section 6.3.2. The data indicated that although at the beginning of the year the children's constructs had been very similar there was a substantial difference between the constructs of CA children and non-CA children by the end of the academic year. Also, there was a substantial difference between the constructs of CA children in the first year of the study compared to the second year. According to CA theory children who understand and who can explain what helps them to learn become better and more effective learners and thinkers. In order to understand more fully the impact that the CA experience had upon children's constructs this study examined CA lessons to investigate children's and teachers' participation in four classrooms over two years.

Both quantitative and qualitative data are analysed. Quantitative data were provided from 64 lessons analysed according to the frequency of categories of oral contributions. Examination of oral contributions was important because CA uses oral interaction to challenge children intellectually. The theory assumes that children able to explain their reasoning and engage in metacognition are those who are attaining higher levels of thinking. Details of the observations also provide qualitative data from the observed groups. In order to better understand the context of the children's personal constructs this chapter analyses the actualisation of CA theory through the teacher and children's responses.

7.2 Classroom observations

During each of two years, observations of CA lessons were undertaken in four Year 1 classrooms as described in the Methodology, section 4.5.2. The number of observations is as follows in Table 7.1

Teacher	Class	CA lessons observed (27 lessons in programme)
Miss Arum	Group A1	15 lessons
	Group A2	13 lessons
Miss Bramble	Group B1	14 lessons
	Group B2	13 lessons
Miss Comfrey	Group C1	14 lessons
	Group C2	13 lessons
Miss Daisy	Group D1	16 lessons
	Group D2	13 lessons

Table 7.1 The number of observed lessons of each CA group in the study

During each lesson observation, all the oral interaction that took place between the teacher and children was recorded with each speaker being identified. Therefore, all the lesson transcripts (111 lessons) provided the evidence for qualitative analysis of all the talk that took place.

As each lesson has its own characteristics giving rise to particular kinds of conversations and actions it was considered important to see the same lesson in each class whenever possible. Comparisons made between groups in terms of the thinking, talking and behaviours of teachers and children need to take into consideration the different characteristics of the lessons. For this reason the quantitative data come from the 64 lessons mentioned in Chapter 5 (Table 5.5). The frequency of categorised events, as described in Methodology, section 4.8 from each of the lessons was calculated for analysis of each group. In this way differences between teachers and groups of children were examined. This information alongside qualitative data from the other 47 lessons is used to consider how the experiences affect children's personal constructs. Part of one lesson is shown in detail in the next section to demonstrate how the analysis of the 64 lessons took place.

7.3 Analysis of observed CA lessons

As described in the Methodology (section 4.8) the oral interaction that took place during the 64 lessons was categorised according to the 12 codes agreed during the pilot phase of the study. Table 7.2 below illustrates these 12 codes with an example of each alongside the CA pillar in which they were most frequently found.

Code	Category	CA Pillar	Example from either teacher or child
1	Procedural management instruction	Concrete preparation Cognitive challenge	Lay out all the cards so I can see them.
2	Behavioural management instruction	At any time during lesson	Sit down.
3	Ask a question at task level	Cognitive challenge Bridging	If you put all the blue animals in this hoop and all the cows in this one where does the blue cow go?
4	Ask a question at metacognitive level	Metacognition	What happened in your brain which helped you to change your mind?
5	Express a challenge	Cognitive challenge	Find the animals that are green and are horses.
6	Give a one word description	Cognitive challenge Bridging	Red.
7	Give a task level phrase/sentence description	Cognitive challenge Bridging	In the bedroom.
8	Give a metacognitive description	Metacognition	Thinking –like in groups.
9	Give a task level explanation	Cognitive challenge Bridging	I think it goes there because it's longer than that one.
10	Give a metacognitive level explanation	Metacognition	It was tricky because I had to think of blue and cow and find a place where both could go.
11	Agree/disagree with a suggestion offered	At any time during lesson	Yes/No
12	Other	At any time during lesson	I am not stupid.

Table 7.2: The codes used in analyses of lessons

All the observed lessons were analysed according to these twelve codes. The following table demonstrates an analysis of part of one lesson to provide an example of the social construction environment under examination, including the analysis from the Piagetian/Vygotskian perspective which has been explained (Methodology, section 4.8) so as to demonstrate how these lessons were being actualised in classrooms. The full transcript is provided in Appendix 7:1.

This CA lesson was taught in Miss Arum's class with Group A1. It is Lesson 25 (27 lessons in the Programme) by which time the teachers had received all the PD so it was reasonable to expect that all aspects of CA pedagogy were in place. The children were all very familiar with CA by this time.

The lesson uses the schema: causality and requires children to consider the likely causes of the events shown. Strips of card were presented to the group. On each card were three squares – two pictures and a question mark. For example, one strip showed, in the first square, a picture of an ice lolly with a bite out of one bottom corner, the second square was a question mark and the third square showed a melting ice

lolly with the bite out of the corner still visible. The children looked at small picture cards and decided which one to choose to put in place of the question mark so as to show what caused the ice lolly to be in the second state.

Table 7.3 provides part of the transcript of the lesson (third column). The teacher's words are in italics and the children are identified by their initial or, in the case of Tiffany – Tif -- so she would not be confused with T for teacher. The left hand column indicates the timing of the lesson. The second column on the left is the number of each event within the lesson. The right hand column indicates a brief analysis and commentary on the oral contributions.

Time in mins	Event	Lesson 25: Transformations-transcript -	Pillar of CA	Analysis
1	1	<i>T: What have we here?</i>	Concrete preparation	Question at task level to encourage pupils to name objects, ensuring all have the necessary vocabulary.
	2	All: Flowers, glasses, water		One word descriptions All pupils call out names of the objects they see on the cards. Only three mentioned. Other words are not checked.
2	3	<i>T: What I want you to do is say which thing is missing and choose the right card to fill the question mark.</i>	Cognitive challenge	Express a challenge This sets the first challenge of the lesson. There is no mention of "cause" which is the schema for this lesson. The intention is that pupils cover the question mark with what causes the change to occur.
	4 5	Tif: Flowers can go there. (pointing at glasses) A: No.	Cognitive challenge	Task level phrase description Suggestion offered Disagree with a suggestion Suggestion rejected
	6	<i>T: Why?</i>	Cognitive challenge	Question at task level to probe for explanation. It is not addressed to a particular individual so is probe about the original idea or the reason for the disagreement?
	7 8	A: Flowers don't go with glasses. J: Glass of water.	Cognitive challenge	Task level explanation by disagreeer. Task level phrase description An alternative suggestion offered
4	9	<i>T: Why?</i>	Cognitive challenge	Question at task level to probe for explanation
	10	J: Glass goes with glass.	Cognitive challenge	Task level explanation Jack is linking a picture of a tumbler of water with spectacles lying broken in a puddle of water. A question is whether Jack is thinking about previous lessons where groups of similar items are collected since "cause" has not been mentioned?
	11	<i>T: Mmmm What about the story?</i>	Cognitive challenge	Question at task level to probe for a more coherent reason but story has not previously been mentioned. The cause

Time in mins	Event	Lesson 25: Transformations-transcript -	Pillar of CA	Analysis
				is still not being requested.
	12 13 14 15	Tif: Hammer could go there. G: Hammer 'cos somebody could smash glasses. A: They're in the grass. Tif: No, somebody could have stepped on them.	Cognitive challenge	Task level phrase description Task level explanation Task level phrase description but there is no grass in the pictures Disagree with Task level explanation
18	58	<i>T: OK What about the candles?</i>	Cognitive challenge	Question at task level about another picture. No mention of "cause".
	59	J: That's hard	Cognitive challenge	Task level description
	60	<i>T: Why?</i>	Cognitive challenge	Task level question
	61 62	J: None what looks like it goes. A: Yes, matches melted 'cos it's been on fire.	Cognitive challenge	Task level explanation Disagree and Task level explanation
20	63	<i>T: What about the torch?</i>	Cognitive challenge	Question at task level Different suggestion being proposed by teacher.
	64 65 66 67 68 69 70 71 72	A: No, torch can't light a candle. Tif: If you don't use matches if you choose a torch you can't. Well, I think I'll use a torch. A: Mum uses matches to light a candle that's why you should use matches. J: If candle goes out you need a torch to find the matches. N: It's melted. J: No, it's gone down 'cos it's stayed there too long. G: I think the sun... A: I think it's the sun because it melts candles. Yes, they light candle with match and it melts. G: If torch there, no, if you don't put fire it won't melt.	Cognitive Challenge Bridging	Disagree and Task level explanation Disagree and Task level explanation lacks coherence Disagree and Task level explanation Task level explanation Task level description Disagree and Task level explanation Task level description different suggestion Agree and task level explanation Agree and Task level explanation Pupils are scaffolding learning for each other.
22	73	<i>T: What's happened to the candle?</i>	Cognitive challenge	Question at task level T draws attention to detail of picture. This is the nearest to "cause" that has been said
	74 75 76 77 78	N: It's melted. J: No, it's gone down 'cos it stayed too long. Tiff: I think the torch. G: I think the torch 'cos if you light a candle it'll melt. A: It could be the sun 'cos that would melt candles.	Cognitive challenge	Task level description Disagree and Task level explanation Task level description Task level explanation Task level explanation different suggestion

Time in mins	Event	Lesson 25: Transformations-transcript -	Pillar of CA	Analysis
	79 80 81	S: My candle's melted so I think you should use a torch 'cos light can melt candle. A: No, 'cos light ain't hotter, it won't make it go smaller. S: It could be another candle what starts off small. G: I've got a small one.		Task level explanation Disagree and Task level explanation Task level description Task level description Pupils are scaffolding learning for each other.
	82	<i>T: Think about birthdays?</i>	Bridging	Question at task level T encourages pupils to link their knowledge of what happens to candles when lit on cake. Scaffolding learning. "Cause" implicit here.
	83 84 85	Tiff: If candle is cold and rain shines then it'll melt so sun is hot. J: If you light the candle again. A: Three people think torch Three people think matches. What does Nurad think?	Cognitive Challenge	Task level explanation Task level description Question at task level
	86	<i>T: Well ask him.</i>		Procedural management
	87 88 89	N: Matches 'cos fire is gone there. Get fire then candle gone. Tiff: Yes, matches 'cos it'll melt down. G: Matches	Cognitive challenge	Task level explanation Agree and Task level explanation One word description Pupils are scaffolding learning for each other.
25	90	<i>T: Are you sure?</i>	Cognitive challenge	Question at task level checking for agreement
	91 92	G: If torch there..if you don't put fire it won't melt. S: Matches		Task level explanation One word description
	93	<i>T: Why?</i>	Cognitive challenge	Question at task level
	94 95 96	S: Cos it'll melt down. A: 'Cos of the matches, she means S: Torch doesn't get very hot.	Cognitive challenge	Task level explanation Task level explanation developed Task level explanation Pupils are scaffolding learning for each other.
27	97	<i>T: What about you, Jack?</i>	Cognitive challenge	Question at task level draw in Jack.
	98 99 100	J: Cos you can light it and it'll melt. They're stupid. S: If you light it in day time, you'll need to go shopping and buy more.	Cognitive challenge	Task level explanation Other An implicit gender remark not related to the task. Task level explanation

Time in mins	Event	Lesson 25: Transformations-transcript -	Pillar of CA	Analysis
	101	<i>T: What was hard about this?</i>	Metacognition	Question at metacognitive level
	102 103 104	J: Nothing. Not for me. A: 'Cos everyone chose different things and then changed their minds. A: Like saying one of these.	Metacognition	Metacognitive phrase description Metacognitive explanation Metacognitive phrase description
	105	<i>T: Jack, what do you think?</i>	Metacognition	Question at metacognitive level
	106	J: It wasn't tricky.	Metacognition	Metacognitive phrase description
	107	<i>T: Are you sure?</i>	Metacognition	Question at metacognitive level
	108 109	A: I think it was tricky. J: Not for me. I'm not stupid.	Metacognition	Metacognitive phrase description Other
30	110	<i>T: OK Well done. We'll finish now.</i>		Behavioural management

Table 7.3: Part of a transcript and analysis of a CA lesson

This lesson was chosen as the example for a number of reasons. Lessons in Miss Arum's class were those taught within the tightest time frame (28-30 minutes) so there is least variety in the number of events per lesson. Therefore, finding a typical lesson to use as an example was more possible than in the other three classes which had a wider range of events. This lesson was the standard length (30 minutes). The questioning was also typical of Miss Arum who aimed to challenge but her questions were short and did not always follow the schema nor the kind of thinking required (as in event 63). The lesson was also typical of children's responses in that the main players in this group were Angela, Grace and Jack (as in events 66-67). The interactions between Angela and Jack were also typical (as in event 102-104) as they often disagreed and Jack frequently referred to others as lacking intelligence.

7.4 Analyses of lessons

The categorised events were collated according to teacher contribution and by child response. Teacher contributions are presented first by displaying all collated teacher responses in a table (Table 7.4). During the teacher intervention, the teachers identified promoting challenge and promoting metacognition as two of the key themes that they wanted to improve in the second year. To understand any changes made in this regard oral interactions concerned with promoting challenge are presented in Figure 7.1 and those encouraging metacognition are presented in Figure 7.2

All of the children's responses were also collated and are presented in Table 7.5. Another key theme identified by the teachers was the development of exploratory talk. Any differences in the use of exploratory talk can be examined through the data presented in Tables 7.4 and 7.5. All responses that are

identified as metacognitive have been extracted to examine separately and are presented in Figures 7.2 and 7.3.

7.4.1 Teachers' oral interactions

The following table provides information regarding the categories teachers used by giving the frequency of each category with the mean number of occasions it was used in each lesson.

Category	Group A1 240 mins	Group A2 230 mins	Group B1 360 mins	Group B2 240 mins	Group C1 216 mins	Group C2 235 mins	Group D1 320 mins	Group D2 245 mins
Qs task level	73 9.1 per lesson	90 11.25 per lesson	106 13.25 per lesson	110 13.75 per lesson	114 14.25 per lesson	120 15 per lesson	63 7.9 per lesson	92 11.5 per lesson
Express challenge	184 23 per lesson	201 25.1 per lesson	287 35.9 per lesson	256 32 per lesson	187 23.4 per lesson	230 28.75 per lesson	206 25.75 per lesson	245 30.6 per lesson
describe	6 0.75 per lesson	5 0.6 per lesson	26 3.25 per lesson	21 2.6 per lesson	14 1.75 per lesson	15 1.9 per lesson	25 3.1 per lesson	20 2.5 per lesson
Task explanation	7 0.9 per lesson	21 2.6 per lesson	10 1.25 per lesson	32 4 per lesson	4 0.5 per lesson	23 4.6 per lesson	4 0.5 per lesson	26 3.25 per lesson
Qs at meta level	9 1.1 per lesson	45 5.6 per lesson	28 3.5 per lesson	67 3.4 per lesson	5 0.6 per lesson	32 4 per lesson	3 0.4 per lesson	44 5.5 per lesson
Meta description	0	26 3.25 per lesson	5 0.6 per lesson	21 2.6 per lesson	2 0.25 per lesson	15 1.9 per lesson	4 0.5 per lesson	32 4 per lesson
Meta explanation	7 0.9 per lesson	13 1.6 per lesson	3 0.4 per lesson	19 2.4 per lesson	2 0.25 per lesson	17 2.1 per lesson	2 0.25 per lesson	23 2.9 per lesson
Process management	51 6.4 per lesson	43 5.4 per lesson	85 10.6 per lesson	54 6.75 per lesson	133 16.6 per lesson	64 8 per lesson	107 13.4 per lesson	53 6.6 per lesson
Behaviour management	11 1.4 per lesson	32 4 per lesson	30 3.75 per lesson	35 4.4 per lesson	94 11.75 per lesson	40 5 per lesson	17 2.1 per lesson	24 3 per lesson
Idea/word	6 0.75 pre lesson	6 0.75 per lesson	9 1.1 per lesson	5 0.6 per lesson	3 0.4 per lesson	6 0.75 per lesson	8 1 pre lesson	7 0.9 per lesson
Other	20 2.5 per lesson	13 1.6 per lesson	33 4.1 per lesson	21 2.6 per lesson	26 3.25 per lesson	23 2.9 per lesson	33 4.1 per lesson	31 3.9 per lesson

Table 7.4: To show teacher events in 64 analysed lessons

It was expected that during the first year as teachers became familiar with and practised the CA pedagogy changes in frequency of some aspects would occur. For example, during the first years of the CA

Programme it was observed that the events that promote challenge and metacognition increased with teacher competence in CA pedagogy and that behaviour management and other unrelated remarks decreased as teachers' competence in developing the social construction environment increased.

Table 7.4 gives a general picture of the teachers' patterns of talk during the analysed lessons. In the first year the majority of teacher events comprised **questions at task level, challenges** and **process management** events. Teachers Arum, Comfrey and Daisy substantially increased the number of times they challenged children in the second year whereas Miss Bramble slightly reduced these events. In the second year all the teachers substantially increased the number of **task level explanations**. **Process management** events in each class decreased in the second year whereas three teachers increased the **behaviour management** events in the second year. Miss Comfrey reduced the **behaviour management** comments by more than half.

One criterion for a successful lesson was that each child experienced cognitive challenge. From the above table, it can be seen that teachers mainly present challenges in two ways. Most frequently teachers **express a challenge** by saying what they want the children to do. For example: "*I want you to sort the animals into groups*" (Lesson 5, Group D1, event 34). Another way of presenting a challenge was to **ask a question at task level**. For example, Miss Bramble asked one child to explain what another had done: "*Why has she put these together in pairs?*" (Group B1, Lesson 8, event 80) One of the key themes identified by teachers as a target for improvement in the second year was the way they created opportunities to challenge the children. Questioning the children about the task was often challenging and clearly required children to think and re-assess their ideas about the challenge. Since cognitive challenge is central to both types of interactions, the figures of these two types of event for each teacher were added together. The total minutes taken for the lessons in each group were recorded. In order to compare any difference in the number of events, their mean frequency per minute was calculated. The results are shown below in Figure 7:1

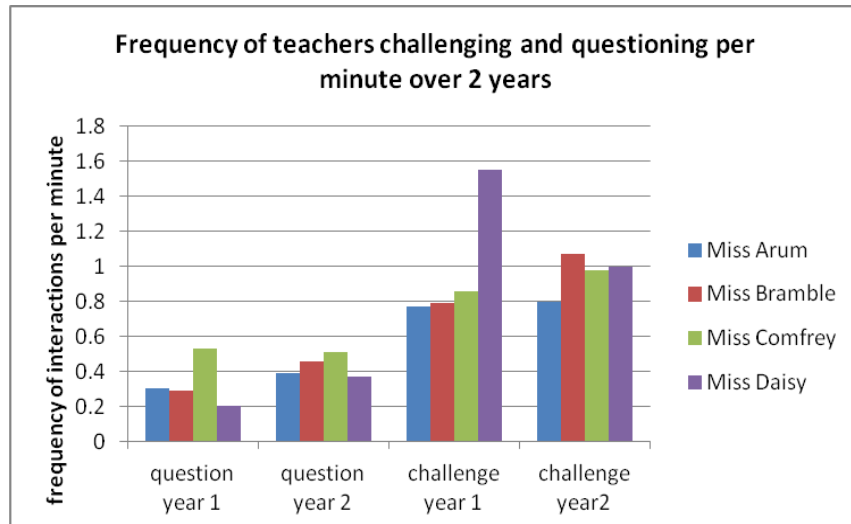


Figure 7:1 The number of events with the intention of promoting challenge

It can be seen from Figure 7.1 that these events were used in broadly similar numbers by each teacher and increased slightly in the second year. The exception is Group D1 who experienced the greatest number of oral challenges from the teacher in the first year. However, in the first year, Miss Bramble's group (B1) was exposed to more expressions of challenge and more questions at task level because the lessons lasted longer.

In categorising the oral events of lessons, three categories of events were identified as focusing on metacognition. These were **ask a question at metacognitive level**, **give a metacognitive phrase description** and **give a metacognitive phrase explanation**. Clearly the teachers used the metacognitive questions more than the other two types as can be seen from Table 7.4. In order to focus more easily on metacognitive events, since the numbers are so small, the average has been worked out by minute so that children's exposure to this element can be considered. These totals per minute of lesson can be seen in Figure 7:2.

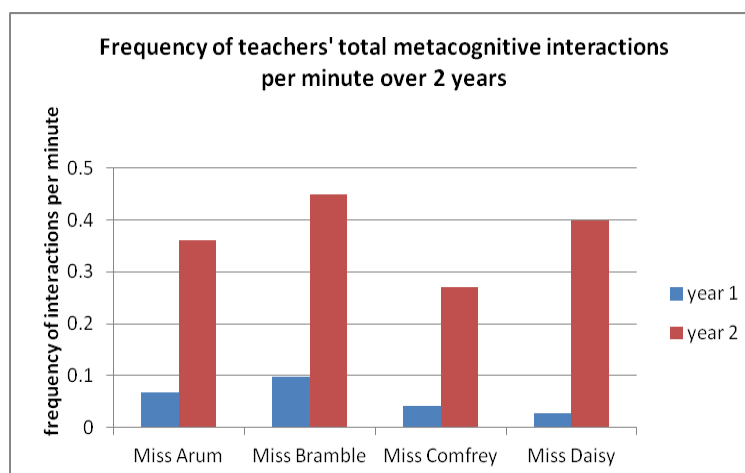


Figure 7.2: The number of metacognitive events spoken by each teacher

It can be seen from Figure 7.2 that in the first year Miss Bramble used slightly more of these events than any other teacher, in particular she used metacognitive questions (28 questions). It could be argued that this gave this group the best opportunity to develop awareness of the thinking being used and more opportunities to evaluate and monitor the quality of the thinking.

In the second year, the four teachers increased the number of each of these three types of event, especially metacognitive questions. This indicated that the groups in the second year had greater opportunity of developing their consciousness of their thinking process than the groups in the first year.

Evidence from the lesson transcripts suggested that in the first year, metacognition was only introduced in the last few minutes. Lessons usually ended quite abruptly with no evidence that the metacognitive aspect was used effectively to evaluate the thinking in the lesson. The lesson transcripts indicated that at no point was thinking monitored during the lesson. Consequently the few attempts that existed at the ends of lessons had little if any affect on the children's thinking development. Also there was no evidence that metacognition was used to encourage the children to reflect, evaluate or monitor their thinking while they worked on a challenge. However, in the second year, these events were used in at least two points of the lessons. Furthermore, in two classes (Groups B2 and D2) the first metacognitive point in each lesson was used by the teacher to help develop the second cycle of the lesson.

7.4.2 Children's oral interactions

This following section presents data taken from the children's contributions. The quantitative data from the oral contributions of the 64 lessons showed that each group used a number of the categorised events described in the Methodology and provided in the Table 7.2. They mostly used the categories **Describe**, **One word/idea**, **Explanation** and **Agree/disagree**. The other categories that have already been discussed were predominantly teacher used categories and the children only used them infrequently.

Table 7.5 provides the information regarding the categories children used by giving the frequency of each category with the average number of occasions in each lesson.

Category	Group A1 240 mins	Group A2 230 mins	Group B1 360 mins	Group B2 240 mins	Group C1 216 mins	Group C2 235 mins	Group D1 320 mins	Group D2 245 mins
Description	134 16.75 per lesson	84 10.5 per lesson	157 19.625 per lesson	96 12 per lesson	131 16.375 per lesson	75 9.375 per lesson	160 20 per lesson	82 10.25 per lesson
Idea/word	98 12.25 per lesson	87 10.87 per lesson	170 21.25 per lesson	102 12.75 per lesson	133 16.625 per lesson	98 12.25 per lesson	108 13.5 per lesson	97 12.125 per lesson
Explanation	145 18.125 per lesson	156 19.5 per lesson	132 16.5 per lesson	167 20.875 per lesson	118 14.75 per lesson	109 13.625 per lesson	162 20.25 per lesson	165 20.625 per lesson
Question	10 1.25 per lesson	12 1.5 per lesson	0	15 1.875 per lesson	7 0.875 per lesson	6 0.75 per lesson	10 1.25 per lesson	21 2.625 per lesson
Challenge	11 0.046 per lesson	12 1.5 per lesson	0	8 1 per lesson	1 0.125 per lesson	2 0.25 per lesson	4 0.5 per lesson	19 2.375 per lesson
Agree/disagree	85 10.625 per lesson	76 9.5 per lesson	86 10.75 per lesson	68 8.5 per lesson	70 8.75 per lesson	75 9.375 per lesson	76 9.5 per lesson	67 8.375 per lesson
Process management	17 2.125 per lesson	25 3.125 per lesson	13 1.625 per lesson	43 5.375 per lesson	11 1.375 per lesson	32 4 per lesson	23 2.875 per lesson	45 5.625 per lesson
Behaviour management	3 0.375 per lesson	2 0.25 per lesson	13 1.625 per lesson	5 0.625 per lesson	10 1.25 per lesson	7 0.875 per lesson	0	2 0.25 per lesson
Ask a Metaquestion	1 0.125 per lesson	3 0.375 per lesson	0	9 1.125 per lesson	3 0.375 per lesson	2 0.25 per lesson	0	12 1.5 per lesson
Give a Metadescription	6 0.75 per lesson	5 0.625 per lesson	16 2 per lesson	35 4.375 per lesson	2 0.25 per lesson	4 0.5 per lesson	10 1.25 per lesson	12 1.5 per lesson
Give a Meta-explanation	26 3.25 per lesson	34 4.25 per lesson	23 2.875 per lesson	54 6.75 per lesson	0	12 1.5 per lesson	17 2.125 per lesson	53 6.625 per lesson
Other	28 3.5 per lesson	10 1.25 per lesson	44 5.5 per lesson	9 1.125 per lesson	20 2.5 per lesson	18 2.25 per lesson	27 3.37 per lesson	6 0.75 per lesson

Table 7.5: The categories of children's talk in the lessons (8 per group)

Table 7.5 shows that in the first year there was no substantial difference between the groups in the frequency with which children used the most common categories: **description, idea/word, explanation and agree/disagree**. Since explaining is associated with the ability to reason this was an important measure when considering children's cognitive development. Although Group B1 had more opportunities to talk, because the lessons lasted longer, they did not use **explanations** more frequently. Table 7:5

shows that the number of descriptions and one word interactions reduce in the second year. In Miss Arum's group and Miss Bramble's group the number of explanations increase slightly in the second year.

Miss Bramble's group provided more **metadescriptions** than any other group and the second highest number of **meta-explanations** which indicated that they engaged in metacognition for a few minutes during each lesson. This was the group whose teacher provided the greatest number of metacognitive events. It was also this group which most frequently gave each other a behaviour management instruction and made the highest number of remarks that belong in the **other** category. Lesson transcripts showed that most of these **other** remarks related to how they perceived each other. For example, children often told Sacha that she was bossy.

Table 7.5 also shows that in the second year, more **explanations** and **questions** were given by children except in Group C2. All **metacognitive** events increased in the second year. The number of **other** events decreased in each group which could indicate that the children were more focused on the task required.

The quantitative analysis identified three categories of event that related to metacognitive function: metaquestions, metadescriptions and meta-explanations. Since metacognition was considered to be very important to children learning to become conscious of their thinking, the totals of each of these events in the specific lessons were collated and the results shown in Figure 7.3 in order to have a detailed examination of metacognitive events.

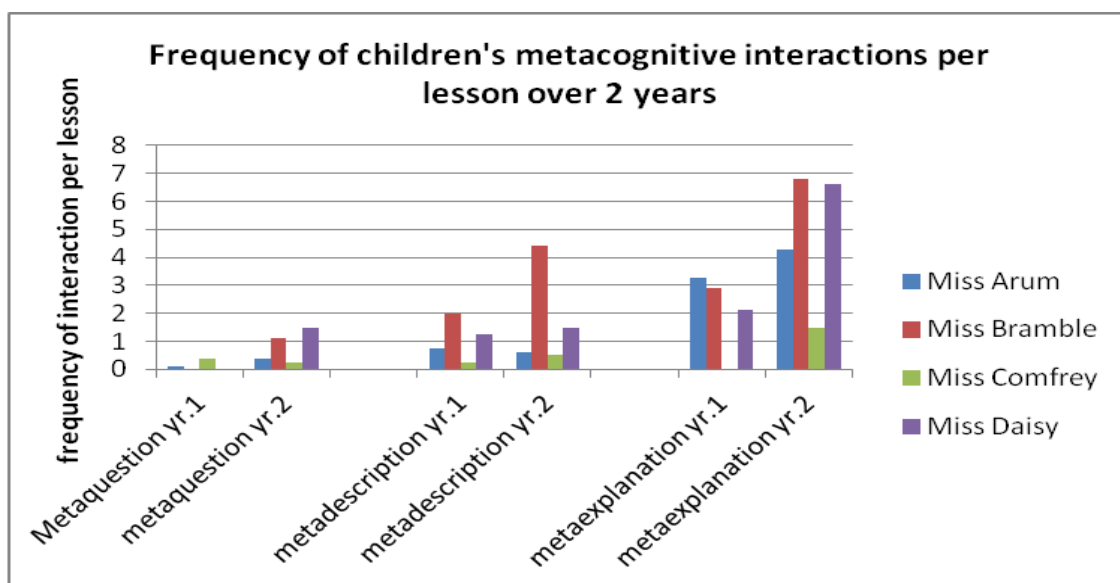


Figure 7.3 The groups' total metacognitive responses

Of the 315 children's metacognitive events, 104 were said in the first year with 211 in the second year. In the first year it can be seen that the children asked very few questions at this level and, in fact, Groups B1 and C1 did not ask any, however, **metaquestions** have already been identified as the teachers' main openings to encourage children to enter into metacognition.

The greatest total number of **metadescriptions** and **meta-explanations** were provided by Group B1 but it must be remembered that their lessons were longer. However, it could be that this encouraged metacognition to develop more effectively in this class. It was seen when looking at the transcripts that Miss Bramble encouraged and gave more space to metacognition than any other teacher. However, as shown in Figure 7.3, Group A1 gave more meta-explanations than may have been expected because the number of metadescriptions was very low. One explanation could be that although Miss Arum gave little time and was inconsistent in her encouragement of metacognitive function that when she did give time for that she encouraged explanations more than descriptions. Given that explanation is a higher level of functioning than description this may have had a positive effect on children's metacognitive development. It can be seen that there were very few metacognitive events in Group C1. Given that it was noted that this group was given the highest number of behaviour management instructions, it was not surprising that the children rarely entered into metacognitive functioning. The emphasis in this group was on behaviour rather than on thinking so little opportunity for meta-thinking was the logical consequence.

The quantitative data have provided a general overview of the 64 lessons. However, in order to analyse the impact of hearing the children's constructs it is necessary to look in detail at the lessons through some of the qualitative data available. The next section examines the four themes identified by the teachers at the end of the intervention through the qualitative data from observed lessons.

7.5 Analysis of the four themes

The lesson observations yielded a wealth of information regarding the teaching of CA lessons. However, what is addressed here is the material most pertinent to the rationale for this study.

During the teacher intervention the teachers listened to the children's constructs then examined lesson transcripts to identify aspects of CA lessons highlighted by the children. Teachers then discussed how they could facilitate CA more effectively. They identified four themes which they wanted to develop and within each theme they agreed the main issues that needed their reflection and changes to their pedagogy. The children's constructs revealed that they found doing challenging tasks helpful to their learning. Being challenged is a crucial element of all effective CA lessons.

The two aspects the teachers noticed through the transcripts were that they did not always set up the challenges in clear and helpful ways and then later in the lessons they often reduced the challenge by their actions. The teachers decided that they needed to work on creating more effective opportunities for children to be cognitively challenged. The children's constructs revealed that thinking about the thinking required for the tasks, was helpful for their learning. However, the teachers recognised the infrequency with which they encouraged metacognition. They also noticed that they usually introduced an aspect of metacognition only in the last few minutes of lessons then ended the lesson very abruptly. So the teachers chose to develop opportunities to encourage metacognition earlier in the lesson. Through their constructs the children demonstrated how helpful listening, discussing and providing their reasoning through explanations were helpful to their learning. The teachers decided that they could facilitate this more

effectively and chose it as their third theme. The constructs also revealed children's concern about the social context. Children explored issues of being ignored and/or dominated and the teachers chose this as their fourth theme. This section examines lessons over the two years through these themes.

7.5.1 Creating opportunities to challenge children

Identifying children engaged in cognitive challenge in this study meant that children had to be seen focusing on tasks that were slightly difficult for them, where they struggled to achieve the solution. The quantitative data demonstrated that **Questions at task level** and **Express a challenge** were the most frequently used events to create challenge. Lesson transcripts showed that these two events were used with the same purpose, that of encouraging the children to engage in difficult tasks. However, the teachers noticed that they often set up the challenges in loose terms by neither being explicit in their language nor clear about the task. The teachers discussed the importance of using appropriate and clear language within each schema when introducing the challenge.

In the first year, lesson transcripts demonstrated that three teachers used appropriate and relevant language to the schema of seriation. However, Miss Arum tended to slip into that of classification. For example in Lesson 10 Miss Arum told the children: "*Put the stones in order.*" (Lesson 10, event 3) but later added: "*Put the smallest ones here and the biggest ones here.*" (Lesson 10, event 7) This example demonstrated that Miss Arum tended to move into the language of classification rather than hold firmly to seriation language. In fact, no stone was the same size as another. By confusing the language of the schema when inviting the children to make two lots of stones, Miss Arum confused children in the thinking about ordering into thinking about grouping.

In Lesson 23, Miss Arum used appropriate language to express challenge according to the schema of rules as in this example: "*There is one big rule about this town. What is a rule? Trucks are not allowed in Shopping Town*" (Lesson 23 events, 21, 22, 26). However, in Lesson 24 rules got mentioned only once at event 80 (the lesson ended at event 91) when Miss Arum asked: "*What are your rules?*" Until that point in the lesson, children were thinking up a game by deciding how to use the given equipment but they were not thinking of rules. By the lack of mention of "*rules*", the group were not encouraged to think in the appropriate way about the task. An obvious link (bridging) which was not made would have been to the previous week's lesson which had clearly emphasised "*rules*".

In the lesson using rolling bottles, Miss Arum was very clear with regard to separating the bottles into rollers and non-rollers, the classification element of the lesson. However, with regard to the question regarding what makes some bottles roll and others not-roll, she did not ask one question. Since this was the key schema of the lesson it could be assumed that the children did not get the most from this lesson in terms of expected challenge.

In the example in Table 7.3 using the causality schema, Miss Arum did not use the word "*cause*" once. The whole lesson was conducted (109 events) without any specific question or comment in relation to the

schema. In the demonstration of this lesson during the PD, the teacher/researcher modelled the challenge as:

You need to look at the first picture, think about what it shows, then look at the next picture and think about what has happened. For example, look at the candle here in the first square and look at it again here in the third square. Now, there is a question mark in between. You need to think what picture could go in place of the question mark to show what caused the candle to change from this to this. And here, what happened to the ice lolly to change from this to this? What caused these events to happen? What made the things change?

This demonstration provides a very different format from that being used by Miss Arum.

In the classification lessons, Miss Bramble frequently asked children to make groups. One example of this is: *"I want you to put them into groups of things that are matching or the same"* (Lesson 13, event 65). In Lesson 10, Miss Bramble asked the children to order the stones from big to small in one line: *"Do this big to small. Put them in one line. Do it together"* (Lesson 10, event 41). Later in the same lesson the children decided on a different way of ordering and Miss Bramble recapped: *"So now we want tallest to shortest"* (Lesson 10, event 94). The language maintained was that of seriation: putting things in order according to an agreed criterion. Miss Bramble was also clear in the schema, spatial perception. For example, as she distributed the cards of the pictures of the crossroads she encouraged the group to look and to discuss with a partner which card represented the view they could see.

What I want you to do is look at these cards with your partner. When you look at these cards sometimes there are pictures of things you can't see. Look at them all and find the one that shows the picture that you can see.

(Lesson 16, event 13)

However, using the time sequence schema, on each occasion Miss Bramble asked the group to make a story but she expressed this differently in each of the three lessons. In the first, Lost Boot: Lesson 8, she did not mention ordering, making sense or thinking. The children could have come up with any story and produced a rationale for it without difficulty. However, in the second lesson, Cooking: Lesson 12 Miss Bramble told the children that the cards were mixed up and she was having difficulty in ordering them.

The problem is that I can't put them back together in the right order. I think there is a story here somewhere. Do you think you can make a story together as a group?

(Lesson 12, event 52-55)

In these events, Miss Bramble referred to *"a problem"*, *"order"*, *"story"*, *"think"* and working *"together as a group"*. These were all the ingredients required to make this a challenge in this schema so were helpful introductions to this task. However, in Lesson 21: Cat and Snail story, the third in the time sequence schema, Miss Bramble gave only one instruction about the task: *I want you to talk together and make a story*" (Lesson 21, event 15). This did not fulfil the requirements of making the lesson challenging.

Miss Daisy was also unclear in her instructions at times. In the spatial perception schema she asked the children to talk to their partner to find the picture illustrating the view they had of the crossroads.

“Right, we’ve got some pictures but they’re not all right. For example, some have the bus stop in the wrong place. What I want you to do is talk in pairs and find the picture of the things from where you are sitting”.

(Lesson 16, event 30-32)

In terms of the schema, the weakness in this example was that Miss Daisy said the pictures provided for the challenge were not right. She could have strengthened the understanding of the schema had she said that the pictures were taken from various different sides of the road to show what somebody on that side of the road could see.

Miss Daisy used the language of the schemata appropriately in most lessons. In classification, one example of her introducing the challenge was: *“Look, this is messy. I want you to make them neater. Put them in piles so that all the things in one pile are the same.”* (Lesson 4, event 29) Miss Daisy used accurate language in seriation lessons too as in the Stones lesson: *“What I want you to do as a group is to put the stones in order. I want biggest to smallest.”* (Lesson 10, event 20)

Three observed lessons used the schema: Time Sequence. In each of these lessons children were asked to order cards to make a story. The lesson transcripts indicated that Miss Daisy suggested on each occasion that there was a right order, a way of making sense that the group must consider. She also encouraged the notion that there may be several correct ideas but that the children needed to explain what they were thinking so that their ideas could be understood by the group. In the following example, she encouraged the children to put the pictures of the giant in order to make a story about his lost boot and to be ready to explain their choice.

“Right, I want you to put the giant’s pictures in the right order so as to make a really good story. We are going to make one story. If you don’t want a picture there, you need to say why.. Give reasons...not right or wrong. Who’s going to start?”

(Lesson 8, events 13-18)

Miss Daisy usually used short focused questions. For example, in the schema causality she asked, *“Why are these rolling?”* (Lesson 20, event 149): *“So what do we need to make a shadow?”* (Lesson 22, event 22). She was generally clear and accurate in her language, however, in the lesson on Transformations Miss Daisy was less specific. She did not focus on the cause of any of the situations but just commented on something missing in the pictures. *“Here we have something missing in the sequence”* (Lesson 25, event 27). *“What has changed?”* (Lesson 25, event 43) These were the only two references that in any way could be construed as relating to the schema and even these were rather oblique

These examples demonstrate some of the aspects noticed and addressed by the teachers.

In the transcripts of the second year, all teachers were seen to introduce the challenges in a more focused and clear way. The language of the schema was generally accurate.

Miss Arum addressed the use of language of the schema “causality” and lesson transcripts showed that she used “cause” several times in each lesson of this schema. For example: *“What caused these bottles to roll and these ones to stay still on the ramp?”* (Group A2, Lesson 20, event 95). However, she used Lesson 24: Making a game as a PE lesson for the whole class and the emphasis on thinking was somewhat lost. Miss Arum mentioned in the initial instruction about deciding upon rules for the game but there was no other mention of rules during the lesson. When the children played the games that other groups had created they were not asked to play and then change one rule as the lesson required. This suggested that the aim of the lesson was not met and that this would not have advanced children’s thinking abilities.

Miss Bramble was more attentive to providing explicit instructions for the tasks in lessons. Lesson transcripts showed that Miss Bramble was attentive to the schema being used in lessons and used language appropriate to most of the schemata in lessons. It can be assumed that this clarity would give the children the best opportunity to develop the thinking in the schema used.

Miss Comfrey also used the language of the schema appropriately in most lessons. She asked children to put objects into groups such as in the following example: *“I am opening a button shop. Can you sort them out so that I can put them in the shop?”* (Group C2, Lesson 6, events 16-17). In Lesson 10, she invited children to order the stones: *These stones are all in a mess. I want you to put them in an order. What sort of order?”* (Lesson 10, event 28) Throughout the lesson, Miss Comfrey stayed focused on ordering according to a different criterion each time so the children were being given good modelling of the schema they were using. With regard to the schema, spatial perception, Miss Comfrey was also clear in her instruction. She asked the children to work with their partners to work out the picture to choose.

You’re going to work in pairs, helping each other. I want you to choose the picture that you can see, the one of the things you can see here.

(Lesson 16, events 31-32)

Miss Daisy appeared to focus more on cause and effect in Lesson 25 than in the first year. She frequently asked about the cause: *“What caused this to happen? Look at the candle. What caused it to go from this to this?”* (event 35) *“What caused the ice lolly to be like this?”* (event 59)

It seemed that the teachers were much more attentive to introducing the challenge clearly and with the appropriate language of the schema.

The second issue in this theme was that the teachers noticed that they frequently reduced the challenge for the children. Having heard through the constructs that children found challenges helpful to their learning, the teachers were inspired to ensure that all children experienced the challenges as somewhat difficult.

In the first year, the lesson transcripts indicated that Miss Arum asked several short questions and particularly used the question "Why?" frequently. These short questions appeared to encourage children to continue to work at the challenges and provide explanations. However, at other points in lessons, Miss Arum could be seen to bring the challenge to a rather hasty solution by her intervention in providing a solution. In the following extract the group was discussing where in the story the cook should wash her hands. Before agreement on a solution had been reached, Miss Arum suggested an order for the story.

G: Well, she can wash her hands after the carrots then.

Tif: I think she should do it before the carrots.

T: *Why do you think that?*

Tif: 'Cos my mum says.

T: *But your mum is not here?*

Jack laughs loudly

Tif: No but she tells me before I eat my tea – wash my hands.

T: *OK So shall we put that here, then the carrots and then the bread?*

(Lesson 12, events 56-63)

At this point, Miss Arum moved the cards into her order which discouraged further discussion and explanation of children's ideas. The lessons frequently came to a sudden end in this way.

Lesson observations also showed that Miss Arum frequently short-circuited the thinking by providing a huge clue to "solving the problem". One example of this was in Lesson 7 when the children were classifying blue animals in one hoop and sheep in another. They were finding it difficult to agree where they should put the blue sheep. Within a few seconds, she intersected the hoops (Lesson 7: event 94) effectively ending the challenge. Another example was in Lesson 8: Lost Boot when only a story from two children was accepted. The lesson finished after only 46 events. A further example came in Lesson 22: Shadows when the children were trying to work out what is needed to make a shadow.

T: *What if I just had the torch?*

A: No.

T: *Why?*

N: We can make shadow without the tree, we can make it more bigger but not get shadow.

T: *How did you work out we needed both the torch and the tree?*

(Lesson 22, events 32-36)

In fact no child had mentioned needing both the torch and the tree and the results can be seen later in the lesson when the group still did not understand that both light and object are required to make a shadow.

Miss Comfrey, like Miss Arum, frequently asked questions which gave clues to the answer she appeared to want. For example, when describing pictures of the giant looking for his boot, the children were asked:

- T: *What do you think the giant is doing?*
M: He's in his kit....
T: *Do you think he's making a cup of tea?*
M: Yes.

(Lesson 8, events 140-143)

The children had had no opportunity to say what they thought the giant was doing when Miss Comfrey made her suggestion. He actually was not making a cup of tea but the children all agreed that he was. Since this programme is aimed at developing children's own thinking this tendency to give the children ideas was unhelpful.

Miss Comfrey also short-circuited the thinking at times. In the following example she suggested that light bottles did not roll down the slope just as a child was about to explain what she thought. In fact, it is the lightest bottles that roll down and also the heaviest. However, this fact did not get discussed as the children agreed with Miss Comfrey and she left them with that idea.

- T: *Why did these roll down and these didn't roll?*
C: 'Cos of rice.
M: 'Cos if there's a bit more...
T: *Do you think they don't roll down because they're very light?*
M: Yes.

(Lesson 20, events 173-177)

In the second year, it can be seen that teachers encouraged the children to focus on the challenges while neither suggesting solutions nor short circuiting the thinking. Sometimes, the time for the end of the lesson arrived without the children having solved the challenge. Teachers asked children to keep thinking about the challenge until later in the week when they would be given time to discuss. On Friday afternoons, teachers timetabled a 15 minute slot to discuss further ideas about that week's challenge.

7.5.2 Creating opportunities to facilitate metacognition

The quantitative data show that the number of metacognitive events increased substantially in the second year. It can be seen from some of the first year lesson transcripts that it was only within the last few minutes of CA lessons, that children were asked what helped them to complete the challenge.

Occasionally children were asked to elaborate by the teacher asking a supplementary question. However, very little time was given to **metacognition** in the first year. The example below demonstrates the normal pattern of accepting a few ideas and then abruptly finishing the lesson.

- T: *What helped us?*

J: God.
G: Waiting.
Tif: Thinking. Thinking of your own one.
J: Thinking of what he said.
A: Waiting. Looking at different colours. My brain in my head.
T: *Go and sit on the carpet.*

(Group A1, Lesson 9, events 122-130)

In some lessons, a little gentle probing gave more time for metacognition. For example, in Lesson 12, Miss Arum gave an example of an aspect that the children had clearly tussled over.

T: *What made that job difficult?*
J: It was easy.
T: *Was it?*
J: Yep.
T: *But I thought we had some problems like when we had to decide when she took her hat off?*
J: They had. I didn't.
A: No, I hadn't. I knew when she took her hat off.
T: *Well, we all had ideas but what about when we have different ideas and we try to agree on one of them?*
J: I don't want to.
T: *You just want to keep your own ideas?*
J: Yes.
G: But sometimes you're wrong and we have a right idea so if you'll change you'll be right.
J: No.
T: *What do you mean, Jack?*
J: It's my idea and so I keep it. It's not wrong.
T: *Well, we need to finish now.*

(Lesson 12, events 126 -134)

Evidence suggested that in the first year, Miss Bramble gave some time towards the end of every lesson to encourage metacognitive aspects. She appeared to be the only one of the four who consistently gave time to this aspect of the lesson. She used a variety of questions as if trying out what helped the children. The example below demonstrates how Miss Bramble encouraged children to enter into metacognition by questioning them on what helped them in their decision making.

T: *When you were doing this, what helped you make the story?*

- A: This and this together 'cos same walls.
- T: *What helped you make the story?*
- M: Showing pictures.
- T: *What made you decide which?*
- S: I thought in my brain for a minute and chose each picture.
- T: *So was that important?*
- S: To do it carefully. Think before you do it.
- T: *What helped you, Claudio? What did you have to look at?*
- C: He didn't find his shoe, the dog found it.
- T: *Was that important?*
- C: Yes, 'cos he shouldn't leave his shoes outside.

(Group B1, Lesson 8, events 162-175)

More time was given to metacognition in Group B1 and a wider range of questions was asked than in any other group in the first year. Also, on occasion, Miss Bramble recapped on what the group had done during the activity to try to help the children to think of what was difficult. The example below illustrates Miss Bramble helping the children to think of the steps they had taken in their challenge. She did this by repeating the actions taken with the reasons why the action had been chosen.

- T: *What helped you do this?*
- J: Looked inside.
- M: Tested them.
- N: Look inside them.
- C: Nothing That one rolling and that one didn't.
- T: *What helped you?*
- C: It never rolled.
- T: *What were you doing?*
- C: Checking them. Checking them rolling down.
- A: Your brain.
- T: *What made it hard? To find out what ones rolled because we didn't know. We checked it, put it in the right order. If it rolled we put it there then those ones that didn't roll we put here. I notice you sorted all the rollers out? What made you do that?*
- S: I think. I check then I put them in order.
- T: *In order?*
- S: Groups.

(Lesson 20, events 172 -194)

Miss Daisy usually gave a little time to metacognition but not in every lesson. She was less formulaic in her approach than Miss Arum and Miss Comfrey and tried to understand what was difficult for the children. In this example, Miss Daisy tried to help the group to question their idea of a card being wrong and encouraged them to think instead of why they took the card out of the sequence

T: *Well done. You've worked hard. Was it difficult?*

N: No. It was easy.

T: *Was it?*

D: No, 'cos the snail was wrong.

T: *Was it wrong?*

D: Yeah, 'cos we had to take it out?

T: *We took it out but was it wrong?*

Tamu: The snail was wrong.

(Lesson 21, events 166-178)

Another example of children trying to respond to a question encouraging metacognition came from the same group:

T: *Who found that difficult? Right, what helped us?*

D: Working together

Tamu: We thought about it a few times

N: We had to think about the important one not the one that didn't matter.

(Group D1, Lesson 23, events 126-130)

The meta-explanations provided by Nemy were logical, coherent and addressed issues pertinent to developing thinking strategies. Unfortunately lesson transcripts showed that his metacognitive events were neither developed nor used to demonstrate to the children how thinking in this way could help them be more successful learners.

In the second year, there was a consistent effort in each lesson to use metacognitive questions, meta-description and meta-explanation. The opportunities for each of these events were substantially increased by the teachers. These were usually used half way through the lesson when the group were concluding the first aspect of challenge and again towards the end of the lesson. Also, teachers tried to remind children in the second cycle of the lesson of what they had said in the metacognitive aspect of the first cycle with a view to using the consciousness more effectively.

T: *Can you remember what we said we were thinking about when we put the animals in groups?*

(Group D2, Lesson 5, event 97)

The fact that both the teacher's and children's meta-events increased in the second year indicated that the groups were given the opportunity to increase their conscious awareness of their thinking and their facility with this type of functioning.

7.5.3 Creating possibilities for the children to engage in exploratory talk

In March and July the children provided constructs- **talk, explain, discuss** implying that they were involved in exploratory talk. In their explanations and descriptions during interviews **explain** was used a lot as an activity that children found helped their learning. Transcripts of lessons demonstrated that children were frequently involved in discussion where they were expected to reason.

When the children were engaged in the challenge, the transcripts showed that they explain, agree/disagree and question. Where children engaged in **task explanation** they were more likely to increase their cognitive development as this level of functioning encouraged them to articulate their reasoning in a way which was more demanding than **describing**. In the following example where children struggled to solve the challenge, the teacher was seen encouraging the children to consider the challenge. In this lesson the children were given pictures of forms of transport and a board to represent a town and beyond. The children are told to place the pictures around the board so as "not to break the rule which was that no lorries were allowed in the town.

- T: *What's our rule?*
G: Lorry not allowed.
T: *So do we have to move the van?*
S: Yes.
Tif: Yes.
J: Lorries not allowed inside the town.
S: These can park outside.
T: What about inside the town?
S: Move the vans and leave the motor bikes.
T: Do you agree?
N: Yes.
T: *Why?*
N: Cos that's the van and Jack said lorries aren't allowed in there but the van is too big.
T: *What's the rule?*
G: Don't park inside the town.

(Group B1, Lesson 23, events 37-51)

In this example, the children were struggling to hold on to the rule regarding lorries not being allowed in the town and ignore the distractions of vans and motor bikes. In fact, the lesson was created deliberately with the fact that five year old children would find this difficult. The teacher patiently kept questioning the group about what the rule for the town was until they completed the challenge. Although the children could

repeat the rule none of them explained in accordance with the rule what they were doing when they moved the pictures.

Other examples showed that Miss Bramble asked questions that allowed for description and explanation and she gave children the time to express themselves. If they provided a one word answer, she sometimes asked them to expand on this to demonstrate more fully what they meant.

T: How do we work out which is longest?

S: Longer.

T: How do you know?

A: 'Cos...

S: I know 'cos you stretch it.

T: Listen. How do you know which is longest?

S: Measure.

T: How?

S: Put some on bottom.

T: Can you explain a bit more – and show us what you mean?

(Lesson 10, events 123-133)

This example demonstrated that Miss Bramble patiently questioned the group to encourage them to explain or describe what they were doing or thinking.

In the second year evidence from the children's interactions in the lesson transcripts indicate that opportunities for exploratory talk were provided in a broadly similar way as in the first year. Teachers encouraged the children to suggest ideas, offer possible ways to reach a solution and discuss possible ways forward with explanations and reasons. When children made suggestions without a reason or explanation, it was not unusual for children to be heard to challenge the child to give their reason. This indicates that the children had come to understand not only the ideas being considered but also what underpinned the suggestions.

7.5.4 Consider carefully the social context during each lesson

Within the interviews, children from each group discussed aspects that caused some concern. Teachers were committed to make changes to the social context to improve the learning experience of all children as a result of these explanations.

The observation notes for Group A1, frequently recorded that Jack was disengaged, staring out of the window or looking around the classroom. Also, he often made disparaging remarks about the other children. As an observer of Group A1, the most striking perception was of Angela and Jack tussling for dominance within the context of the tasks while Grace and Nurad appeared to remain more focused on the cognitive challenge. Observation transcripts and lesson notes also demonstrated that the normal

pattern in response to challenge was that Angela dominated the group with Jack clearly resenting this and trying to demonstrate that he was cleverer than Angela. For example:

- A: Wait. Wait. Listen. Do what I say.
J: You're not the teacher
A: I'm helping you. Do you understand what card?
J: We're not listening anyway. Don't need you.
G: That doesn't go there.
A: Yes, it does. That's right. It goes there.
J: That's last 'cos he's ate all his dinner. He's sleeping.
A: No, it goes here.
J: That's last anyway 'cos he's ate his dinner and he's all fat.
N: It could go first. He's asleep before mum comes in.
J: No. He's fat. It must go last. This must go first 'cos he's thin then.
A: No, this goes here 'cos he's eating.
J: No this does with the food in the bowl. You're stupid.

(Group A1, Lesson 21, events 68-92)

When Jack did not get his way in manipulating the equipment or when his idea was not accepted as the one to lead to the solution he sulked and became silent or made remarks. In the instance above, Angela's idea was used and the observation notes read:

"At this point, Jack sucks his fingers and looks all round the room. He acts as if he is not listening."

Following this, Jack did not make a positive contribution until event 104.

- Tif: She put up the rubbish
T: *What do you mean?*
J: She puts the rubbish in a bag and then goes outside to the bin.
Tif: And sweeps the floor.
J: No, she sweeps the floor and then puts the rubbish out.

(Lesson 12, events 102-106)

This indicated that he had been listening because his first intervention was to scaffold for Tiffany and try to enlarge the sentence. When Tiffany joined in, he corrected her and maintained the floor must be swept first. He tended to disagree with any of the girls but was particularly argumentative with Angela who generally argued back.

Miss Arum sometimes allowed both Angela and Jack to manipulate the equipment and follow their individual ideas. However, as the tasks have to be solved collaboratively, it was not possible for two different ways to be tried simultaneously. Lack of agreement to try one idea first, inevitably led to disagreements. On each occasion Angela held firmly to her idea and to her manipulation of the equipment and when she refused to listen to Jack, he became disengaged within a few minutes. Generally, he turned away, made a face and moved his chair away slightly from the table. This was not addressed by the teacher. He sometimes stayed disengaged for more than five minutes. The usual pattern was that he remained at a distance until Miss Arum spoke to him directly and drew him back into the lesson.

For example, in Lesson 7, when the children were trying to work out where to put the animal that should be in the intersection of two hoops, Jack's idea was not taken. Jack sat sucking his fingers turned slightly away from the group for six minutes before the teacher spoke to him. When incidents of this nature happened, it was clear that he had been listening to the conversation because he was always able to use the current idea to offer an alternative suggestion. During the time when he was disengaged, Angela listened to Grace and the two of them usually collaborated in seeking a solution. In Lesson 8 for example only Angela and Grace really participated. They took the cards and made a story and then the others did not even want to try to fulfil the challenge.

The observation notes showed that half way through the year Jack started to make remarks about Angela and sometimes about both Angela and Grace. He referred to Angela as "bossy", "trying to be the teacher" and "stupid". Angela and Grace always sat on one side of the table and Jack and Nurad sat together on the opposite side. Jack also made remarks to Nurad and smile at him. The remarks to Nurad could not be heard but from his demeanour it can be assumed they were disparaging of Angela. Nurad looked uncomfortable in this situation. He looked at Jack and smiled but then looked away from him to the teacher as if wondering what to do. He appeared to weigh up how to behave. Sometimes the two of them held a very quiet conversation but mostly Nurad kept his eyes on the equipment.

As the lesson ended and the children moved back to their tables, Jack often said that he had had the idea that solved the problem and had the others listened to him they would have finished more quickly. However, there was no evidence from the transcripts that this was the case. It seemed that he did not want to appear to be challenged by the task. It may be that he had the idea that "not to know" was a weakness and he may not have wanted to be seen in this way. Jack was the one who sometimes referred to others as "stupid" so he may have thought that finding things difficult indicated something about his own intelligence. The only occasions when he appeared to be engaged for more than a few moments were when he was being allowed to lead the group in pursuing one of his ideas. At these points, he refused to allow any other child the opportunity to speak or to move equipment. When his idea did not lead to the solution he became annoyed, blamed somebody and became disengaged again. For example:

T: *Right, let's see if they all grow.*

J: Train doesn't.

A: It moves.

J: But it doesn't grow. You put it there. Not me. I'm not stupid.

(Lesson 13, events 145-151)

It may be that the cognitive challenge for Angela assumed less importance than trying to show Jack that she was cleverer than him. She appeared to want to take control of the group and to demonstrate that the tasks were easy for her. In fact, the tasks were difficult for her as evidenced by the fact that she struggled to contribute ideas that took the group forward. Miss Arum gave her frequent reminders to listen to the others and on one occasion she called her "*Smarty Pants*" and on another she told her she was a "*Bossy Boots*". For example:

N: That should be a big apple tree.

A: Put house there. Put house there. Put it there. It can face any way.

T: *You're a Bossy Boots today. Can you remember to listen?*

(Group A1, Lesson 26 events 52-58)

During interviews, Grace was clear that Jack had no time for her and the transcripts showed that, in fact, he did not speak to her. She frequently spoke very quietly to Angela and then Angela made a comment. It seemed that Grace was feeding ideas for solutions to Angela who was then saying them to the group as if they were her ideas.

At the intervention meeting when the teachers heard Grace's constructs with her explanations, they were shocked. Miss Arum was concerned that this situation had existed all year and she had neither recognised it nor addressed it in any way. The teachers discussed how to avoid such a situation happening again. The seating arrangement in each group was one factor discussed. The teachers agreed that they should be responsible for deciding how children sat in the group and how conversations could be monitored. They agreed that no child should be allowed to dominate. Children should not be encouraged to speak for another child but each child encouraged to speak for themselves.

In the second year, in Group A2, Anna, Philomena and James were the children who, from the beginning of the year, were the most verbal and active in solving the challenges. Anna and Philomena tried to talk together as they struggled with some of the challenges but Miss Arum was pro-active in encouraging them to share their ideas with the whole group.

J: This one's tallest.

A: This one's tallest and this one's shortest.

J: Or longest.

P: And this middle sized goes in between.

T: We have heard what they think, Jackie, what about you? Let's hear what you think before we decide where they go.

(Lesson 2, events 17-22)

At no point were Anna and Philomena allowed to follow an idea without sharing it with the group and getting agreement. Anna tended to want to work with Philomena and discuss things with her but the teacher encouraged her to share with the whole group.

A: (in a low voice to P) I think it is a hexagon ... faces and sides like a hexagon.

T: I heard a good idea there, Anna. Can you share it with all of us to help us to think of the shape too?

(Lesson 17, events 42-45)

This had the effect of encouraging children to work together as a group, treating everybody with respect and helping them to understand that each person's contribution helped in some way. During the year, the other children in the group, Tahmid, Jackie and Abda, became more confident. Their ideas were welcomed and used along with the others. Very often, Abda and Tahmid particularly, used the equipment to demonstrate what they meant. Early in the year, the teacher then modelled the language required and the children nodded or shook their heads appropriately at the teacher's interpretation of their idea. Gradually, the other children in the group began to take on this role from the teacher. Evidence from lesson transcripts suggested that Miss Arum had become very aware of encouraging every child in the group to voice their ideas. The constructs from this group were positive about collaborative work with no reported dominance.

The children in Group B1 reported in their interviews that Sacha prevented them from discussion, sharing equipment and frequently solving the puzzles. The observation notes for Group B1 often recorded that Miss Bramble had left the group and then the behaviour changed. For example, The children are all shouting out words. Nobody is listening to each other. Sacha has taken a whole bundle of cards and is scattering them around the table as she shouts out what is on each one. Another example is, All the children grab some cards without looking at what they are taking. Sacha is shouting loudly and demanding one particular card.

It was not unusual in this group to have situations like this. While this behaviour predominated children neither focused on the task nor considered their own thinking.

In the first year when Miss Bramble set the first problem Sacha invariably immediately grabbed the equipment and tried to tell the others what to do. For example:

T: Can you all do a story together you all agree?

S: We share them.

M: And not grab them.

S: I'll tell you what we can do. This is the castle first.

(Group B1, Lesson 8, events 38-42)

- T: *OK Let's try Sacha's group. What were they?*
S: In water, inside, outside. I'm trying to get them in order.
J: These go outside.
A: I want to help. (Sacha continues to do all the sorting)
J: That's inside. (Abdul takes two cards)
S: No, shells go in water. (Sacha grabs back Abdul's cards)

(Group B1, Lesson 13, events 101-108)

John often came up with a suggestion which could have led towards a solution but he usually was shouted down by Sacha and often his suggestion was not followed through to a successful conclusion.

- S: The lady brings the food and puts it in the bowl and the cat eats it all up and gets fat and goes to sleep.
J: But that's wrong 'cos there's the snail.
T: *Can you explain that a bit more?*
A: The snail is going up the wall.
J: But he's wrong here
S: No, no, no He comes back. He can come back too.
M: But there's the trail. He just keeps going.
J: Yes, that's right. The snail is not right with the cat so we need to....
S: No, he can, he does. You're wrong.

(Group B1, Lesson 21, events 36-49)

Sacha was clearly challenged by the tasks. Although she jumped in saying she knew the answer and she knew what to do, the transcripts demonstrated that, in fact, she did not help to resolve the problems by producing the final solutions. Sacha was very distracted from the challenge by her apparent need to demonstrate that she was clever. Abdul repeatedly responded to Sacha and appeared not to allow her to squash his determination to fully participate.

- T: *Can you see the horse?*
S: No, can't see horsey
A: Yes, yes, I'm right. I am right. You're wrong
S: No, you're wrong. You've found mine. It's mine.
A: I am right.

(Group B1, Lesson 16 events 106-116)

Abdul, Sacha and John seemed very motivated and intent, in varying degrees, to demonstrate that they were the one to solve the problem that the thinking was given less time and attention. Sacha was frequently heard shouting remarks and being seen to grab equipment, refusing to share it. Abdul always objected. Sacha did not give way and an argument always ensued. Miss Bramble encouraged them to try to sort out a method of work and she drew in other children in the group to offer suggestions. John often disagreed with Sacha too but he was quieter and less persistent than Abdul and Sacha showed more tolerance towards John. Sacha may have recognised that it was worth listening to John as he often had good ideas that were successful in solving the problem. However, when an idea led to success, Sacha always claimed that it was her idea. Transcripts showed that in fact this was never the case.

Lesson transcripts showed that Sacha did not listen to the others and if the group did not follow her suggestions she became very frustrated, shouted and occasionally threw the equipment across the table. Frequently, throughout the lesson, Miss Bramble asked her to co-operate in collaborating. However, Sacha's periods of calm co-operation were short lived. The reminders of what was expected during CA usually resulted in Sacha becoming sulky and withdrawing for several minutes. This created the opportunity for Miss Bramble to refocus the rest of the group and get them back to solving the task of the lesson. As soon as they began to offer ideas and manipulate the equipment, Sacha began to join in claiming that she had the solution. This pattern was repeated throughout the lesson. Sometimes, despite the disruption, they were successful in reaching a solution that satisfied the challenge. Sacha always took the credit for bringing the group to a successful conclusion. If they did not reach a solution, Sacha always blamed the others for preventing success.

For most of the time the teacher was present, children remained engaged and active with the task, Sacha was kept under a degree of control, children provided ideas which were tried out and usually the group solved the problem. The children clearly struggled with the tasks and did not find them too easy. However, without the teacher this focus was lost and the group seemed unable to continue to collaborate, try ideas or reach any solution. Despite Sacha's frequent and repeated attempts to dominate the group, the children stayed engaged and tried to find the solutions.

Miss Bramble was very open about experiencing Sacha as a problem and wanted support from the others in how to deal more effectively with such children in future. The teachers encouraged Miss Bramble to be firm in not accepting such behaviour and to explain why behaviour of this nature cannot be tolerated. It was agreed that children with needs such as Sacha had to be supported in changing their behaviour little by little so that both they and others could learn. They agreed that as the teachers they were responsible for facilitating a positive environment for all the children. The teachers agreed that sometimes children need specific targets to work on in order to support more appropriate behaviour patterns developing. The teachers also agreed that it was unhelpful for the teacher to leave the group as they needed to be present to facilitate children's thinking.

In the second year, there were no occasions when the children became distracted by loud or excitable behaviour. In contrast to Group B1, it was noticeable that Group B2 was calm and listened to each other well using language provided by each other in a co-operative way.

T: *I want you to look at the pictures without saying anything. (Pause for 2 minutes)
Now, I want you to go round the group. Point to one thing you know and say its name. Then we'll each say one thing we don't know.*

Thom: Starfish.

S: Sun.

M: Leaf.

R: Shells.

Gav: Baby.

G: Tree.

T: *Well done. You know lots of things. Now, what about the things we don't know?*

R: That thing.

Thom: That's an octopus.

Gav: It might be a jellyfish.

Thom: Oh yeah. I've changed my mind. I think it's a jellyfish too.

(Group B2, Lesson 13, events 1-19)

The calm, listening environment meant that the group moved into the challenge in a focused way ready to consider the problem posed and to think of possible ways to come to a solution. In Group B2 Thomas and Gavin were the main players at the beginning of the year. Miss Bramble encouraged them to repeat their verbal contributions as they demonstrated their ideas with the equipment. This encouraged the other children who often demonstrated a different idea without saying anything. The teacher then said what she thought they were thinking and they indicated their agreement or tried again to show what they really meant. Thomas was particularly helpful in that he understood very early on how to support others. He took on the role of modelling behaviour ensuring that all the children had a fair chance to provide ideas.

Sometimes, Gavin became impatient at waiting for Georgio to express himself and tried to take the equipment from him and suggest his own idea. Miss Bramble stopped this by explaining why it was important for Gavin to allow each child to speak and/or to use the equipment to explain. She smiled approval at him and tried to stop him tactfully, *"I know you're trying to help but it's good to let others speak when they want..."* In this way, he realised that he had to wait and give everybody the opportunity to share their own ideas. On each occasion, Gavin accepted without argument and gradually began to correct himself until he appeared to stop this type of behaviour.

G: It'sit's like, umm it's ...

Gav: Look, it goes ...oops, sorry, you try again, Georgio.

(Group B2, Lesson 10, events 36-38)

The observation notes recorded that Gavin grabbed a stone from Georgio and was about to place it where he wanted it in the line. He then realised that he should not have done this and handed the stone back to Georgio with a smiling apology. Georgio accepted the stone and said, *"It's long. It goes here."* He put the stone where he originally wanted it.

All the children in this group were challenged regularly throughout the lessons. They worked collaboratively with a determination to solve the problems posed. Thomas and Gavin contributed the largest number of events, however, they also allowed the others to contribute and to move the equipment where they thought it should go. Thomas was particularly good at scaffolding the language for the others. He would say, "Do you mean.... ? Do you think that....?" and it was clear that this helped the children to develop their language skills. As the year progressed Renata and Sakia seemed particularly encouraged by Thomas to express their ideas.

Miss Comfrey asked many questions to encourage the children to enter into the challenge and to describe and explain their thinking but was also very concerned about behaviour management of the group and gave frequent instructions about keeping hands in laps, listening to each other and not touching the equipment.

T: Everyone like this. (finger on lips)

T: What's this?

P: House.

J: Sheep.

T: Where's the sheep? I want you to work sensibly. What I want you to choose...Wait. Hands itchy? Wait in laps. No snatching. When you've chosen then put in front. Sit like this. Hands in laps.

(Lesson 26, events 12-25)

T: Can anybody tell me anything about the stones? Sitting beautifully, Tom.

Tom: Different sizes.

M: Different colours

P: They're hard.

T: If I show you..Hands in laps. Don't touch.

(Lesson 10, events 14-20)

Miss Comfrey set the challenge clearly but the lesson transcripts showed that as soon as children began to demonstrate enthusiasm and interject with ideas to solve the task, Miss Comfrey interrupted with a behaviour admonishment. Interestingly, the rest of the class became quite noisy during the second half of each lesson but Miss Comfrey rarely appeared to notice. Miss Comfrey stayed very much in control. The children had only short opportunities to manipulate the equipment as can be seen by the few places where

children held a conversation between themselves without a teacher intervention. Many of the frequent interventions were reminders of how to behave.

- J: Ice cream then sun melts it.
Tom: No, 'cos I can see teeth marks.
T: *Why?*
Tom: The teeth marks here so that one goes 'cos that's the mouth.
T: *Tom, talk nicely. Don't snatch. Listen. Don't snatch. Talk nicely. What happens first?*
Tom: Bited ice lolly has ...
P: Bite taken out.
M: That can't go there 'cos it's not bitten yet and sun goes there 'cos it melts it.
Tom: No. Not that one.
T: *No snatching. I want you to talk beautifully and think.*

(Lesson 25, events 75-90)

The above example is typical in that as soon as this group got excited and started expressing different opinions, Miss Comfrey stopped the conversation to remind them of how to behave and the conversation was not picked up again and so the thinking appeared to be lost. The children sometimes did not solve the tasks and the lessons came to a somewhat abrupt end. For example:

- Tom: If that's there, it ain't breaking the rule 'cos the rule is no trucks in the centre.
J: But it's not in the centre.
Tom: 'Cos the rule is that...
T: *Right. Stop. On the carpet.*

(Lesson 23, events 144-149)

- W: No, knocked all flowers off
T: *Do we all agree?*
W: No.
Tom: Put another seed in and make it grow.
M: These are just drips of water not flowers.
T: *Are you all happy with that?*
W: No, 'cos the flowers are off.
M: Put all the water in.
L: And it'll get bigger and bigger.
T: *Right. We'll stop there.*

(Lesson 25, events 157-167)

It can be seen in these examples that the children were in the middle of trying to work something out when for no apparent reason the lesson was brought to an abrupt end without explanation.

Miss Comfrey had to work hard to encourage Group C1 to contribute in the lesson whereas in other classes, children spoke spontaneously and naturally from the beginning as soon as they saw the equipment for the lesson. The lesson transcripts demonstrate that it was very rare in this group for more than two events between children before the teacher cut in. For example,

- T: *Is that a shadow?*
- P: No, it's just the line of the torch.
- T: *Where is the shadow of the pyramid?*
- P: Take the pyramid away.
- T: *OK. What happens?*
- P: No shadow.
- T: *What do you think causes the shadow all of you?*
- L: By the light.
- Tom: The bulb.
- T: *What does it do?*
- Tom: Lighting up.
- P: Light 'cos when you turned the light on the shadow came.
- J: The light.
- T: *Right. Take this shape away.*
- P: No shadow.
- T: *But you said it was ...*
- P: But only if there is something there.
- T: *So what causes the shadow?*
- P: Light.
- T: *Take it away.*
- P: No shadow.
- T: *Sit down. Do this, and this and this (bodily actions)*

(Lesson 22, events 69-92)

The above transcript is not only an example of children not being allowed to discuss the problem amongst themselves but also an example of a common event that took place. Just when a child appeared to be on the cusp of understanding Miss Comfrey cut in and changed the conversation to ask children to do bodily actions. The moment was lost as the distraction took over. In this lesson the children were struggling to identify what created the shadow and to recognise that the light alone is insufficient to create a shadow. At

event 87, Polly said that there was only a shadow if there was something there, she then named the light as the cause but the observation notes read, "Polly, looked as if she was going to add something. She was staring at the paper and the light shining on it. She glanced at the object but as this was happening, Miss Comfrey switched off the light and asked all the children "to move." On these occasions, the children never returned to the question they had been struggling with and no solution or conclusion was ever discussed.

In Group C1 Paige and Mark were the ones with the most verbal events at task level but the quality of their interaction is poor which may be attributed to the frequent interruptions from the teacher. There was no obvious tension between particular children in Group C1. In as much as children got involved they all appeared to be challenged. There was very little space for child to child interaction of any nature. Given the distraction that tension between children caused in other groups, it may be that the lack of this interaction was a positive aspect which could encourage concentration and focus on the cognitive challenge. However, this appeared to be offset by the frequent behaviour reminders and the repetitive nature of Miss Comfrey's interactions. These seemed to lead to boring the children as they often seemed distracted and more interested by the other activities that the rest of the class were involved in rather than fully engaged with the task of the lesson. It may be that because the children were frequently interrupted as they struggled to explain what they thought, especially when they tried to use the equipment to demonstrate what they meant, that they lost interest in challenge and did not experience the value of going through the struggle and achieving success at the end.

During the intervention meeting, Miss Comfrey expressed her concern over behaviour management and could see that she had not allowed the children to discuss in the same way as the other teachers.

During the second year, Miss Comfrey was still very concerned about behaviour and gave frequent behaviour reminders as the children were struggling in trying to express their thinking. Evidence indicated that she kept tight control over the group and gave the least opportunities for children to discuss with each other. In Group C2 Stacey and Matthew spoke the most frequently but their conversations were never allowed to continue to reach a solution to any problem. This group generally had few opportunities to speak and to discuss between themselves as the teacher still made frequent interventions, often regarding behaviour rather than thinking.

Miss Daisy usually opened the lessons with a story which set the context for the challenge. Her concrete preparation times were short and focused and usually the first task was set within the first few minutes. Immediately, the children began to put forward ideas of how they should go about finding a solution. Miss Daisy supported them in their ideas to promote challenge usually by asking further questions.

T: *This farmyard is in such a big muddle. What do we need to do?*

D: Put in order.

T: *How?*

D: I want all horses over here, big horses over here, little pigs over here.

T: *OK. Off you go all of you. Help her. Karen are you helping? What do you need to do? Temi, what does she want there?*

(Lesson 7, events 45-54)

In this example, Dawn immediately suggested how to tackle the problem. Without discussion her idea was promoted by Miss Daisy who suggested that they all help to complete this suggestion. Nemy, Temi and Dawn suggested lots of ideas and provided explanations in this group.

N: All the ones that swim under water go there.

T: *OK, You begin.*

N: Slug – duck ‘cos it swims under water and live under water and it’s called a duck.

T: *No, that’s not the reason.*

N: It’s because it moves the same.

D: That duck.

T: *Give an example.*

N: I know toad, slug, cat, lizard. That’s not got a tail – tail.

T: *So you think it’s about tails?*

(Lesson 14, events 41-50)

In this example, it is Nemy who was leading the discussion and following the line of argument.

Miss Daisy seemed to be the teacher with a form of discipline which gave her control but allowed the group time and space. However, in Group D1, some tension developed between Nemy and Dawn. When followed, Nemy’s suggestions usually led to a successful conclusion and he explained why his idea worked. It can be seen from the transcripts that this group had many opportunities to continue conversations between themselves without Miss Daisy intervening. For example,

N: That lorry needs moving.

T: *Why?*

N: ‘Cos lorries cannot go in the centre.

D: The motor bike should go in the centre

N: No, ‘cos it’s lorries not allowed in centre.

(Lesson 23, events 52-56)

However as the year went on, Nemy began to appear frustrated that Dawn did not readily accept his ideas. He gave way to her but he put up some resistance. Dawn often asked to take a vote when a crucial stage in the lesson was reached, when a decision was required to decide whose idea to follow. For example:

N: There. There. It goes there.

D: No. It goes here.

N: No, it's too long. It goes there.

D: Let's vote then.

(Lesson 10, events 145-153)

Every time Miss Daisy allowed the vote to happen. On each occasion, Dawn phrased the question and the others put their hands up to vote. It was unclear whether Mooni and Karen understood what a show of hands meant but, on each occasion, they both raised a hand. This meant that the vote always went in Dawn's favour. Tamu and Nemy were always the only two who opposed her idea. Nemy clearly saw that following Dawn's suggestions were not going to lead to the solutions. With Dawn winning the vote on each occasion, Nemy and Tamu became increasingly frustrated. However, they co-operated each time but it was obvious that they felt they were wasting their time. Dawn did not seem to take on board that Nemy always came up with a suggestion that helped. She always insisted that her ideas were followed first. She appeared to find the tasks challenging. She was keen to put forward ideas, made suggestions and led the group. This aspect seemed to take precedence over the thinking required for the task.

During the intervention meeting the situation was discussed. All agreed that the children needed to be allowed to discuss and demonstrate their ideas to solve the challenge and the voting did not encourage the development of thinking.

In the second year, Aurora and Bernie related well in the group and tended to want to work together in a pair. Miss Daisy encouraged them to share all their ideas and would not let anybody try out suggestions until the group had fully discussed the ideas. Rakhmi and Keendi were very quiet at the beginning of the year and Miss Daisy encouraged them to use the equipment to show their ideas and then to speak where possible. In this class, the group doing the CA lesson did not sit at a table but on the carpet.

Consequently, the children moved about during the lesson. Aurora and Bernie often tried to sit together but Miss Daisy tried hard to keep them from making a pair and working quietly together. This form of discipline supported the children and helped to create a positive environment where the whole group were collaborating in each other's learning. In the second year, Miss Daisy did not really change her style of being with the children. She worked hard at enabling them to develop their thinking. She seemed to have control over the group while, at the same time, allowing the children to have a measure of control too.

Summary

In summary the changes in CA lessons in the second year indicate that the teachers not only became more competent in using CA pedagogy but also took seriously the experience of the children communicated through the personal constructs. This is evidenced particularly by the changes in metacognitive opportunities within the lessons. Also, lesson transcripts show that teachers used shorter concrete preparation times and prioritised creating challenges for each child. All of the teachers were more

accurate in their use of language especially when using instructions regarding the schemata. The social context and group dynamics aspect of the collaborative group work worked more successfully in that every child was encouraged to contribute and no child was allowed to dominate. This created a helpful, supportive environment where peer scaffolding was evident on a regular basis.

7.6 Analysis of the children’s test results

The children’s pre/post test results from all four CA classes from both years of the study were examined. The test results from all the thirty children in each class were totalled and then the average result worked out to get a general picture of the effect. This is only a small sample, however, a clear change can be noted between the two years.

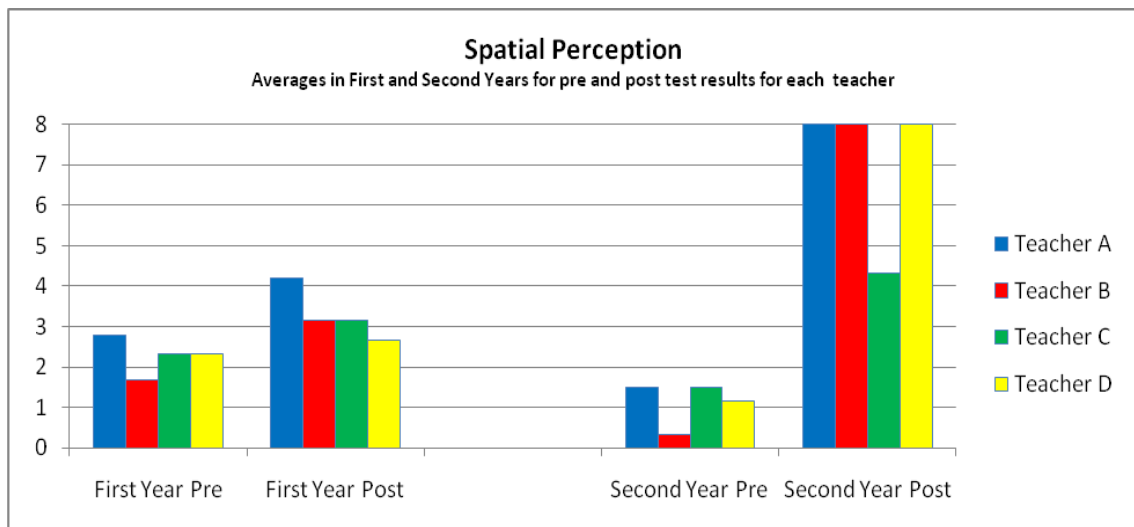


Figure 7.4: Average test scores of the Spatial Perception test in both years of the study.

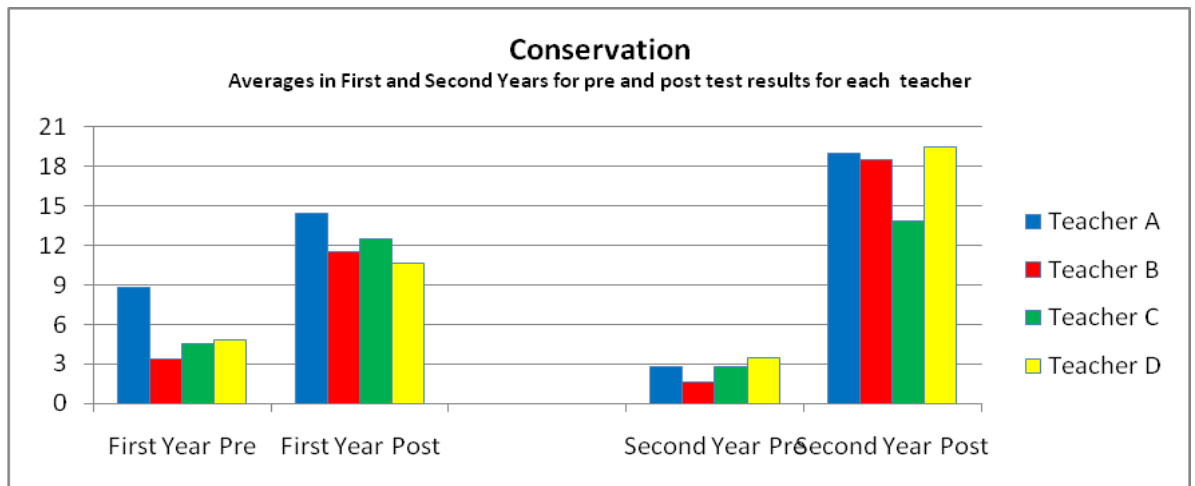


Figure 7.5: Average test scores of the Conservation test in both years of the study.

The pre/post tests results from the first and second years show substantially more gain in the second year in three of the classes in both tests. One of the limitations of the Spatial Perception test was that the ceiling was fixed. It can be seen that in the second year the majority of these children achieved the maximum score on this test. It is unclear from these results whether, had it been possible, they could have demonstrated a higher level of thinking. The class where the gain is not substantially different is Miss Comfrey's class. It is not possible to fully account for the difference in this class by the lack of opportunities for the children to discuss the cognitive challenges. However, lesson transcripts demonstrate that there was a substantial difference in the way CA lessons were taught in this class in both years. Difference is also reflected in the children's constructs in their ability in exemplifying "thinking behaviours".

To provide further evidence, I returned to the original results of the CA Programme which had been publicly reported. When the Programme began it was developed and taught in fourteen classes. The results in the first year of teaching following development, provided in Chapter 2, demonstrated a significant effect on children's cognitive abilities. The results the next year indicated a similar effect. This effect is similar to the results in the first year of this study with the classes all making a difference as shown above in Figure 7.3 and Figure 7.4. It is reasonable, therefore, to assume that this picture indicates the general effect of the Programme in raising children's thinking abilities. However, the second year of this study indicates an effect which is substantially different. This gives credence to the argument that raising teachers' awareness to the children's experience makes a difference to their pedagogy and ultimately to the children's thinking ability.

The children in Miss Comfrey's class in the second year have lower results than the other three classes although clearly they have made significant progress during the year. The only observable aspect that was different in this class was the quality of the social construction environment. The other three teachers allowed the children to discuss between themselves during lessons and the teacher facilitated the talk but did not lead or control the discussion. Miss Comfrey seemed very anxious about this and could not relax

sufficiently to allow this to happen. Her pre-occupation with behaviour management seemed to paralyse her ability to believe that she could allow the children to discuss and come to solutions together without her input.

Chapter 8:

A significant staging post: discussion and conclusions

Thinking happens in my brain. My brain listens and looks at the things on the table and people's ideas and then it whizzes about to **make sense** of everything. When it's made sense it puts words in my mouth and then I say ideas what help to solve the problems. (Aurora, Group D 2, July)

This chapter summarises the study. A summary of the results leads to the main learning points of the whole study. Implications for further research are noted. A methodological evaluation is included. It ends with a summary from the children who have the last word.

8.1 Summary of the study and the results

This chapter is a time to reflect on the journey of this study. This is a pause to summarise the learning so far before travelling on again.

Five stepping stones capture the main learning points of the journey of this study and are the platforms for future development:

1. CA children can inform pedagogy and CA theory.
2. CA makes a difference to children's awareness of being a learner and their articulation of thinking.
3. Teachers can learn from listening to children.
4. Using strategies underpinned by Personal Construct Theory can be effective in facilitating a change in pedagogy.
5. Classroom Pedagogy can be improved when teacher participants are actively involved in research.

These stepping stones are explored as the chapter unfolds.

This study provides an opportunity to consider how Year 1 children understand what helps their learning during a CA Programme. In addition, it allows for the observation of four CA teachers over two years. During the first year the teachers participated in the PD programme and taught CA for the first time. The second year's teaching followed an intervention in which the teachers listened to children's constructs of what helped their learning and examined lesson transcripts in the light of the knowledge gained from listening to the children's constructs.

As a result of the discussions during the intervention, the teachers set themselves targets to provide the children with a more effective experience the following year. The rationale for the study was that understanding CA from the perspective of the children informed teachers and gave them the opportunity to

improve their pedagogical practice. This chapter considers the children's constructs in the light of subsequent changes to the CA pedagogy by the teachers.

The study sought to answer three research questions:

How do Year 1 children understand what helps their learning during the CA Programme?

What differences emerge between CA and non-CA children's constructs?

What differences emerge in CA pedagogy when teachers understand and take account of children's personal constructs?

In brief, the results demonstrate that the Year 1 children were able to provide constructs regarding what helped their learning and that over time the constructs changed. By the end of the year, the CA children were able to articulate their ideas about what helped their learning providing detailed examples with explanations. In contrast, although the non-CA children were able to provide constructs of what they thought helped their learning they were largely unable to provide explanations. They were not able to demonstrate that they had become aware of the learning process or the importance of their active involvement in becoming an effective learner. Their constructs were more about behaviour than learning activities and showed less change over the year than CA children.

At the beginning of the second year the results demonstrate that children's constructs were very much the same as those in the first year. However, the constructs with explanations involving learning activities developed earlier and by July more constructs were provided regarding **challenge** and **metacognition** than in the first year. In addition, evidence in the second year suggests that the social collaboration was more effective in three of the groups.

8.2 How the results answer the research questions

This section summarises the findings from the study in relation to the research questions. This study arose from an interest in prioritising how children understand learning. Published cognitive test results demonstrate that the Programme had an impact on raising children's cognitive abilities, however, the important aspect that was missing in my view was the voice of the children. I believed that by finding out from the children what helped their learning in CA then the PD could be adjusted to take account of those factors. The rationale for this was that knowing what makes an impact on children enables teachers to teach more effectively. The children are, then, enabled to become better learners.

8.2.1 How do Year 1 children understand what helps their learning during the CA Programme?

The literature suggested that children can produce meaningful constructs about their lives and experiences in a range of contexts. Most literature cites work being done in the medical and educational psychology field where children successfully inform relevant adults of issues that need to be addressed. In

the CA context, the children were able to provide meaningful constructs regarding their learning experience. The constructs developed over time and by the end of the Programme, they could provide examples and explanations which were coherent and consistent with observed classroom lessons.

The children were interviewed three times during the year. This was considered sufficient to show development through the year and to demonstrate that children were able to articulate their thinking while at the same time be sufficiently infrequent and separated from each other for the children not to be in a routine and simply repeat what they had said on the previous occasion.

By each July, the CA children showed an awareness of their experiences as learners that they were enthusiastic to share. Their analysis of what helped/hindered their learning was very clear. They were also very open to discuss times when they chose not to engage with learning and when they found the activities too difficult. They were empathetic to others in their group and were able to make reasonable interpretations of their behaviours. Kelly (1969) stated that our constructs become our theories about the world in which we live and from the interviews it was clear that the CA children were using the CA experience to develop their understanding of what it means to be active in learning (Pollard, 2010). As Kelly's view of the human person was of "a whole" he did not separate thinking and feeling but saw all of life's experience as one inter-connected journey (1991). Children produced constructs with no distinction between thinking and feeling. In expressing their constructs they discussed thoughts and feelings as one and it was clear that when they felt at ease in a group the distractions from learning were minimal. However, when uncomfortable situations arose, for example, when one child dominated the group or when a child felt unvalued in the group, the feelings that arose distracted from the learning, altered behaviour and, ultimately, impacted upon the outcome. The children expressed their awareness of their developing ideas during the interviews which afforded them the only opportunities to articulate their thoughts.

The following sections discuss specific aspects of the CA experience explored by the children in order to develop understanding of key aspects of CA. These were the four themes identified during the teacher intervention as aspects that they needed to consider during their teaching. As identified in Chapter 2 in discussion about CA theory, children need to experience both challenge and metacognition as they are keys to the success of the Programme. Also, the quality of the social construction is highlighted as an important factor in developing children's thoughts and ideas. An aspect raised by the children, but not considered previously by the teachers, was the group dynamics during lessons.

CA children's understanding of challenge helping learning

During the year the constructs provided by CA children became more focused on activities such as **listening, sharing ideas, thinking, explaining**. For the purpose of this study, I refer to these as "thinking behaviours" as they actively support the development of children's thinking. Early in the year the children focused more on "doing behaviours" such as **–feel objects, sort things**. Of course, "doing behaviours" lead the children to developing their thinking if they make sense of what they are doing through "thinking behaviours" but the "doing behaviours" diminished during the year as the "thinking behaviours" took on

more significance. This indicated that the children became able to generalise and prioritise “thinking behaviours” and by July, were able to describe and provide explanations with examples of how these helped learning. From this, it is reasonable to conclude that the children had become more aware of the learning process and their part in it.

Challenge is a key aspect of CA pedagogy and in their constructs children mentioned being challenged. For example, they provided –**solve a problem, solve a challenge, challenge someone**. The children were able to explain that being challenged helped them to learn by keeping them engaged, interested and motivated. They identified times when they found challenges difficult and could not understand them. They explained various ways of working at the challenges and said that they were usually able to solve the puzzle when they worked together. Challenge in this study is identified when children found the task difficult but remained engaged in trying to solve the problem. Piaget saw cognitive challenge or cognitive conflict as one of the main drivers of increasing children’s cognitive abilities (Piaget, 1959a). The fact that children mentioned challenge as helping them to learn is a positive indication that the CA pedagogy was having an effect. Chapter 7 (Table 7.4) demonstrates that teachers either expressed a challenge or asked a challenging question between 257 -393 times each in the 8 analysed lessons. This meant that on average, every minute of the lesson included some element of challenge facilitated by the teacher. Table 7.5 shows that children also challenged each other. Evidence suggests, therefore, assuming that these lessons are typical of all the CA lessons taught that children were being challenged frequently and they responded positively to this. For example: “It is good when the puzzle is a bit hard because then we have to work together and put lots of ideas in to try to find the way through. It means that it is not boring and we all have to try” (Sakia, July).

Recognising challenge within the lesson observations and hearing it from the children as helpful to learning indicated success in using challenge to stimulate and engage the learners. This corresponds to both Piaget (1955) and Vygotsky (1978) who subscribed to the fact that learners need material a little in advance of current knowledge and understanding in order to stimulate the brain and learn.

CA children’s understanding of metacognition helping learning

Although only a small proportion of the total constructs provided, the children mentioned several constructs relating to metacognition – **work out what thinking you need, think of how to think, say how you are thinking, ask how people think**. The children provided explanations for how each of these aspects helped their learning indicating that this aspect of the CA pedagogy had begun to be embedded and considered by the children. Chapter 7 Table 7.4 indicates that teachers used metacognitive questions, explanations and descriptions in each lesson but with less frequency than most other categories of talk. During the intervention meetings, all four teachers expressed concern over not feeling confident in the use of metacognition. However, although evidence of explicit use of metacognition as identified in this study is sparse it cannot be denied that the children were aware of certain behaviours, attributes and attitudes at a level beyond the task helping their learning. There are many definitions of metacognition but most

theorists agree that metacognition includes elements of enabling understanding, monitoring and evaluating the progress made while engaged in a task and being aware that others have a perspective which may well be different (Garner, 1987, Carr, Alexander & Folds- Bennett, 1994, Flavell, 2000, Alexander, 2010). The children's awareness of what helped them was detailed and explained. Alongside this detail of themselves, the children included awareness of other people's thinking and how those others impacted upon them in terms of their success or failure to solve the puzzle. This awareness of others, described in the literature as "theory of mind" (Piaget, 1955) was an indication of a child's ability and readiness to engage with metacognitive thinking. The findings of this study in regard to metacognition correspond to those of Larkin (2005) who completed her research within the same CA programme. She concluded that Year 1 children naturally develop a theory of mind and that metacognition can be developed through nurturing within a classroom environment where thinking is valued.

Another feature of the children's examples was of "thinking behaviours" that they could use but chose not to at particular times. For example: *"Sometimes I listen to the others and that helps me 'cos it gives me ideas and then I say my ideas too but sometimes I don't listen. I just look around at the rest of the class sometimes to see what things they are doing 'cos I like to see that."* (Margarite, B1)

The indication that the children had become aware not only of behaviours and attributes which helped them to learn but also of their willingness or not to engage with the tasks and/or the groups was also indicative that the process of metacognition had in some way begun to develop in them. Their awareness of themselves as learners and themselves as engaging in a process developed as the year continued. This echoes the work of Flavell who discussed one aspect of metacognitive behaviour as including "intentionality" (Flavell, 1979). This was one of the ideas drawn from Piaget by whom Flavell was heavily influenced. In the situation above Margarite declared that she knew that listening helped her to learn as she heard ideas that she had not thought about. According to Flavell, intentionality presupposes thinking which is deliberate and goal directed. In this example, Margarite was aware that listening to others helped her towards the goal of solving the puzzle. However, she was also aware that she was not always willing or able to attend and concentrate on what was going on in the group as the rest of the class attracted her attention.

According to Flavell (1976) there are three aspects that children learn and acquire over time in the context of storing and retrieving information helpful to learning.

Children learn to:

- identify situations in which intentional, conscious storage of information is important and may be useful later.
- keep current information related to problem-solving and are able to retrieve it when necessary.
- make systematic searches for information helpful in problem solving.

Children provided evidence that they were learning to remember to consider what kind of thinking to use as this helped them to solve challenges. They were able to explain why using the right kind of thinking helped them. However, they did not provide evidence that they understood or were aware that their method of storing information was important. The children provided evidence that they were learning to use current information, particularly ideas from other children in their group but there is no evidence to suggest that they were at the stage of being able to make systematic searches for relevant information. Being at the early stages of concrete thinking, it could be that children had not yet the capacity to use their brain in this way.

CA children's understanding of how social construction helps learning

According to Adey (2004) the ability to process information, the development of intelligence, depends upon good social interaction where ideas and arguments are tossed about. All CA lessons require time spent on discussion and argument within groups and/or between groups while children learn to listen, challenge ideas, state positions, change ideas and take risks in articulating thoughts. The teacher facilitates the on-task discussions and arguments ensuring that all children have a voice, are respected and are included.

This way of teaching promotes Vygotskian belief that learning, the development of intelligence is essentially a social process. Lesson observations provided the evidence of the quality of the discussions in which children engaged. Children provided many examples with explanations of how the social construction within their group helped them to learn. They were very conscious of the need to listen to each other and could give unique descriptive explanations of how listening helped them. Children provided many constructs relating to speaking- **sharing, discussing, explaining, talking**. Again, they were able to give many and varied explanations as to how the sharing of ideas helped them to learn. The children did not use the word "scaffolding" as in the literature but their descriptions of how speaking helped them provided very clear examples of peer scaffolding where they described sharing ideas with those ideas supporting someone else's learning (Vygotsky, 1978). This is an important point because teachers often assume that it is they, alone, who provide scaffolding to develop knowledge and understanding. Children in this study are explicit about the value of peer scaffolding.

In the first year, CA was the only lesson where children worked together in a shared task and the only one where speaking was the main method of communication. Children working collaboratively has been the subject of much research. Where collaborative working is facilitated by a teacher and set up through programmes and specific projects, it has been found to be successful in raising the quality of children's discussion and ability to articulate thinking (Baines *et al*, 2007, Baines *et al*, 2009). However, research has also shown that where the quality of the discussion was not well managed by a competent teacher, learning was superficial (Pollard *et al*, 2000; Hughes & Westgate, 1998; Collins, 1996; Kutnick & Rogers 1994).

This study provides evidence of children valuing and explaining how discussion helped their learning. Although this was only a once weekly experience, the children in three classes (Arum, Bramble, Daisy) discussed at length the value of shared communication. I believe that in these three classes the quality of group interaction was supporting the development of thinking as evidenced by the children's constructs and lesson observations. The quality of the interaction in the fourth class (Comfrey) where the teacher is dominated by her concern for "good behaviour" is different and, again, this corresponds to children's constructs and lesson observations where it is clear that the children do not get many opportunities to discuss their ideas.

CA children's understanding of how the group affects learning

In the first year, another relevant aspect of the interviews was that children mentioned an impact that could be described as group dynamics. These influences are examined also through the analysis of lesson observations. During the observation of lessons in the first year, it was clear that interaction between children was impacting on learning and this was reflected in constructs. For example, in Group A1, Angela and Jack both sought dominance in the group and generally sparked annoyance in each other. In Group B1, Sacha tended to dominate and found it difficult to allow other children time to speak or to share the equipment. In Group D1, Nemy and Dawn were the children frequently seen interacting in a negative way because Dawn would not let Nemy's ideas be tried and always asked to vote on the best way forward rather than thinking through which way to work. Another important aspect which is less obvious from the lesson observations but very clear in children's interviews is how specific behaviours interfere with children's learning and their self perceptions. For example, Grace made it very clear that she was beginning to construct a world where to be a black girl in a group prevented her from learning in ways that would not happen if she was a "white girl, a brown boy or a white boy – which is the best one to be". Another example is Margarite who was aware of being dominated by Sacha but who felt unable to challenge her and stand up for herself. "Sacha just bosses me and thinks I am stupid but I have more ideas than what she has but I just can't tell her. I can just be bossed all the time."

The awareness that the children showed in relation to the impact of others on their learning is an important insight in this study. During the first year, the articulation of this emotional or affective impact only took place during interviews and teachers were shocked by it when they heard it during the intervention meetings. In the second year, children did not raise any issues within this category so it can be concluded that the teachers made changes to their facilitation so that the children had a learning experience which was freer from negative impact from others.

8.2.2 What differences emerge between CA and non-CA children's constructs?

Chapter 6 demonstrates that CA children were able to provide many constructs about what helps them to learn. Data provided for each of the two years demonstrates development from September to July. It is clear that in September the children have little idea of what helps them to learn. They mostly mention that adults help them but they cannot explain how this process takes place. As the year progressed, the

children became more able to provide constructs with explanations of what helps and hinders their learning. Many “thinking behaviours” were discussed and these took over from “doing behaviours” as the year progressed. This is in contrast to non-CA children who were largely unable even by the end of the year to provide “thinking behaviours” that helped them to learn. These non-CA children were being taught by slightly more experienced teachers. Also, more non-CA children spoke English as their first language. Given these two considerations, it could have been assumed that these children would have been more able to provide constructs with explanations regarding what helped their learning. However, although the children were willing and able to discuss aspects of school, the notion of what helped their learning was not one in which they were able to engage. They provided constructs but could not say how these actions helped. For example, all the non-CA children in July said that **doing sums** helped them but could not say how or why this helped. Many constructs revolved around “doing behaviours” – **copy off board, put hands up, get lots of stars, keep quiet, be bored** (Figure 6.3 – but having produced them the children were unable to discuss the meaning these constructs held in helping them to learn (section 6.3.1). All the children in the study were in mainstream state schools and the only structural difference in the curriculum provided was the addition of a weekly CA lesson. Therefore, it may be considered that the CA lessons which encouraged children to articulate their thinking in a small group as they worked together at solving challenges made the difference to the children’s facility in expressing their responses to the question of what helped their learning (section 6.3.3). Furthermore, the CA Programme may have helped the children in being able to articulate the descriptions and explanations of their lived experience for which they provided constructs.

Alongside the curriculum, the atmosphere and the ethos of the classrooms may also need to be considered. Since the CA teachers were involved in a PD Programme which encouraged collaborative tasks needing children to speak and listen it may well be that the amount of oral communication within the classroom increased during the year as the teachers began to see the benefits of CA to the children’s learning. Although three CA teachers said at the end of the first year that they had not included more oral tasks on a formal basis they recognised that their teaching had changed during the year to include more “talking time”. Miss Comfrey reported that she did not think this was the case in her class.

Another difference that was obvious through the children’s interviews was that the CA children hardly ever mentioned their teachers in March and July. It was as if the teachers were invisible in the process. In contrast, the non-CA children frequently mentioned their teachers especially when asked for an explanation. For example, “I wonder how doing sums helps you learn?” In response to this and similar probes, most non-CA children replied, “Cos Miss says”. These children were more dependent upon their teachers and appeared to be far less aware of themselves as learners or aware of being engaged in a learning process. Their motivation for working appeared on the whole to be to please the teacher rather than to learn or to become independent. Ultimately, this may affect how far they journey in their learning because until they become self motivated and consciously engage with the learning process their progress will be limited (Leo & Galloway, 2006).

8.2.3 What differences emerge in CA pedagogy when teachers understand and take account of children's personal constructs?

Knowing what impacted most upon the children in the first year of the study supported the teachers in the second year to focus their pedagogical skills more acutely on aspects of the CA pedagogy. In particular, they were alert to introducing the cognitive challenge clearly and within a few minutes of the beginning of the lesson rather than allowing the concrete preparation to go on too long. Also, they realised that they should be clear about the challenges, being as explicit in their instruction as possible and without giving any clues to the solution. They were alert to creating occasions for raising the conversation to a metacognitive level and increasing the number of opportunities that children engaged with this pillar of CA. During the last intervention meeting, each teacher set herself some targets to work on during CA lessons in the second year.

In the second year of the study, the children's ability to describe and explain developed earlier. Chapter 6 (Figures 6.2 and 6.3) demonstrates that the number of constructs focusing on challenge and metacognitive aspects of learning increased during the second year. Chapter 7, Table 7.4 demonstrates that the frequency of certain categories of teacher talk increased – expressing a challenge, task explanation and metacognitive aspects. All of these categories are aimed at increasing the effectiveness of CA. The fewest number of constructs were provided by children in Miss Comfrey's class. As this was the teacher in the first year who provided the least opportunities to engage in social construction this correlation is important. However, also, in the second year, process management categories reduced in each teacher, especially in behaviour management. In the case of Miss Comfrey, behaviour management interventions reduced from 94 to 40 so the possibility of discussion between the children taking place is greater if they were being given more time to engage in interacting with each other.

Having looked briefly at the quantifiable differences that took place in the second year, some of the wider implications of these differences can be considered. Kelly (1955) maintained that change is always possible and, indeed change has happened in terms of the outward expression of the CA pedagogy and the constructs provided by the children. The wider implications concern the impact these differences made to the children's learning.

According to Kelly, children construct the story of their reality based on their experience through the constructs they provide (1955). The lesson observations allow a view onto the actualisation of the constructs during the lessons. During the second year, the most common constructs - **listening, sharing, discussing ideas, considering metacognitive processes** - became more frequent. In the second year the teachers reported that they began to allow these same "thinking behaviours" to spill over into other lessons and gradually over the course of that year more and more lessons were taught in a collaborative, supportive talking environment in three classes. In a primary classroom this is important because the teachers are with the children all day and teach all subjects so opportunities to enable children to develop the "thinking behaviours" in a range of lessons is possible.

There was, therefore, much less of a division between CA and other lessons although CA was the only lesson where the teacher concentrated on one small group each day and where the total focus was on the development of thinking. As young children are more likely to process responses in the amygdala and therefore from the seat of emotions teachers were keen that the children were happy and relaxed so that the learning experience took place in a relaxed environment (Johnson, 2004b). The fact that the children were being taught with more of a whole curriculum approach to pedagogy may have helped the environment to be less stressful as expectations were more consistent across lessons. Miss Comfrey was still very concerned about behaviour and was reluctant to allow children too many opportunities to collaborate which may account for the difference in her children's ability to articulate their reasoning.

The research across the whole project demonstrated that the CA programme made a significant difference to children's attainment. Although as Deforges (1993) maintains children think naturally and are well endowed as thinkers, nevertheless, CA has been seen to make a difference to their attainment as measured by tests in conservation and spatial perception. Chapter 6 also shows that the programme makes a difference to the constructs about learning that children produce. If becoming more conscious of the process of learning in self and others and being more able to engage in "thinking behaviours" acts as a measure of progress then again, this progress cannot be denied as evidenced in Chapter 6. Alongside this evidence, lesson observations demonstrated positive changes to the quality of the talk children engaged in during the first year.

At the beginning of the year, the children produced more one word responses and little in the way of explanation or any evidence of exploratory talk, as defined by Mercer (2000). However, from the spring onwards, evidence of exploratory talk increased during each observed lesson. In the second year, exploratory talk appeared earlier in the year and became more frequent as the year progressed. Analyses of lessons of the second year, indicate that the teachers kept the concrete preparation shorter and more focused with clearer instructions being given about the cognitive challenge. This enabled the children to get underway more quickly and engage in discussion for longer within the lessons. The teachers reported that they allowed the discussion to continue with "more trust in the process" (Miss Arum) and "with more confidence that the children were going to achieve and make progress even when they could not solve the challenge" (Miss Bramble). Teachers also included more encouragement to engage in metacognitive behaviours. Although, these categories of talk were still fewer than other types identified in lessons, nevertheless, they increased substantially in the second year in lessons and this was reflected in children's constructs.

This belief in the theory, the process and "faith in the children" (Miss Daisy) appears to be an important factor in allowing CA to work. The over concern about managing behaviour prevented Miss Comfrey from allowing the process to be fully implemented.

8.3 Implications of the results in relation to the key arguments

The main argument in this study is that the children's voice is an important perspective to consider when teaching CA. Having analysed what the children had to say during the first year, facilitated the teacher intervention meetings and subsequently analysed the lesson observations and children's constructs in the second year, I am even more convinced that the children's voice is a crucial one to prioritise. The evidence provided in this study has strengthened my conviction. During the year, children grew in the ability to discuss their constructs of their CA experience. In their constructs, children identified the helpfulness of challenge and metacognition, two pillars of CA. This corroborates key aspects of CA pedagogy based on the theoretical perspectives from Piaget and Vygotsky. Through participation in the CA lessons and then through "listening" to their own experience, the children have come to understand what renowned theorists have explained in learned tomes. They expressed their understanding in simple language. It is detailed and evidenced-based, verified through lesson observations. Teachers recognised it and were impelled to act upon what they heard.

This leads me to the second argument, then, which is that by listening to children, teachers can improve their pedagogy. Teachers in this study listened to the words of their children and took seriously what they heard. The teachers were awestruck when they heard the children's explanations of how the "thinking behaviours" helped their learning but also of their interpretation of the group dynamic aspect of their experience. They set themselves goals to improve their teaching the following year. Evidence from children's constructs and lesson observations suggests that three teachers made a substantial difference to the children in the second year.

This supports the third argument that the importance of listening to the children's lived experience needs to be an element in the PD Programme so that more teachers become aware of the crucial part children can play in developing teachers' skills. An important insight in this study is the indication that even excellent PD, a well constructed Programme indicating it makes a difference to children's thinking, participating in a teacher research group and willingness to be a good teacher is not sufficient to facilitate the most effective social construction environment. This confirms Adey's view (2004) that it is a long and difficult journey for many professionals to change their pedagogical styles and to be able to embrace the CA approach. At no point in either year did the teachers try to disentangle aspects of the CA pedagogy. When asked directly about whether they considered that one aspect or another was more important, they all responded that it required each aspect together to make the process work.

Adey's view was that it was not possible to separate aspects of CA and that it is all pillars working together that makes the programme effective. This implies that the social construction environment created, allows for children talking and working together to solve the cognitive challenge which is pitched so that it is puzzling and a little difficult in each lesson for every child, each lesson engaging children in metacognitive levels of conversation, the concrete preparation leading into the challenge but not distracting from it and aspects of bridging supporting and creating hooks for children to make links with areas of learning. The experience of Miss Comfrey's groups indicates that enabling the CA approach to fully happen requires not

only knowledge and skill but also a deep understanding of the learning process within children and a belief in the process itself so that the process leads and the teacher takes a back seat.

Given that all aspects of CA theory working together make the programme effective, the changes in numbers of metacognitive opportunities demonstrated in this study inform the PD of the CA programme. Encouraging and supporting the teachers to make the time and create opportunities for the children to engage in metacognition are crucial to an effective CA PD programme. Increasing the number of opportunities for children to engage in bridging is also important. Encouraging children to make links across the curriculum and daily life is very important for their cognitive development (Goswami & Bryant, 2007)

8.4 Implications for CA Pedagogy and Classroom Practice

The CA Programme and the CA PD Programme can both benefit from the results of this study. The main aspects of learning are identified as five stepping stones from which to build the road for the next stage of the journey.

CA children can inform pedagogy and CA theory

The study shows that children can inform pedagogy by providing constructs about what helps their learning. Listening to constructs as they develop and addressing the issues as they emerge informs pedagogy while it is still possible to improve a situation. For example, had Miss Arum listened to Grace during the year, she may have been able to address the fact that Grace was feeling not valued in the group because she was a black girl. Grace may then have gone on to make more progress in her learning unhampered by negativity.

CA makes a difference to children's awareness of being a learner and their articulation of thinking.

Including non-CA children in the study allowed for a comparison to be made regarding children's awareness of being learners. Results demonstrate very clear differences between CA and non-CA children in their ability to identify general "thinking behaviours" that help learning to take place. The non-CA children concentrated more on "doing" behaviours and were unable to explain how these helped their learning. The children were unable to articulate their thinking and had very little sense of being a learner. This evidence provides a very strong case for the value of CA in providing children with the tools they need to walk efficiently and effectively on their learning journey.

Teachers can learn from listening to children.

During the intervention meetings, initially, the teachers were amazed at how much the children had learnt about what helps their learning and at how much they could communicate their experience. After their initial reaction, they wanted to really use the experience to develop their pedagogy. An attitude of learning from the children pervaded the meetings. They put aside an assurance "of knowing" and listened with true

humility. They put aside the “delivery mode” of teaching and wanted to learn how to facilitate learning in line with what the children indicated they found helpful. As previously discussed, they identified key themes that came from what the children reported and use these to set themselves targets for improvement. They agreed that their classrooms should be places where they and the children were learning together. The second year of the study demonstrates clearly by the results that the teachers took the learning seriously as there is a quantifiable difference in children’s constructs and in transcripts of lessons.

CA children can inform the CA PD programme.

What has been learnt about the effect of increasing the number of metacognitive opportunities is important to inform the PD programme so that teachers develop the confidence and competence in including these opportunities regularly within CA lessons. It is also important to emphasise that the pillar, bridging has perhaps been underplayed within the PD programme and this needs to be developed to ensure that all of the elements of CA theory are used together to make the greatest amount of impact on children’s cognitive development. Teachers need these aspects to be addressed fully in any effective PD programme so that teachers have every chance to be the most effective teachers possible (Craft, 1996). It also concurs with Adey’s view (Adey, 2004

Using strategies underpinned by Personal Construct Theory can be effective in facilitating a change in pedagogy.

PCT was used as the underlying theory for listening to life experiences from children and teachers in this study. It gave a simple and non-threatening structure to interviews which allowed all the participants to express their lived experience. The interviews were effective in drawing out the information required for this study. Moreover, the method was effective in that it brought about change- a change in pedagogy which brought about change in children’s learning and an interior change in the attitude of the teachers towards the children. The interior change came from a humble stance, not one of standing from a place which “knows” but a stance of truly wanting to learn how to be a more effective teacher in front of the people who matter- the children.

PCT was used in a simple way in this study. More could have been done with the children and the teachers, for example, detailed use of the Salmon Line, a Repertory Grid could have analysed behaviours. However, key to the success of this study was the researcher living the attitudes and values being promoted. First and foremost, this was a journey where researcher and participants walked together. An attitude of listening humbly to children and teachers in order to learn pervaded all the activities. Communicating the learning was of bringing teachers to a window to share children’s constructs and

lesson transcripts. What was there was there to be seen but each one saw what they were able to see and address what was theirs for that time. An attitude of non-judgement was lived and when the teachers made suggestions to each other for improvements they were made constructively and without criticism. This was reflected in their willingness to set themselves targets and then realise the targets during the following academic year.

Classroom Pedagogy can be improved when teacher participants are actively involved in research.

My experience of primary teachers, generally, is that they want to be excellent teachers who help and inspire their children to learn and to succeed. However, the current climate in schools often renders research as “too distant” or “too inaccessible” to teachers. This may be partly because over the years, as described in Chapter 1, many dictates have come to teachers that are not based on evidence of making a difference to children. In this situation, teachers find themselves caught up in doing lots of activities for which they see little value or positive effect on children and “delivering” lessons over which they have little input or control. Another reason often used by teachers is a lack of time as they are given so many other tasks to complete. Many of these tasks appear to become paper exercises for which the teachers have little respect. In my view, these issues destroy a fundamental principle at the heart of learning. Teachers who feel they are wasting their time when “they could be helping children” lose motivation and bring this into classrooms.

Research has shown that teachers do not create learning but learners create learning (William, 2010). With this in mind, then, it follows that the best teachers are the best learners. Teachers who feel tired and drained by tasks that they experience as worthless are generally going to lack energy and enthusiasm in the classroom. According to William (2010) there is no evidence to suggest that the quality of teachers' work is affected by the amount of salary received, however, quality increases when teachers feel valued and when they receive quality feedback which enables them to help children more effectively. This corresponds to Johnson (1986) who also found that important to teachers was to be encouraged by accurate and constructive feedback, to be given some autonomy in accomplishing tasks and participating in challenging, stimulating work, for example, curriculum development groups. These activities encourage teachers to continue to learn in a positive way.

When I invited the teachers to participate in this study, each one individually asked about their place and their role in the research. When I explained that what I hoped was that I would be a transporter of knowledge on a learning journey stemming from the children through to them, they were interested to participate. Miss Daisy and Miss Bramble both said at the end of the study that it was this image that inspired them to commit to the study. Miss Arum said “I was inspired by it but thought that maybe it would not really happen like that. I thought you may just start like that but not really listen to children or us. When it was clear you were doing what you said, that was when I really committed to it”. Miss Comfrey said that she was keen to be part of anything that would help her to be a good teacher.

The tradition in education in involving teachers in research is an important one and one that I believe needs to continue in order to improve pedagogy and raise attainment (Bransford *et al*, 1999, Day *et al*, 2006, Wiliam, 2010). According to Wiliam (2010) teacher learning takes time and long term PD is an essential ingredient to assist the learning. He maintains that teacher learning communities are an excellent way forward to value expertise, offer a steady source of support, facilitate sharing and build collective knowledge. These learning communities support teachers to grow professionally in knowledge and understanding and offer a positive way to deal with the changing climate, the judgemental accountability and imposed directives that teachers have been dealing with over the years as discussed in Chapter 1. Essentially the four CA teachers in this study built a learner community which continued long after the two years of this study. Although each one has now moved further afield, they have all established learner communities in their current schools and are using their learning through the study to promote ongoing learning in their current schools. This ongoing commitment is an indication of the impact the study had on four teachers. I believe that the element that captured the teachers from the beginning was two-fold. Firstly, the study began and ended with children and secondly, the teachers experienced an impact on their teaching which they saw reflected in children's learning.

The lived experience from both children and teachers was the basis of a changed pedagogy in this study and I believe this valued form of knowledge needs to be more valued. In this way educators may be able to respond to Noddings question regarding whether educators know what children need (Noddings, 2005). It also indicates that teachers participating in the research has a positive impact. Teachers are currently requesting involvement in action research and this study gives evidence of its value on teachers and children. The PD associated with CA easily incorporates the possibility of teacher participant research. My experience encourages me to include the possibility that teachers become participants in areas of interest to them in order for research to continue to impact on their children.

8.5 Methodological implications

The methodology in this study allowed for the children's voice to be heard particularly through the interviews where they provided their constructs of what they considered helped them to learn within the CA context. These constructs could be seen and heard also through the lessons observed during each of the two years of this study. The methodology allowed data to be collected which is mainly of a qualitative nature. Some of this has been presented in a quantitative way so that comparisons between groups, classes and individual children could more easily be identified. This presents some difficulty in that qualitative information was rich in detail and nuance. The quality becomes reduced when information is reduced to data in a table or chart. However, I believe that the qualitative description and quotations ensure that the richness and depth of detail is not completely lost.

The interviews with the children took place in a simple way where children were allowed to speak in their own time and with their own words being accepted as true expressions of their experience. Although these children were 5 -6 years of age and limited in their language ability- the ability to articulate their lived

experience, nevertheless, they were able to make clear what they thought. Careful attention was given to the detail of what they said with gentle probing to ensure an accurate interpretation of meaning was being made.

Although each child was interviewed individually and children had no opportunities to discuss their interviews between each person, there was a remarkable consensus between the constructs mentioned. It could be argued that children were simply repeating behaviours that their teachers promoted on a daily basis. A sceptic could say that the CA children heard their teacher encourage a group each day to think, to listen and to share their ideas and that in interviews children merely repeated these behaviours by rote. Several aspects lead me to reject this argument and to believe that the constructs were more meaningful than that to the children. In many instances the words children used were very much their own and not just repetition of teachers' words. Observation of lessons revealed that teachers did not say things like, **work out what kind of thinking you need, you have to make things make sense to yourself**. Children were able to give rational and reasonable explanations as to how and why these activities helped them to learn. For example, "I listen a lot to the others and when I look at what they are doing, I understand and then I learn something what I didn't know". (Lewis, C1)

One limitation of this study is the simple way in which PCT was applied. There is depth to the theory and there are several instruments that could have been used. Had the study been examining a situation that required change as a matter of urgency, for example, depressed children then some of these instruments could have been applied, for example the Salmon Line, pictures of faces in various poses. However, in this study PCT is being used simply as a method of gaining access to children's lived experience. This lived experience was being used as information essentially and it was only later that teachers chose to use it to lead to change. In this case, therefore, I believe that PCT provided a way of opening up conversations and enough structure to be able to analyse the information later but loose enough to accompany each child as s/he followed their experience. The interviews were also sufficiently fluid that had a child at any point not been constructive or co-operative it would have been possible to allow them to follow a personalised line of thought or to have terminated the interview prematurely.

The method of interviewing the children was simple in its outward expression, however, complex, at times, in getting to the heart of what children wanted to say ensuring that I captured an accurate meaning. Some children required some time just looking at the name cards before speaking and others liked to talk about the lesson just finished before providing any constructs. It required a sensitive approach to gauge when to probe for more explanation and when to bring the interview to a close. My main attitude was one of being at the service of the lived experience to enable it to be heard. In this way, I consider that each child was able to communicate all that they wanted to say in their own words and in that I think this study was successful.

The lesson observations were complex social and educational experiences where CA pedagogy was being used by the teachers and taken up by the children according to their possibilities. Again, qualitative

data was rich and detailed. The 111 observed lessons yielded a wealth of material to learn from and of those lessons 64 were reduced to quantitative data for ease of comparison. It was unfortunate that of all the observed lessons only 64 could be analysed by the identified codes. This meant that a full analysis of all the lessons could not take place so the analysis is partial and may not provide a full and accurate picture. Also, reducing all the detail of the lessons to be identified by 12 codes could risk inconsistency or inaccuracy as meaning and intent can get lost in this kind of translation. However, there was a thorough and honest attempt to understand fully the complex interactions taking place in all the lessons observed and to report as accurately as possible the lessons as they were lived. Furthermore, at the beginning of the study, the observation of lessons was conducted with a colleague as a reliability check and later coding of this data was also subjected to inter-rater reliability checks.

Establishing and maintaining open and positive relationships with the teachers was a key priority for me from the outset. Without their willingness to engage, discussion and attendance at the intervention meetings this study would not have been possible. Such was their commitment that full attendance at intervention meetings took place even although two of the meetings were in holiday time. They also had me arriving in their classrooms to observe lessons on a regular basis and on three occasions withdrawing their children individually from lessons. This caused a certain disruption but never once did any of them complain. Their good humour and support was invaluable and quite unsurpassed in my experience. I believe that how I conducted myself, how I planned and prepared for visits and adhered to the schedule were important factors. However, their good will and continued professional relationships is a testament to the rapport built up over time during which professional conversations took place in an atmosphere of trust and respect.

It could be perceived as a limitation of this study that only a small number of schools is used. To have had lesson observations and child interviews from a wider range of schools would have provided material for statistical analysis. Had it been feasible to have included more schools, the focus group of teachers would have been larger. This would have provided a wider range of views from this perspective. However, time was a factor and it was not possible to include the number of visits to more schools. Furthermore, maintaining the quality of relationship with more teachers may have stretched possibilities too far.

8.6 Implications for future research

This study is a significant piece of work which contributes to primary education in several ways.

Firstly, the children are prioritised, their voice is heard and taken into account to contribute to school improvement in raising achievement. Secondly, it is new for CA teachers to listen to their children's voice in this way learn from it and improve their own pedagogy as a result. Thirdly, it is new to use the long established and well respected theory, PCT with year 1 children to inform classroom practice. Because the method is transparent in this study, teachers participating in the PD for a CA Programme can learn about this theoretical approach and use it during the programme to inform their

ongoing practice and pedagogy. Also, this study encourages teachers to become participant researchers because they see the value of it for themselves and their children.

The avenues followed in this study open the possibility to develop the use of children's voice to inform practice more fully through a range of CA Programmes or other teaching more generally. The method of accessing children's personal constructs requires time and skill in allowing children the opportunities to articulate them. However, teachers are keen to engage with children's views and see this as valuable to learning. More work can be done in integrating into the PD of the CA Programmes to analyse the impact on larger groups of children and teachers.

Currently, in my work with student teachers, I use the results of the study to highlight to them the importance and value of listening to children and demonstrate to them how children can inform their pedagogical development.

Further research is possible with older children using CA, for example, the Year 3 and 4 CA Programmes: Let's Think through Science. It would be possible to use PCT in interviews to develop children's awareness of thinking and learning. Children in these year groups use the programme on a fortnightly basis in groups as a whole class. Teachers report that it is difficult to develop the CA pedagogy using it so infrequently. I believe teachers would glean useful information about children's learning were children to be interviewed following these lessons. Intervention meetings with teachers could inform them and allow them to develop their pedagogy through hearing children's lived experience.

Using PCT with older primary children would also be useful in involving them in the learning journey. Teachers and children could create learning communities where learning conversations could take place. I believe this would be very fruitful for both children and teachers for their long term development.

The last word comes from quotes from children from a range of groups over the two years:

Sacha: What are you writing all the time for?

R: *I am trying to learn about how children learn.*

Sacha: Well, you're very slow. It's easy you know. Just give us hard things to do and we can sort them out, 'cos we're clever.

R: *Hard things to do?*

Margarite: Hard things help us learn 'cos you have to try and say ideas and listen to ideas and then you try out some of them and some of them work and you solve the puzzle.

Grace: You have to speak and share and let ideas go round about in your mind and that helps you to have new ideas.

John: You have to work together to solve problems and that way they're not really

problems 'cos you do it together.

Cathie: You have to think of how to think so that you go about things the right way.

Matthew: You have to challenge and ask how people think and try to understand what they're talking about and say how you think and that way you all learn.

Nemy: We have to listen to teachers but if they had to listen to us, school would be better and we would all learn more things what we didn't know before and teachers would learn too. School's good then, ain't it?

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Appendix 1.1:

An outline of the PD Programme

In the years relevant to this study, the Professional Development (PD) Programme was agreed with the Programme Director and organised within the LA. The Programme Director and the research team all participated in each aspect of the PD.

The PD consisted of eight days in a Teacher Centre where all class teachers assembled with the CA team. In between each of these days, CA modelling visits took place to classes where a member of the research team taught the CA lesson for the class teacher to observe and discuss to improve the pedagogy. Also, coaching visits to classes took place where a member of the research team visited while a teacher taught CA to observe and give formative feedback about the CA pedagogy. Peer visits were encouraged and the majority of the class teachers using the programme organised two visits to a colleague to observe and offer formative feedback.

Eight days out of class

The days were normally divided into three sections. The first section offered teachers the possibility for discussion, the second section provided an input on an aspect of the theoretical perspective making links to practice and the third aspect gave opportunities to model some CA lessons and to discuss the challenges, possible concrete preparation scenarios, metacognition examples and bridging examples.

Day 1

Section 1:

Introduction to the CA project and commitment discussed

Introduction to each other: researchers and teachers.

Work in a small group to resolve a cognitive challenge. What was it like to be cognitively challenged?

Section 2:

Outline of the CA theory.

Input on Piaget's understanding of thinking development and what this means for us in teaching Year 1 children.

Input on the schema: seriation and discuss how the schema is developed eg moving from one simple criteria of difference- length of sticks to discussing criteria for organising irregular shaped stones

Section 3:

Model the three introductory lessons and suggest how these are used for organising the groups within each class.

Model the first three lessons using the schema: seriation.

Day 2

Section 1:

Discuss experience of teaching CA since the first day.

What went well?

What were the challenges?

Discuss how you are developing the children's talk.

Work in a small group to solve a challenge. What was it like for you to share ideas that were not being heard and used by the group?

Section 2:

Outline of the CA theory in more detail.

Input on Vygotsky's understanding of thinking development in the social context and what this means for us in teaching Year 1 children. How can we facilitate talk effectively?

Input on the schema: classification and discuss how the schema is developed eg moving from one simple criteria of difference- colour or shape to using more than one criteria at once – colour and shape. Lead discussion into how to develop understanding of the intersection of sets and the empty set.

Section 3:

Model the lessons using the schema: classification.

Day 3

Section 1:

Discuss experience of teaching CA since the last day we met.

What went well?

What were the challenges?

Discuss how you are developing the children listening to each other and using what they hear in developing their ideas.

Work in a small group to take forward the idea provided. Analyse your personal experience of working in this group.

Section 2:

Input on Mercer's understanding of children's talk and what this means for us in teaching Year 1 children.

Section 3:

Model the lessons using the schema: time sequence.

Day 4

Section 1:

Discuss experience of teaching CA since last meeting.

What went well?

What were the challenges?

Discuss how you are developing the collaborative aspect of working together.

Section 2:

Outline of the CA theory with a particular emphasis on metacognition.

Input on how metacognition enhances thinking development and what this means for us in teaching Year 1 children. What does metacognition look like in young children? What can we do to develop its use during lessons?

Input on theory of mind. Discuss how this is developed in children.

Section 3:

Model the lessons using the schema: spatial perception.

Day 5

Section 1:

Discuss experience of teaching CA since the last meeting.

What went well?

What were the challenges?

Discuss how you are developing metacognition.

Section 2:

Outline of the CA theory to recap.

Input on the schema: causality and discuss how the schema is developed. What language is used?

How do you handle ideas that are illogical?

Section 3:

Model the lessons using the schema: causality.

Day 6

Section 1:

Discuss experience of teaching CA since the last meeting.

What went well?

What were the challenges?

Discuss how you are developing the collaborative aspect of solving the challenge.

Section 2:

Input on developing collaborative groups and what this means for us when children find collaboration difficult. What do we do to support their development in this area?

Input on the schema: rules and discuss how the schema is developed.

Section 3:

Model the lessons using the schema: rules.

Day 7

Section 1:

In a small group, devise a challenge that you could use in a staff meeting in school to help teachers understand the value of challenging children.

Section 2:

Input on the pre/post testing. What does the testing provide? What are the limitations? What might we expect from results?

Section 3:

Ask teachers to model one of the lessons they found difficult to teach. Teachers give each other formative feedback with a view to improving the CA pedagogy.

Day 8

Work together in a small group to devise a pictorial representation of the CA theoretical base.

Explain your model to the other groups. Groups give feedback to other groups with a view to refine the model.

Evaluation of the CA Programme.

Time given for focus groups to discuss various aspects of the pedagogy and research interests.

Time given for individual interviews on aspects of the research.

Appendix 2.1:

Brief description of the Let's Think Programme

The Programme offers three initial lessons which the teachers use at the beginning of the year while they are getting to know their children and deciding who to put into each group. These initial lessons are not intended to be too challenging but fun and a forum for the teacher to talk about turn taking, speaking one at a time and listening to other members of the group. While the teacher is initiating the class into the beginnings of collaborative working, the rest of the class are beginning to learn how to work independently without interrupting the CA group.

The other 27 lessons are based on one or two of the schemata researched and described by Piaget.

Seriation

The programme begins by developing the schema, seriation. Children are provided with different contexts where they order objects by various criteria, therefore, leads to conversations about putting objects in various orders for example, according to length or height. The first lesson (Activity 1: Sticks) uses nineteen sticks which differ only in length. Children work together to order the sticks from longest to shortest. They explore a number of ways to recognise when they have placed a stick correctly. They learn the language of describing not only what they are doing but also how and why they are doing it. They learn to listen to one another's explanations, to add to descriptions and to challenge one another when they disagree.

There are six further lessons using this schema occurring throughout the programme. Lesson 2 (Activity 2: Flowers) uses flowers that are ordered from tallest to shortest. The flowers are not rigid like the sticks, adding another dimension of difficulty. In Lesson 3 (Activity 3: Marble Run) children are provided with 20 plastic chutes of varying lengths and are asked to make the longest marble run they can using ten of the chutes. Children are being challenged to find the longest chutes while remembering that they can only use ten. Lesson 10 (Activity 10: Stones) returns to seriation and asks children to order ten stones. This is challenging as the stones are irregular in shape and each group has to decide their method of measurement. Lesson 11 (Activity 11: Boxes) uses a number of boxes differing not only in size but also in weight; neither the smallest being the lightest nor the largest being the heaviest. Lesson 15 (Activity 15: Library Books) is the only lesson where there is simultaneous whole class involvement. In their groups children order a number of library books according to a criteria agreed in their group. This whole class opportunity affords the teacher the possibility to be at a slight distance from each group and observe and assess how children's thinking abilities and collaborative skills are developing mid-way through the Programme.

Classification

The second schema addressed is classification which leads to discussions about similarities and differences between groups of objects, for example, all the red ones, all the big squares, all the red squares that are also big. Children begin by identifying criteria of sameness and difference. They express these similarities and differences in a number of ways as they develop more complex skills for identifying more difficult criteria. Identification begins with the more apparent: shape, colour and size (Activity 4: Sorting Shapes). Skills are gradually refined and developed in terms of detail, for example, this car has wide wheels but this one has thin ones (Activity 9: Cars). Activity 5: Farm Animals 1 requires children to classify using two criteria simultaneously by constructing a grid with plastic farm animals (colour and type of animal). The children progress to the recognition and identification of the empty set (Activity 6: Buttons) and the need for the intersection of sets (Activity 7: Farm Animals 2). Within each of these lessons class inclusion questions are asked on a number of occasions, for example: Are there more red sheep than sheep altogether? Later classification lessons use the identification of living and non-living things and

classes of animals (Activity 13: Living?, Activity 14: Guess What?). The final classification lesson Activity 19: Bricks uses the context of a 6X6 brick wall which has to be completed with six colours and six patterns. The main challenge being that each colour and each pattern must be used once only in each row and column.

Time sequence

The third schema uses time sequence as the basic reasoning pattern. This usually involves children agreeing the order of pictures to make a logical story and links with seriation as order is discussed. In Activity 8: Lost Boot, the first lesson using this schema, eight pictures are ordered to make a coherent and logical story. There are a number of options for this story all of which could be reasonable and logical. The next story used in this schema introduces the notion of one incident having to precede another (Activity 12: Cooking). For example, in one picture whole carrots are being washed and in another the carrots are being cut. The stories introduced later (Activity 21: Cat and Snail Story, Activity 27: Ice Cream Story) are more complex and introduce the notion of conflict; one solution being the removal of a card before a logical story can be made. The children have to come up with this idea and decide which card to remove so that the story makes sense. Another possible solution is that additional cards are drawn and added to the story before it can make sense. Children have to realise that there is more than one story line within the pictures and in order to create a coherent narrative they need to agree a solution.

Spatial perception

This is a particularly challenging schema for five year old children as they have to “see” events from various perspectives while maintaining their own view. The spatial perception lessons allow opportunities for children to discuss what they can see from a certain position at a table while looking at shapes or a model of a crossroads with cars, people, buildings and a bus stop. They then have to imagine what they may see from other positions and draw the resultant picture or choose the appropriate photograph. The first lesson (Activity 16 Crossroads 1) uses a crossroads scene with pictures taken from all four sides. Children have first to identify the picture which matches what they can see from their place and then identify pictures of the views which their peers can see from their place on each side. This requires a child to put themselves in another child’s position and visualise that view. Subsequent lessons use shapes (Activity 17: Looking at Shapes) standing on the table with some hidden from each side by other bigger shapes, a crossroads scene (Activity 18: Crossroads 11) from an aerial view and a farmyard scene (Activity 26: Farmyard). In this last lesson of this schema children have to imagine themselves to be one of the animals in the farmyard. Each child offers three clues for their peers to work out “who they are”. They are asked to say as their clues two things they can see and one they cannot see. Children find it particularly challenging to hold the view of the chosen animal and of their own actual view of the farmyard.

Causality

The next schema introduced is that of causality where children have to look at the causes of certain events by looking at their subsequent effects. This encourages children to consider cause and effect and conversations revolve around this concept. The first lesson (Activity 22: Shadows) uses a torch and the children consider the question “What causes the shadow to be made?” In the second lesson (Activity 25: Transformations), children use pictures to identify the causes of events. These pictures contain details irrelevant to the cause and are, therefore, challenging distractors which children have to negotiate.

Rules

The last schema to be introduced is that of rules where children begin to realise that rules are important and also that negotiation of changes of rules for group co-operation is also important. The first lesson (Activity 23: In this Town) encourages children to identify when the rule is being broken, how to correct the

situation and how to find out whether or not the rule is being broken. The second lesson (Activity 24: Making a Game) requires each group to make up a game, agree rules and keep the rules to make the game work. They also have to discuss the changing of rules and agree certain conditions for this happening. They then have to teach their game to another group. That group then play the game but thereafter agree one rule to change. They teach this “new game” to the next group. This continues until the last group teach their game to the first group. A class discussion then takes place: this encourages children to discuss many issues, for example, the difficulties they encounter when rules are being negotiated, helpful rules, the necessity to communicate well.

Appendix 2:2: Pillars of CA with examples from lessons

Concrete Preparation

Teachers often begin the lesson by asking children what is going to be expected of them during the lesson. This covers cognitive behaviours, for example, thinking, sharing ideas, working out a problem as well as more socialised behaviours, for example, taking turns, not snatching, sharing the equipment. The timing ranges from a minute to five minutes.

For example:

Miss Comfrey: A few rules before we start. We're going to work together as a group. If I say hands in lap remember what I mean.

Miss Arum: We all awake? Brains working? How are we going to work today?

Soha: Listen

Jack: And talk

Tiffany: And do things together.like.share and work it out

Grace: And think

Angela: And use our brains

After these preliminaries, the first phase of the lesson is to contextualise the challenge which follows. The teachers and children can be seen and heard to name the equipment or pictures. Occasionally children are asked what they think they are going to do during the lesson. The length of the concrete preparation varies according to the lesson and to each group. The context of some lessons is immediately obvious and requires little in the way of description.

For example, the first lesson begins with ten sticks, differing in only one dimension by a centimetre, being placed on the table. Usually, without prompting the children begin to describe the sticks and comment that "some are long and some are short". This is an immediate cue for the teacher to ask what is meant. Children then identify that no stick is the same. The teacher then holds up three sticks – a very short one, a very long one and a middle one – so that the length differences are obvious. Children are encouraged to explore the idea that the middle stick is longer than one but shorter than the other. This draws children into looking at more than two sticks at once which some find difficult. It also models the language of measure which they will need throughout the lesson. In this way both the materials and the vocabulary required for the challenge are becoming familiar.

Cognitive Challenge

According to CA theory cognitive challenge is an essential component to every lesson. Although most children at the beginning of Year 1 are generally thinking in a pre-operational or early concrete way as described by Piaget, nevertheless, a range of challenges within each lesson is crucial to the advance of each child's cognitive development. Unless each child cognitively struggles with some aspect within each lesson, then, the lesson has failed to meet its key objective.

Although children are encouraged to challenge each other, most frequently making the lesson challenging rests with the teacher. This is done by frequently posing the problems to be solved, for example, Put the sticks in order, sort the cards into groups. At other times the teacher asks questions to probe for explanations, for example, Why did you put that stick there? Can you explain the criteria for that group?

Sometimes the teacher uses body language to indicate confusion, needing help, looking puzzled. The teacher encourages children to ask questions of each other and expects children to explain why they agree or disagree with possible solutions.

For example:

- Temi: This goes after the carrots 'cos he's sweeping bits of carrots.
Muad: Sweeps.
Dawn: No, washing hands. Do you agree?
Karen/ Temi: Yes.
Dawn: Hands....wash carrots.
Nemur: This should be next.
Dawn: I agree.
Muad: Butter bread.
Dawn: No, I don't agree.
Miss Daisy: Why?
Muad: 'Cos she's cutting bread.

Metacognition

In order to make the thinking and learning more conscious the teacher uses opportunities to ask questions which aim to take the children beyond the task to consider what they are learning, how they are solving the problems, which strategies are useful and which are rejected as unhelpful or less useful. In the professional development teachers are encouraged to do this at points during the lesson as appropriate. In this way, children know exactly what is being discussed and these "windows of opportunity" (Piaget, 1954) are captured and learnt from in an experiential way.

For example:

- Miss Arum:* What was hard about this?
Angela: Cos everybody chose different things.
Miss Arum: Why does that make it hard?
Grace: Cos it's tricky.
Miss Arum: Why?
Grace: Cos people said different things and then changed their minds.
Angela: Like saying one of these.

Bridging

At various points during the lessons the teachers or children refer to a link with either some aspect of the curriculum or something from home.

For example:

- Miss Comfrey:* Does this remind you of anything?
Lewis: Yes, sorting my toys into boxes like what my mum says.

These links act like memory prompts or supports to develop a more conscious awareness of the learning. Bridging usually links the kind of thinking being developed through the lesson. Opportunities for bridging are provided by the teacher or through spontaneous comments from the children.

Appendix 2.3:

Year 1 tests

Test of spatial relations

This test is based on both original Piagetian protocols. Firstly, it assesses a child's ability to perceive the horizontality of the surface of juice in a bottle as the bottle is placed on its side, turned upside down and tilted. Secondly, it assesses a child's ability to perceive the verticality of a plumb line within a bottle which is tilted and placed on its side. Children were required to colour, within ready-drawn bottles, both in anticipation of the bottle being turned and after they had seen it in the new position. Scoring depended on both anticipation and the perceptual learning which occurred when children saw the bottle in the new position. This resulted in a six item test:

- upright bottle, bottle upside down, on side, tilted
- plumb line on side and tilted.

The Cronbach alpha internal consistency measure for this with a pilot sample of 114 children was 0.74. This was acceptable in a six item test (Adey, 2001).

Test of conservations

This test is based on the original Piagetian protocols (Piaget & Inhelder, 1974) which have created much argument in the literature. Donaldson (1978) claimed that Piaget underestimates children's real ability by imposing the authority of an adult on non-conserving responses. However, Eames, Shorrocks & Tomlinson (1990) showed that, when properly administered with an appropriate mixture of pro and anti-conservation prompts and counter-suggestions, the results were reliable and much as originally reported by Piaget, given due allowance for the non-representative nature of Piaget's sample.

After the pilot study of the tests, eight items were finally selected which offered an appropriate range of facilities. One mark was given for each correct conservation response with adequate explanation. The eight items were:

- Number of eggs and egg cups, eggs in cups then cups in a row and eggs altogether in an egg carton.
- Number of counters placed one to one in two rows, then one row expanded and the other compressed.
- Amount of liquid: three measures poured into each of a tall thin glass and a short fat glass.
- Amount of solid: One of two equal balls of plasticene transformed into a sausage, a pancake and five little balls.
- Weight: One of two balanced balls of plasticene transformed into a pancake and five little balls.

Cronbach alpha consistency for this test was 0.81 (0.85 with Horst's correction for limited age range) (Adey, 2001).

This test took approximately 20-30 minutes to administer to each individual so it was not possible to give it to every child. Consequently, a one third sample was chosen. This was taken from the full range of ability as given on the baseline test administered in schools the previous year. The baseline test in this particular LA was Signposts, Birmingham LA (1997). This test was administered by the class teacher within the first six weeks of the child entering Reception (children aged 4-5 years). A score is given in speaking and listening, reading, writing, mathematics and personal and social development.

In calculating the sample for the conservation tests, a cumulative score was collated for each child using the marks attributed to children for all but the personal and social development aspects. These were then placed in a hierarchical order and every third score was taken. The resultant nine or ten that this yielded were looked at in terms of gender and ethnicity. If these were very unbalanced in any particular class children either side of the scores were used to balance ability, gender and ethnicity, so that the final sample was truly representative of the whole group.

Appendix 4.1:

Teacher preparation for interview

In preparation for your interview in two weeks time, think about these questions.

We will discuss your responses during the interview.

- Consider what most helps/hinders children's learning.
- Consider the impact on learning of the child's own view of him/herself.
- Is the focus group typical of the groups in the rest of your class?

Appendix 4.2:

Teacher Interview Schedule

Can you say what you believe to be the general factors affecting children's learning?

Now that we have the constructs on the table (shown in Appendices 5.1, 5.2 and 5.3), can you consider some of your children and think about the similarities and differences between them for each construct?

Now you have identified some similarities and differences, can you say more about these similarities and differences?

Now, can you tell me how you think a child's view of him/herself as a learner affects their learning?

How does the observed group in your class compare to other groups?

How does the observed group behave across the curriculum? Are there similarities and differences in other subjects?

Appendix 5.1:

Constructs provided by the teachers in September of the first year

First year: September			
	Constructs	Opposite pole	Frequency
Constructs from: What do you think helps children's learning?	Do what they are told/behave/keep rules	Will not co-operate	8
	Ability	Won't co-operate	6
	To learn to read	Can't learn to read	5
	Be supported by home	Parents against school/ Parents who do not care	3
	Listen/Listen to adults	Won't listen	3
	Gender	Boys don't learn the same	6
	Complete set work	Won't finish anything you give them to do	2
	Be independent	Need attention all the time	2
	Sit quietly	Will not be quiet	2

Appendix 5.2:

Constructs provided by the teachers in the first year

First year: July			
	Constructs	Opposite pole	Frequency
Constructs from: What general factors affect children's learning?	Child ability	Not able to learn	6
	They want to behave	Won't co-operate	6
	They are mature	Immature	6
	Positive attitudes to school from home	Against school	6
	Positive parenting	Parents who do not care	6
	Gender	Boys don't learn the same	6
	Emotional solidity	Unstable	5
	Positive attitude to learning	Does not want to learn	5
	Biology/genetic	Can't give them what they haven't got	3
	Controlled TV time	Allowed to watch violent things	3
	Conform to school discipline	Won't do what they're told	3
	Some cultures have different attitudes	Boys allowed to do what they like	2
	Positive environment	Boring environment	2
	Lived in peaceful place	Been in war zone	1
Constructs from: How does the child's view of him/herself as learner affect his/her learning?	Teacher has responsibility in developing children's views	Unprofessional teacher would not take responsibility	3
	Child view affects achievement	Negative view children will not achieve much	3
	View of high ability has positive effect	Negative view children will not learn	3
	Their view impacts on everything	Negative view will not learn	2
	Their view of high ability has positive effect on effort	Negative view won't make effort to learn	2
	Positive view is developed from what teacher says	Won't listen to teacher view	2
	High ability view has positive effect on risk taking	View of low ability has negative effect on risk taking	2
	Their view has huge impact upon learning	If no view they won't realise they need to learn	1

First year: July		
Constructs	Opposite pole	Frequency
Their view is linked to how others view child	If parent is negative, child will be negative	1
Child has to have power	If they don't have power they won't try.	1
Child has to understand that they are responsible	If they don't take responsibility they won't learn.	1
They can get better if they try	If they don't try they won't improve	1
School is positive effect	Families give children the wrong message about themselves	1
Teachers have no effect on children's views of themselves as learners	View of learning comes from the family	1

Appendix 5.3:

Constructs provided by the teachers in the second year

Second year: July		
Teacher	Constructs	Opposite poles
Arum	They need to express their ideas	They need to keep quiet
	They need to have their ideas challenged	They need easy things
	They need to want to learn	They are not motivated
	They need to think about the challenges	They need answers provided
	They need to make suggestions	They need to be told
	They need to be prepared to adapt their ideas	They cannot change their minds
	They need to think about how to think	They need to be told how to do puzzles
	They need to learn from others	They do isolated work
	They need to have experiences where they collaborate	They work on their own
	They need clear explanations	They won't learn if the teaching is poor
	They need to be able to explain things so they need time	Everything done in a rush does not help learning
	I need to plan well for learning	Poor planning
	I need to assess the learning and keep ahead of where they are at	Poor assessment unrelated to planning
	I need to be allowed to be a professional who can make decisions for their good	Government telling us what to do all the time
	They need support from home	Unsupportive family
	They need as many different type of experiences as we can give them	Limited experiences
	I need to be able to help them love learning	No enthusiasm for learning
	I need to know what they think	Just consider teaching content
I need to hear what would help them more	No time to listen to children	
Bramble	They need to become independent	Having everything done to them
	They need to be able to think	Content teaching only
	They need to be challenged	Easy work
	They need to think about the learning process	Not consider the process of learning
	They need to be emotionally strong	Emotionally fragile
	They need to ask questions	Questions not encouraged
	They need to become self controlled	No empowering
	They need to be aware of others	Self centred
	They need to be able to collaborate	Not able to work with others
	They need to be able to learn from others	Not being ready to be humble
	They need to be able to read independently	Unable to read
	They need to be motivated to learn	No motivation to learn
	I need to teach well planned lessons at the right pitch	Poorly planned lessons that are too easy or too hard

Second year: July		
Teacher	Constructs	Opposite poles
	I need to help them learn self control	Teacher in control all the time
	I need to listen to what they think helps learning	No time to listen to them
	I need to listen to them and hear what they need	Not understand their needs
	I need to stand back and let them learn	Teacher controlling
	I need to realise that they are not just dependent on me	Not open to them not needing me all the time
	I need to evaluate my work by listening to them more	Poor evaluation without consideration of their views
Comfrey	I have to give them tasks that challenge	Easy work
	They need to behave	Bad behaviour
	They need to discuss things	Quiet classroom
	They need to become independent so I do not need to watch them all the time	Teacher in control all the time
	They need to work together	Individual work
	They have to be able to be polite and act nicely without a teacher	Poor behaviour to others
	They need to be able to read	Cannot read
	They need to learn manners	Ill mannered
Daisy	They need to learn to think	Content teaching only
	They need to be challenged	Easy work
	They need to accept that things are difficult but they can go through that to learn	Make life easy for them
	They need to know how to think	No opportunity to think for themselves
	They need to think about the process of thinking	Do not consider how to think
	I need to give them lots of experiences	Limited kinds of experiences
	I need to provide creative activities	Dull work
	I need to give them time	Rush everything
	I need to teach them how to discuss	No talking allowed
	I need to teach them how to listen and then use what they hear	No opportunity to listen and learn from others
	They need to want to learn so I need to make it interesting	No motivation to learn
	I need to motivate them	Teacher poorly motivated
	I need to provide fun	Boring teacher
	They need to listen and learn from each other	No humility
	They need to learn to ask questions	No questioning allowed from children
	I need to know what they think helps them	Teacher does not listen to children
	I need to give time to really hear their views	No teacher time to listen
	I need to act upon what they think helps them to learn	Teacher does not respond to their needs

Appendix 5.4:

Interview with Miss Arum in July of the first year

R.

Can you say what factors you think most affect children's learning?

Miss A.

Yes. Ability, Maturity, If they want to behave, positive attitudes from home, positive parenting, their gender, emotional solidity, positive attitude to learning, controlled TV.

(These constructs are written on individual cards)

R.

Thanks. Can you tell me, do all of the children in the group behave in a similar way?

Miss A.

No, they can be different. For example, **ability**, let's see – Angela she is able and Jack and Grace. But these others (Tiffany, Nurad) well –not so much and they are not so mature either but then neither is Jack so he has to move over here for this construct. **Maturity** makes a difference because they can get on and they don't need me in the same way.

If they want to behave- that's crucial. These all behave really but you have to watch Jack at times, he drifts and does not work really. But he does not cause trouble. Grace wants to behave and gets on with her work. These all have **positive attitudes from home** and that helps because it makes them want to do well. Their **parents are helpful**. They want them to have a good education and they teach them right from wrong and tell them to behave in school.

Gender is a big thing. Boys need pushed. Girls just get on but you need to push boys and tell them it is not good enough. You couldn't do that to girls. Like Jack, I have to push him or he wouldn't do anything. He needs pushing all the time. So when he brings me work I just say that's not enough, go back, do more. You wouldn't need to say that to a girl. You couldn't.

R

Do you think that helps his learning?

Miss A

Yes, it has to if I keep pushing. He goes back. Mind he does not always come back with more work.... maybe it doesn'toh God... maybe I am wrong about all this....

emotional solidity –that links to maturity too. Grace is very solid and Tiffany, I think. The others I think need some support in that. I don't think they are that solid really. It was different for us at home because we had lots of security, lots of solid people around and that made us solid early. It helps.

positive attitude to learning, I think that if there is a lot of positive support and positive comments about school, it does the children a lot more good. When they hear parents criticising school, that does not help at all. We have a lot of that around here. I am not used to that. They need to be taught to co-operate with us and then they get on. If we are arguing and fighting against them all the time it does not help anybody.

controlled TV-parents need to think about what they are watching. They should not watch violence or sex or things like that. They should just see children's programmes. TV does a lot of damage.

R

How do you think the children's self view impacts upon them as learners?

Miss A

Yes, I think it does. If they see themselves as getting things right they'll do more. If they are high ability they will put effort in and that's what makes the difference, effort is the thing so this high view really matters. They need to co-operate with us though, that and effort and they think of high ability.

R

How does this group compare with the rest of your class?

Miss A

Oh much the same really, no real differences, mix of everything.

R

What about how this group work in other lessons?

Miss A

Well, that's difficult really. Jack and Angela work the hardest to solve the challenges in CA. They are really competitive with each other. They don't work together any other time so I can't really tell.

It's interesting. I've never thought about all these things before. I was pleased to read your preparation sheet or I would have been lost. I'm dying to know what the children said about everything.

R

Yes, their comments are interesting. We'll share those when we have our group meetings.
Thanks.

Appendix 6.1: Constructs provided by the children

The following eight tables show the constructs provided by each group in each of the three points during the year - September (S), March (M) and July (J).

Group A1*	Angela			Grace			Jack			Nurad			Tiffany		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Have to work	♦			♦			♦			♦			♦		
Read	♦			♦			♦			♦			♦		
The teacher	♦			♦			♦			♦			♦		
Do numbers/sums	♦			♦			♦			♦			♦		
Learn times tables	♦			♦			♦						♦		
Put your hand up	♦			♦									♦		
Go to school				♦											
Do what you are told				♦											
Your mum				♦											
Listen		♦	♦		♦	♦			♦		♦	♦		♦	♦
Talk		♦	♦		♦	♦									
Explain		♦				♦									
Share things		♦	♦		♦	♦						♦			♦
Solve a problem		♦													
Look			♦		♦	♦						♦			
Think			♦			♦			♦						
Ask						♦									
Sort					♦									♦	
Discuss			♦		♦	♦			♦						
Work hard/sensibly		♦			♦			♦			♦			♦	
Understand					♦										
Kind					♦										
Not argue											♦				
Helpful					♦										
Confused					♦										
Order		♦	♦			♦			♦						♦
Feel objects					♦										
Difficult														♦	
Try					♦	♦			♦						
Describe things												♦			♦
Put things in order			♦			♦			♦						♦
Make sense						♦			♦						
Agree and disagree			♦			♦			♦						

Group A1*	Angela			Grace			Jack			Nurad			Tiffany		
Constructs	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Use your brain			♦			♦			♦						
Work out what thinking you need						♦									
Total	6	7	10	9	14	14	5	1	9	4	3	4	6	4	5

*Muhad left in December and Soha arrived in May so these two children are not included in the above table.

Table 6.4: Constructs provided at each of the three points in the year by Group A1.

Group A2	Anna			Philomena			James			Abda			Jackie			Tahmid		
Constructs	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Have to work	♦			♦			♦			♦			♦			♦		
Read	♦			♦			♦			♦			♦			♦		
The teacher	♦			♦			♦			♦			♦			♦		
Do numbers/ sums	♦			♦			♦			♦			♦					
Learn times tables	♦			♦			♦			♦								
Go to school	♦			♦			♦											
Do what you are told	♦						♦						♦					
Your mum	♦			♦														
Your dad							♦											
Sit quiet							♦			♦						♦		
Listen		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦
Talk		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			♦
Explain		♦	♦		♦	♦		♦	♦		♦	♦			♦			
Share things		♦	♦			♦		♦	♦		♦	♦					♦	♦
Share ideas		♦	♦			♦		♦	♦		♦	♦		♦	♦			
Solve challenges		♦	♦		♦	♦		♦	♦		♦	♦			♦			
Look		♦	♦		♦	♦			♦			♦		♦				♦
Think		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦
Ask		♦	♦		♦	♦		♦	♦			♦		♦	♦			♦
Discuss		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			♦
Try		♦	♦		♦	♦		♦	♦		♦	♦					♦	♦
Put things in groups		♦			♦			♦			♦			♦				
See other ways of doing things		♦			♦													
Agree/disagree		♦	♦		♦	♦		♦	♦		♦	♦			♦		♦	♦
Use your brain		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			♦
Work as a team		♦	♦		♦	♦		♦	♦									

Group A2	Anna			Philomena			James			Abda			Jackie			Tahmid		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Show what to do		◆	◆		◆	◆		◆	◆		◆	◆						
Make stories right			◆						◆									
Think of other views			◆			◆			◆			◆						
Think of how to think			◆			◆			◆									
Say how you are thinking			◆			◆			◆			◆						
Ask how people think			◆			◆												
Challenge someone			◆															
Say if you remember something like it			◆															
Total	8	17	22	7	15	19	9	15	19	6	13	16	5	9	10	4	5	10

Table 6.5: Constructs provided at each of the three points in the year by Group A2.

Group B1	Sacha			Abdul			John			Margarite			Nania			Claudio		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Have to work	◆			◆			◆			◆			◆			◆		
Read	◆			◆			◆			◆			◆					
The teacher	◆			◆			◆			◆			◆			◆		
Do numbers/ sums	◆			◆			◆			◆			◆					
Learn times tables	◆			◆			◆			◆								
Put your hand up										◆								
Go to school	◆			◆														
Do what you are told	◆						◆			◆			◆					
Listen		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆			◆
Talk		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆		◆	
Explain		◆	◆		◆	◆		◆	◆		◆	◆		◆				
Share things		◆	◆		◆	◆		◆	◆		◆	◆					◆	
Solve problem		◆	◆		◆	◆			◆			◆						
Look		◆	◆		◆	◆												
Think		◆	◆			◆			◆			◆			◆			◆
Ask		◆	◆		◆	◆			◆									
Sort					◆													
Discuss		◆	◆		◆	◆			◆			◆			◆			◆

Group B1	Sacha			Abdul			John			Margarite			Nania			Claudio		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Work hard/sensibly		♦			♦			♦										
Understand					♦			♦										
Kind														♦				
Play																		♦
Try			♦			♦			♦									
Describe																		♦
Put things in order			♦						♦			♦						♦
Make sense			♦			♦			♦			♦			♦			
Agree/disagree			♦			♦			♦			♦			♦			♦
Use your brain			♦			♦			♦			♦			♦			♦
Work out what kind of thinking you need			♦			♦			♦			♦						
Total	7	10	15	6	11	14	6	6	14	7	4	12	5	4	7	2	3	7

Table 6.6: Constructs provided at each of the three points in the year by Group B1.

Group B2	Sakia			Thomas			Meenah			Gavin			Renata			Georgio		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Have to work	♦			♦			♦			♦			♦			♦		
Read	♦			♦			♦			♦			♦			♦		
The teacher	♦			♦			♦			♦			♦			♦		
Do numbers/ sums	♦			♦			♦			♦			♦			♦		
Learn times tables	♦			♦			♦			♦			♦					
Go to school	♦																	♦
Do what you are told	♦			♦			♦						♦					
Your mum	♦			♦						♦								
Your dad							♦											♦
Sit quiet	♦						♦			♦			♦					
Listen		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦
Talk		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			♦
Explain		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			♦
Share things		♦	♦			♦		♦	♦		♦	♦		♦	♦			
Share ideas		♦	♦			♦		♦	♦		♦	♦			♦			♦
Solve challenges		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			
Look		♦	♦		♦	♦		♦				♦						♦
Think		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦

Group B2	Sakia			Thomas			Meenah			Gavin			Renata			Georgio		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Ask		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆			
Discuss		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆
Try		◆	◆		◆	◆		◆	◆		◆	◆						
Put things in groups		◆			◆			◆			◆							
See other ways of doing things		◆			◆			◆			◆							
Agree/disagree		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆
Use your brain		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆
Work as a team		◆	◆		◆	◆		◆	◆					◆	◆			
Show what to do			◆					◆	◆		◆							
Make stories right			◆						◆			◆						
Think of other views			◆			◆			◆			◆						
Think of how to think			◆			◆			◆			◆						
Say how you are thinking			◆			◆			◆			◆						
Ask how people think			◆															
Challenge someone			◆															
Say if you remember something like it			◆															
Total	9	16	22	7	14	17	8	17	18	7	15	17	7	11	12	6	5	9

Table 6.7: Constructs provided at each of the three points in the year by Group B2.

Group C1	Polly			Mark			Joleen			Lewis			Weena			Tom		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Have to work	◆			◆			◆			◆			◆			◆		
Read	◆			◆			◆			◆			◆			◆		
The teacher	◆			◆			◆						◆			◆		
Do numbers/ sums	◆			◆			◆			◆			◆					
Learn times tables	◆			◆						◆						◆		
Put your hand up	◆			◆			◆									◆		
Go to school	◆																	
Do what you are told							◆											

Group C1	Polly			Mark			Joleen			Lewis			Weena			Tom		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Your dad																♦		
Listen		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			♦
Talk		♦	♦			♦			♦			♦			♦			
Explain		♦	♦			♦			♦			♦			♦			
Share things		♦	♦		♦	♦			♦			♦			♦			
Solve problem		♦	♦		♦	♦			♦			♦			♦			
Look			♦		♦	♦											♦	
Think		♦	♦			♦			♦			♦		♦	♦			♦
Ask		♦	♦			♦			♦									
Sort					♦													
Discuss			♦			♦			♦			♦						
Work hard/sensibly		♦																
Not argue														♦				
Try			♦			♦			♦									
Describe			♦			♦			♦			♦						
Put things in order			♦						♦			♦						♦
Make sense			♦			♦											♦	
Agree/disagree			♦			♦											♦	
Use your brain			♦			♦			♦								♦	
Work out what kind of thinking you need																	♦	
Total	6	9	15	6	5	14	6	1	12	4	1	9	4	3	10	6	1	3

Table 6.8: Constructs provided at each of the three points in the year by Group C1.

Group C2	Stacey			Cathie			Matthew			Talmi			Magata			Mohammed		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Have to work	♦			♦			♦			♦			♦			♦		
Read	♦			♦			♦			♦			♦			♦		
The teacher	♦			♦			♦			♦			♦			♦		
Do numbers/sums	♦			♦			♦			♦			♦			♦		
Learn times tables	♦			♦			♦			♦						♦		
Go to school	♦			♦			♦			♦								
Do what you are told	♦			♦			♦						♦			♦		
Your mum				♦			♦			♦								
Your dad	♦						♦											
Sit quiet							♦			♦			♦			♦		

Group C2	Stacey			Cathie			Matthew			Talmi			Magata			Mohammed		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Listen		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦
Talk		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			
Explain		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			♦
Share things		♦	♦			♦		♦	♦		♦	♦						♦
Share ideas		♦	♦			♦		♦	♦		♦	♦		♦	♦			♦
Solve challenges		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			
Look		♦	♦		♦	♦		♦	♦			♦		♦			♦	♦
Think		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦
Ask		♦	♦		♦	♦		♦	♦		♦	♦		♦			♦	
Discuss		♦	♦		♦	♦		♦	♦		♦	♦		♦	♦			♦
Try		♦	♦			♦						♦						♦
Put things in groups		♦			♦													
See other ways of doing things		♦			♦			♦			♦			♦				
Agree/disagree		♦	♦		♦	♦		♦	♦		♦	♦			♦			
Use your brain		♦	♦		♦			♦	♦		♦	♦						♦
Work as a team		♦	♦		♦	♦		♦	♦			♦			♦			
Show what to do		♦	♦		♦	♦		♦	♦									
Make stories right			♦						♦									
Think of other views			♦			♦												
Think of how to think			♦			♦												
Say how you are thinking			♦															
Ask how people think			♦															
Total	8	17	20	8	14	16	10	15	15	8	12	14	6	10	9	7	4	9

Table 6.9: Constructs provided at each of the three points in the year by Group C2.

Group D1	Dawn			Nemy			Susan			Tamu			Karen			Mooni		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Have to work	♦			♦			♦			♦			♦			♦		
Read	♦			♦			♦			♦						♦		
The teacher	♦			♦			♦			♦			♦			♦		

Group D1	Dawn			Nemy			Susan			Tamu			Karen			Mooni		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Do numbers/ sums	◆			◆			◆			◆			◆			◆		
Learn times tables	◆			◆			◆			◆			◆					
Put your hand up	◆																	
Go to school	◆			◆														
Do what you are told	◆			◆			◆						◆					
Your dad				◆														
Listen		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆
Talk		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆
Explain		◆	◆		◆	◆		◆	◆			◆			◆			◆
Share things		◆	◆		◆	◆		◆	◆		◆	◆			◆			◆
Solve problem		◆	◆		◆	◆		◆	◆			◆						◆
Look		◆			◆			◆			◆						◆	
Think		◆			◆			◆			◆							
Ask		◆																
Helpful								◆										
Discuss					◆													
Work hard/sensibly					◆													
Remember		◆			◆						◆							
Get right								◆										
Kind														◆				
Play														◆				

Table 6.10: Constructs provided at each of the three points in the year by Group D1.

Group D2	Aurora			Joshua			Bernie			Rakhmi			Pauline			Keendi		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
Have to work	◆			◆			◆			◆			◆			◆		
Read	◆			◆			◆			◆			◆			◆		
The teacher	◆			◆			◆			◆			◆					
Do numbers/	◆			◆			◆			◆			◆					

Group D2 Constructs	Aurora			Joshua			Bernie			Rakhmi			Pauline			Keendi		
	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J	S	M	J
sums																		
Learn times tables	◆			◆			◆			◆			◆			◆		
Go to school	◆			◆			◆			◆						◆		
Do what you are told	◆						◆						◆			◆		
Your mum	◆																	
Your dad							◆											
Sit quiet							◆			◆			◆			◆		
Listen		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆
Talk		◆	◆		◆	◆		◆	◆		◆	◆			◆			◆
Explain		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆			
Share things		◆	◆			◆		◆	◆		◆						◆	◆
Share ideas		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆
Solve challenges		◆	◆		◆	◆		◆	◆		◆	◆			◆			◆
Look		◆	◆		◆	◆					◆	◆		◆				
Think		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆
Ask		◆	◆		◆	◆		◆	◆			◆		◆	◆		◆	
Discuss		◆	◆		◆	◆		◆	◆		◆	◆		◆	◆			◆
Try		◆	◆		◆	◆		◆	◆		◆						◆	◆
Put things in groups		◆			◆			◆			◆			◆				
See other ways of doing things		◆			◆			◆										
Agree/disagree		◆	◆		◆	◆		◆	◆		◆	◆						
Use your brain		◆	◆		◆	◆		◆	◆			◆			◆			◆
Work as a team		◆	◆		◆	◆		◆	◆		◆			◆				
Show what to do		◆	◆		◆	◆		◆			◆							
Make stories right			◆						◆			◆						
Think of other views			◆			◆			◆									
Think of how to think			◆			◆			◆									
Say how you are thinking			◆			◆			◆									
Ask how people think			◆															
Challenge someone			◆						◆									
Total	8	17	21	6	16	18	9	16	18	7	14	12	7	9	9	6	6	9

Table 6.11: Constructs provided at each of the three points in the year by Group D2.

The following tables indicate the constructs provided in each of the two years in September, March and July.

Constructs	September – Years 1 and 2							
	Year 1				Year 2			
	A Pine	B Pine	C Larch	D Larch	A Pine	B Pine	C Larch	D Larch
Have to work	5	6	6	6	6	6	6	6
Read	6	5	6	5	6	6	6	6
The teacher	5	6	5	6	6	6	6	5
Do numbers/sums	5	5	5	6	5	6	6	5
Learn times tables	4	4	4	5	4	5	5	6
Put your hand up	3	1	4	1	0	0	0	0
Go to school	1	2	1	2	3	2	4	5
Do what you are told	1	4	1	4	3	4	5	4
Your mum	1	0	0	0	2	3	3	1
Your dad	0	0	1	1	1	2	2	1
Sit quiet	0	0	0	0	3	4	4	4

Table 6.12: Constructs provided in September in both years of the study.

Constructs	March – Years 1 and 2							
	Pine School				Larch School			
	A1	A2	B1	B2	C1	C2	D1	D2
Listen	4	6	5	6	5	6	6	6
Talk	2	5	6	5	1	5	6	4
Explain	1	4	5	5	1	5	3	5
Share things	2	4	5	4	2	3	4	4
Share ideas	0	4	0	3	0	4	0	6
Solve a problem	1	0	2	0	2	0	3	0
Solve challenges	0	4	0	5	0	5	0	4
Look	1	3	2	3	2	4	5	3
Think	0	6	1	6	2	6	4	6
Ask	0	4	2	5	0	6	1	5
Sort	2	0	1	0	1	0	0	0
Discuss	1	5	2	6	0	5	1	0
Work hard/sensibly	5	0	3	0	1	0	1	0
Understand	1	0	2	0	0	0	0	0
Remember	0	0	0	0	0	0	3	0
Kind	1	0	1	0	0	0	1	0
Not argue	1	0	0	0	1	0	0	0
Helpful	1	0	0	0	0	0	1	0
Get right	0	0	0	0	0	0	1	0
Confused	1	0	0	0	0	0	0	0
Play	0	0	1	0	0	0	1	0
Order	1	0	0	0	0	0	0	0
Feel objects	1	0	0	0	0	0	0	0

Constructs	March – Years 1 and 2							
	Pine School				Larch School			
	A1	A2	B1	B2	C1	C2	D1	D2
Difficult	1	0	0	0	0	0	0	0
Try	1	5	0	4	0	1	0	5
Put things in groups	0	5	0	4	0	2	0	5
See other ways of doing things	0	2	0	4	0	5	0	3
Agree/disagree	0	5	0	6	0	4	0	4
Use your brain	0	5	0	6	0	4	0	3
Work as a team	0	3	0	4	0	3	0	5
Show what to do	0	4	0	2	0	3	0	4
Total	28	74	38	78	18	71	47	72

Table 6.13: Constructs provided in March in both years of the study.

Constructs	July– Years 1 and 2							
	Pine School				Larch School			
	A1	A2	B1	B2	C1	C2	D1	D2
Listen	6	6	6	6	6	6	6	6
Talk	2	6	5	6	5	5	6	6
Explain	1	5	4	6	5	6	6	5
Share	4	5	4	5	5	5	6	4
Discuss	3	6	6	6	4	6	6	6
Solve a problem	1	0	4	0	5	0	5	0
Solve challenges	0	5	0	5	0	5	0	6
Look	3	5	2	4	2	5	3	3
Think	3	6	6	6	6	6	6	6
Ask	1	6	3	5	3	4	5	5
Describe things	2	0	1	0	4	0	3	0
Put things in order	4	0	4	0	4	0	5	0
Make sense	2	0	5	0	3	0	4	0
Agree and disagree	3	6	6	6	3	5	5	4
Use your brain	3	6	6	6	4	4	6	6
Work out what thinking you need	1	0	4	0	1	0	5	0
Try	2	5	3	4	3	4	5	4
Share ideas	0	5	0	6	0	6	0	6
Make stories right	0	2	0	3	0	2	0	3
Think of other views	0	4	0	4	0	2	0	3
Work as a team	0	3	0	4	0	5	0	3
Show what to do	0	4	0	2	0	3	0	2
Think of how to think	0	3	0	4	0	2	0	3
Say how you are thinking	0	4	0	4	0	1	0	3
Ask how people think	0	2	0	1	0	1	0	1

Constructs	July– Years 1 and 2							
	Pine School				Larch School			
	A1	A2	B1	B2	C1	C2	D1	D2
Challenge someone	0	1	0	1	0	0	0	2
Say if you remember something like it	0	1	0	1	0	0	0	0

Table 6.13: Constructs provided in July in both years of the study.

Appendix 6.2:

Interview with Sacha Group B1 March (First year of study)

You seemed to enjoy that lesson.

Yeah, well, it was fun and I could do everything and tell the others too.

You like telling the others?

Yeah, they couldn't do things without me. Here are the cards with our names. I'll put them out like round the table, like we were sitting. You did that before.

Yes, thanks. Well remembered. Would you like to turn on the tape or would you prefer it off?

No, I'll do it on. It's better then.

OK. Yes, that's it. Thank you. Now, do you think we can think about that lesson and talk about what helped you to learn?

Yeah, are you going to do the writing?

Yes, I'll write what you tell me helped you to learn.

*OK well, listen, you have **to listen** and **talk** like **explain** things what the others don't know.*

Right, so tell me what goes down then-

Listen..... talk.... explain... and you have to look too.

Right. I'll put these four over here. Anything else?

Yeah, you have to do the problem, like, think.. and share the things what are on the table and talk and then you can do it.

I'm not sure about how all that works really...

*Well, if you work like sensible and look at the things what are on the table and then think in your brain, you know, and **discuss** them with the others and then I can tell them things.*

You tell them...

Well, if you ask, you learn, that helps 'cos when they ask me, I tell them and then they knows and that's 'cos I've helped them learn.

OK Anything else?

Well I don't think so. You have it all written down now. Right.

OK So if we look at each card now and think about how this helps- listen – do you all do that the same?

No, I listen and Margarite listens so that comes here.. and Abdul he doesn't listen and John a bit so here. And Nania here too and then Claudio well, I dunno, he never does nothing..

Have you written it yet? Will I do the next one?

Yes, please. Thanks

OK Well, I'll do look, so I go here with Nania and Margarite but Claudio doesn't look or Abdul. He wants the things all the time and snatches them. I tell them to share and look but they don't always listen, you know.

Right, now I'll do explain. I do that but mmmm no, no, no, maybe Margarite a bit...no for all the others.

So if they don't explain, what do they do instead?

Well like they can't. I help them but they can't they say words sometimes but not explains.

So what is explain?

Well, like when you say it goes here, it goes here 'cos it fits or something or if you say you're wrong 'cos that does not solve the problem.

I see.

Anyway, I'm going to do talk 'cos that's like explain but not the same...like you talk words but... like not explain. Like you say the cook is washing her hands but explain goes like... she is washing her hands and, mmm, so it goes here 'cos..they're dirty. Do you get it, like?

Mmmm, I think so. You're telling me that when you talk you say some words with information but when you explain....

Yeah, right, you give more. Now, share things....mmmm. well, share things, you need to do that to help or people can't see what's going on. Mmmm

Is this a bit tricky?

Mmmm, yeah

I wonder what's making it tricky?

Well, you need to share to help people so everybody can help.

So do you all do that the same then?

Well, no, not really, I go here and Abdul goes over here, and Nania doesn't do much, Margarite helps and shares a bit, Claudio is just dreaming if he's here, John shares but he always wants to do things.

OK, now I'll do getting the problem..I'm good at that, I always get it and tell the others. They need me all the time. John gets it a bit, Nania doesn't, Claudio no way, Margarite a bit and Abdul I don't think so, no, he can go here anyway. He always thinks he knows what he doesn't.

I wonder about solving the problem..

Yeah, you need to do it right and I can do them always, Miss says and she tells me to tell them 'cos they don't know. You need to think so I'll do this now. Here, here, here, mmmm no they don't think and Margarite thinks a bit.

You are the only one over here then?

Yeah, 'cos I'm the one what thinks.

OK What about ask?

Well, the others ask me a lot so they go here, here, here, here. I don't ask 'cos I know bt asking helps when you don't know nothing. Sometimes you ask and you discuss

Discussing helps you to learn?

Yeah, 'cos if you discuss you listen and then you hear more things, like ideas, you know, and you can agree and disagree, you can if you're polite and that means you're working sensible so I can do this last one, here, here, here, here. Abdul isn't sensible so he can go over here, on his own.

Is he on his own?

Well, he is in the group but I'm putting him over there 'cos he's not sensible not even a bit. Have you got all that wried down 'cos I think that's the bell?

Appendix 7.1: Transcript of lesson 25 (A1)

Time in mins	Event	Lesson 25: Transformations transcript	Pillar of CA	Analysis
1	1	<i>T: What have we here?</i>	Concrete preparation	Question at task level to encourage pupils to name objects, ensuring all have the necessary vocabulary.
	2	All: Flowers, glasses, water		One word descriptions All pupils call out names of the objects they see on the cards. Only three mentioned. Other words are not checked.
2	3	<i>T: What I want you to do is say which thing is missing and choose the right card to fill the question mark.</i>	Cognitive challenge	Express a challenge This sets the first challenge of the lesson. There is no mention of "cause" which is the schema for this lesson. The intention is that pupils cover the question mark with what causes the change to occur.
	4	Tif: Flowers can go there.(pointing at glasses)	Cognitive challenge	Task level phrase description Suggestion offered
	5	A: No.		Disagree with a suggestion Suggestion rejected
	6	<i>T: Why?</i>	Cognitive challenge	Question at task level to probe for explanation. It is not addressed to a particular individual so is probe about the original idea or the reason for the disagreement?
	7	A: Flowers don't go with glasses.	Cognitive challenge	Task level explanation by disagree.
	8	J: Glass of water.		Task level phrase description An alternative suggestion offered
4	9	<i>T: Why?</i>	Cognitive challenge	Question at task level to probe for explanation
	10	J: Glass goes with glass.	Cognitive challenge	Task level explanation Jack is linking a picture of a tumbler of water with spectacles lying broken in a puddle of water. A question is whether Jack is thinking about previous lessons where groups of similar items are collected since "cause" has not been mentioned?

	11	<i>T: Mmmm What about the story?</i>	Cognitive challenge	Question at task level to probe for a more coherent reason but story has not previously been mentioned. The cause is still not being requested.
	12 13 14 15	Tif: Hammer could go there. G: Hammer 'cos somebody could smash glasses. A: They're in the grass. Tif: No, somebody could have stepped on them.	Cognitive challenge	Task level phrase description Task level explanation Task level phrase description but there is no grass in the pictures Disagree with Task level explanation
7	16	<i>T: Why?</i>	Cognitive challenge	Question at task level to probe for explanation
	17 18	N: If they're blind A: They might have dropped them. They can't see them and step on them.	Cognitive challenge	Task level explanation Task level explanation
8	19	<i>T: Right. Does that make sense with the hammer?</i>	Cognitive challenge	Question at task level looking for coherence
	20	A: This one with the lolly	Cognitive challenge	Task level phrase description different suggestion being offered
	21	<i>T: Does that make sense?</i>	Cognitive challenge	Question at task level to probe for explanation and coherence.
	22 23 24 25	G: No that person has lolly and knows where he's going. N: No maybe the hammer goes there. J: That match could break it. N: No, the hammer.	Cognitive challenge	Disagree with Task level explanation Disagree with Task level description Task level phrase explanation unclear what is meant. Disagree return to original suggestion with one word description
9	26	<i>T: Why would the matches break it?</i>	Cognitive challenge	Question at task level to probe for explanation from J – N's idea being ignored
	27 28	N: Hammer could be on shelf, fall down and break glasses. A: Yes, the hammer is on the shelf, they fall down on the glasses and they smash.	Cognitive challenge	Task level explanation provides explanation for his idea Agree with further task level explanation T's question to J goes without response.
10	29	<i>T: What do you think, Tiffany?</i>	Cognitive challenge	Question at task level to draw in Tiffany.
	30	Tif: If it's in the drawer, they can't fall out.	Cognitive challenge	Task level explanation but there is no drawer visible

11	31	<i>T: How did the glasses get there?</i>	Cognitive challenge	Question at task level to probe for explanation T's question remains unanswered.
	32	A: The person looks down and they fall off.	Cognitive challenge	Task level explanation
	33	N: The clouds could go there.		Task level explanation new card selected
	34	A: It was sunny and the person opened the window but the rain came in the window and blew over the glasses.		Task level explanation developed into a story
	35	J: Person wouldn't want them wet so just hammered them.		Task level explanation different reason for using hammer
12	36	<i>T: Right. Is everyone happy with the hammer?</i>	Cognitive challenge	Question at task level to conclude with this picture. The lesson moves to the next challenge but it is unclear why the hammer has been chosen and who agrees with this conclusion.
13	37	<i>T: What about the ice lolly?</i>	Cognitive challenge	Question at task level There is no mention of the cause as intended.
	38	A: That's easy.	Cognitive challenge	Task level description
	39	<i>T: Is it?</i>		Task level question
	40	A: Yes, person with lolly.	Cognitive challenge	Task level explanation
	41	N: No that's wrong.		Disagree with an idea
	42	Tif: Yes, it's melted. It should be the sun.		Agree and offer an alternative suggestion Task level description
	43	G: Yes, the sun.		Agree and One word description
	44	J: No. It's this. He bought a new one.		Disagree and Task level description
	45	N: He's eating two lollies.		Disagree and Task level description
	46	A: He dropped it and bought another one.		Agree with J and Task level explanation Very little discussion on this sequence. Wrong card chosen with no challenge offered by teacher. Tif and G were right but idea not used.
15	47	<i>T: What about the flowers?</i>	Cognitive challenge	Question at task level – about another picture. No mention of "cause".
	48	N: The die one, the die one.	Cognitive Challenge	Task level description
	49	J: No		Disagree
	50	N: This is a little bit dying and		Task level explanation

	51	they water it and came back alive.	Bridging	Disagree and Task level description
	52	A: No, it can't come alive again.		
	53	G: Yes, 'cos if it gets water it grows again. A: Sometimes we do that with our plants. It's what they need.		
	54	<i>T: Do you all agree?</i>	Cognitive challenge	Question at task level
	55	G: Yes, 'cos if it gets water it grows again.	Cognitive challenge	Task level explanation
	56	<i>T: Jack, what do you think?</i>	Cognitive challenge	Question at task level draw in Jack
	57	J: If you water it, it will come back up.	Cognitive challenge	Task level explanation Idea accepted with no further challenge from the teacher.
18	58	<i>T: OK What about the candles?</i>	Cognitive challenge	Question at task level about another picture. No mention of "cause".
	59	J: That's hard	Cognitive challenge	Task level description
	60	<i>T: Why?</i>	Cognitive challenge	Task level question
	61	J: None what looks like it goes.	Cognitive challenge	Task level explanation Disagree and Task level explanation
	62	A: Yes, matches melted 'cos it's been on fire.		
20	63	<i>T: What about the torch?</i>	Cognitive challenge	Question at task level Different suggestion being proposed by teacher.
	64	A: No, torch can't light a candle.	Cognitive Challenge	Disagree and Task level explanation Disagree and Task level explanation lacks coherence
	65	Tif: If you don't use matches if you choose a torch you can't. Well, I think I'll use a torch.		
	66	A: Mum uses matches to light a candle that's why you should use matches.	Bridging	Disagree and Task level explanation Task level explanation
	67	J: If candle goes out you need a torch to find the matches.		
	68	N: It's melted.	Cognitive Challenge	Task level description Disagree and Task level explanation Task level description different suggestion
	69	J: No, it's gone down 'cos it's stayed there too long.		
	70	G: I think the sun...		
	71	A: I think it's the sun because it		

	72	melts candles. Yes, they light candle with match and it melts. G: If torch there, no, if you don't put fire it won't melt.		Agree and task level explanation Agree and Task level explanation Pupils are scaffolding learning for each other.
22	73	<i>T: What's happened to the candle?</i>	Cognitive challenge	Question at task level T draws attention to detail of picture. This is the nearest to "cause" that has been said
	74 75 76 77 78 79 80 81	N: It's melted. J: No, it's gone down 'cos it stayed too long. Tiff: I think the torch. G: I think the torch 'cos if you light a candle it'll melt. A: It could be the sun 'cos that would melt candles. S: My candle's melted so I think you should use a torch 'cos light can melt candle. A: No, 'cos light ain't hotter, it won't make it go smaller. S: It could be another candle what starts off small. G: I've got a small one.	Cognitive challenge	Task level description Disagree and Task level explanation Task level description Task level explanation Task level explanation different suggestion Task level explanation Disagree and Task level explanation Task level description Task level description Pupils are scaffolding learning for each other.
	82	<i>T: Think about birthdays?</i>	Bridging	Question at task level T encourages pupils to link their knowledge of what happens to candles when lit on cake. Scaffolding learning. "Cause" implicit here.
	83 84 85	Tiff: If candle is cold and rain shines then it'll melt so sun is hot. J: If you light the candle again. A: Three people think torch Three people think matches. What does Nurad think?	Cognitive Challenge	Task level explanation Task level description Question at task level
	86	<i>T: Well ask him.</i>		Procedural management
	87 88 89	N: Matches 'cos fire is gone there. Get fire then candle gone. Tiff: Yes, matches 'cos it'll melt down. G: Matches	Cognitive challenge	Task level explanation Agree and Task level explanation One word description Pupils are scaffolding learning for each other.

25	90	<i>T: Are you sure?</i>	Cognitive challenge	Question at task level checking for agreement
	91	G: If torch there...if you don't put fire it won't melt.		Task level explanation
	92	S: Matches		One word description
	93	<i>T: Why?</i>	Cognitive challenge	Question at task level
	94	S: Cos it'll melt down.	Cognitive challenge	Task level explanation
	95	A: 'Cos of the matches, she means		Task level explanation developed
	96	S: Torch doesn't get very hot.		Task level explanation Pupils are scaffolding learning for each other.
27	97	<i>T: What about you, Jack?</i>	Cognitive challenge	Question at task level draw in Jack.
	98	J: Cos you can light it and it'll melt. They're stupid.	Cognitive challenge	Task level explanation Other An implicit gender remark not related to the task.
	99			
	100	S: If you light it in day time, you'll need to go shopping and buy more.		Task level explanation
	101	<i>T: What was hard about this?</i>	Metacognition	Question at metacognitive level
	102	J: Nothing. Not for me.	Metacognition	Metacognitive phrase description
	103	A: 'Cos everyone chose different things and then changed their minds.		Metacognitive explanation
	104	A: Like saying one of these.		Metacognitive phrase description
	105	<i>T: Jack, what do you think?</i>	Metacognition	Question at metacognitive level
	106	J: It wasn't tricky.	Metacognition	Metacognitive phrase description
	107	<i>T: Are you sure?</i>	Metacognition	Question at metacognitive level
	108	A: I think it was tricky.	Metacognition	Metacognitive phrase description
	109	J: Not for me. I'm not stupid.		Other
30	110	<i>T: OK Well done. We'll finish now.</i>		Behavioural management

Appendix 7.2:

Frequencies of oral interactions during the analysed lessons

Categories	A1 240 mins	A2 230 mins	B1 360 mins	B2 240 mins	C1 216 mins	C2 235 mins	D1 320 mins	D2 245 mins
Ask question at task level	73 0.30 per min	90 0.39 per min	106 0.29 per min	110 0.46 per min	114 0.53 per min	120 0.51 per min	63 0.20 per min	92 0.37 per min
Express challenge	184 0.77 per min	184 0.8 per min	287 0.79 per min	256 1.07 per min	187 0.86 per min	230 0.98 per min	206 1.55 per min	245 1 per min
Total	257 1.07 per min	291 1.26 per min	393 1.09 per min	366 1.5 per min	301 1.40 per min	350 1.49 per min	269 0.84 per min	337 1.38 per min

Table 7.6: Categories analysed for creating challenge

Category	Group A1 240 mins	Group A2 230 mins	Group B1 360 mins	Group B2 240 mins	Group C1 216 mins	Group C2 235 mins	Group D1 320 mins	Group D2 245 mins
Qs at meta level	9 0.037 per min	45 0.19 per min	28 0.078 per min	67 0.28 per min	5 0.023 per min	32 0.14 per min	3 0.009 per min	44 0.18 per min
Meta description	0	26 0.11 per min	5 0.014 per min	21 0.09 per min	2 0.009 per min	15 0.06 per min	4 0.01 per min	32 0.13 per min
Meta explanation	7 0.029 per min	13 0.06 per min	2 0.005 per min	19 0.08 per min	2 0.009 per min	17 0.07 per min	2 0.006 per min	23 0.09 per min
Total	16 0.067 per min 2 per lesson	84 0.36 per min 10.5 per lesson	35 0.097 per min 4.37 per lesson	107 0.45 per min 13.4 per lesson	9 0.042 per min 1.125 per lesson	64 0.27 per min 8 per lesson	9 0.028 per min 1.125 per lesson	99 0.40 per min 12.4 per lesson

Table 7.7 Categories analysed for opportunities for metacognition

Categories	A1	A2	B1	B2	C1	C2	D1	D2	Total
Meta-questions	1	3	0	9	3	2	0	7	25
Meta-descriptions	6	5	16	35	2	4	10	12	90
Meta-explanations	26	34	23	54	0	12	17	34	200
Total	33	42	39	98	5	18	27	53	315

Table 7. 8 Numbers of oral events at metacognitive level in the analysed lessons

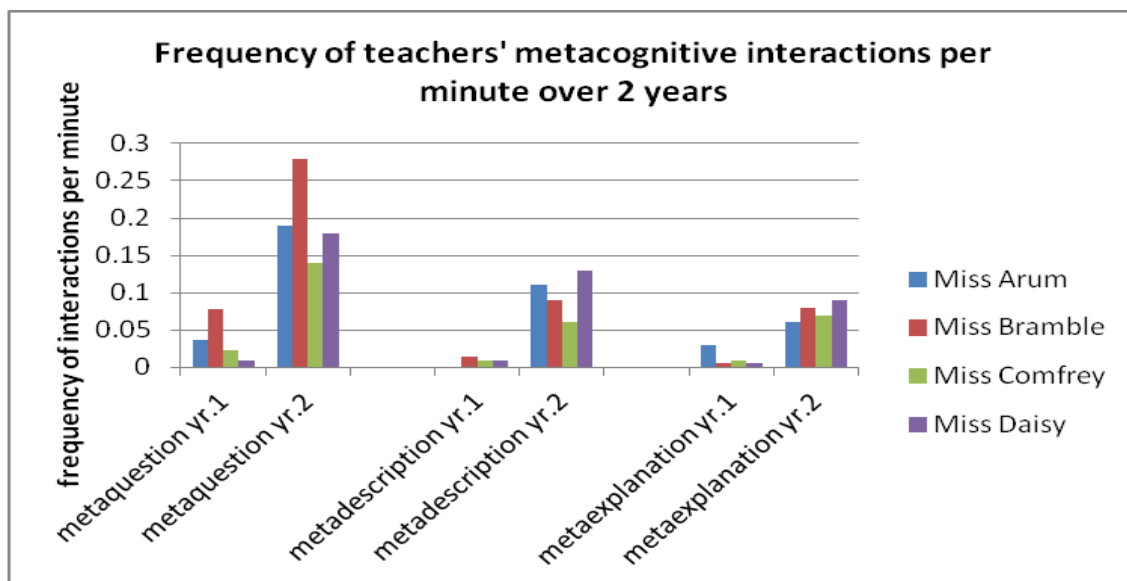


Figure 7. 6 Frequency of teachers' metacognitive interactions per minute over 2 years

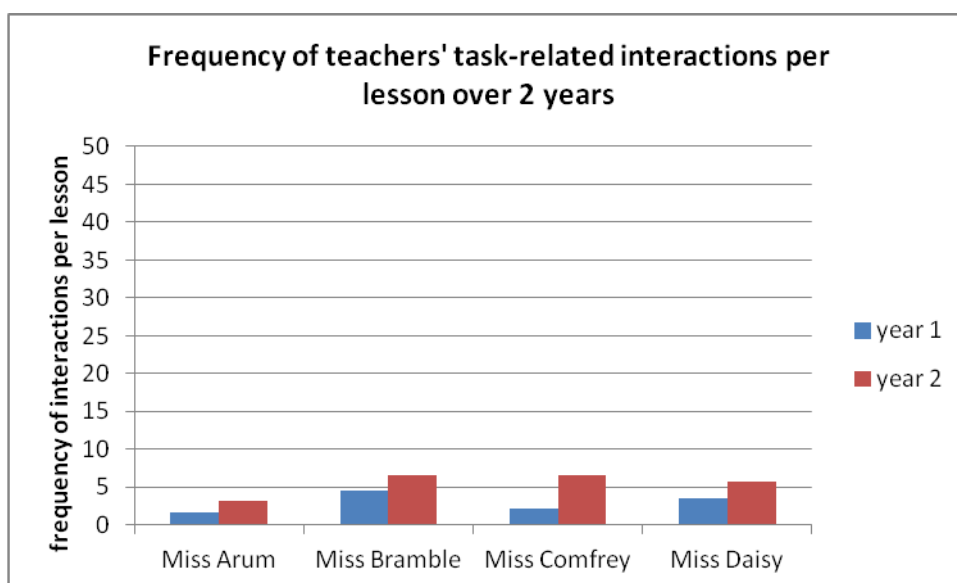


Figure 7.7 Frequency of teachers' task related interactions per minute over 2 years

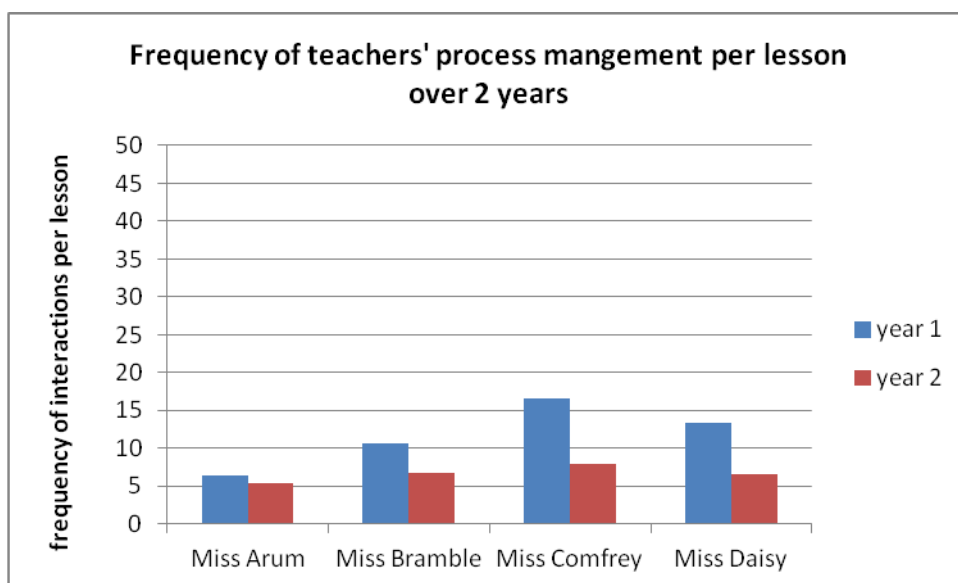


Figure 7. 8 Frequency of teachers' process management interactions per lesson over 2 years

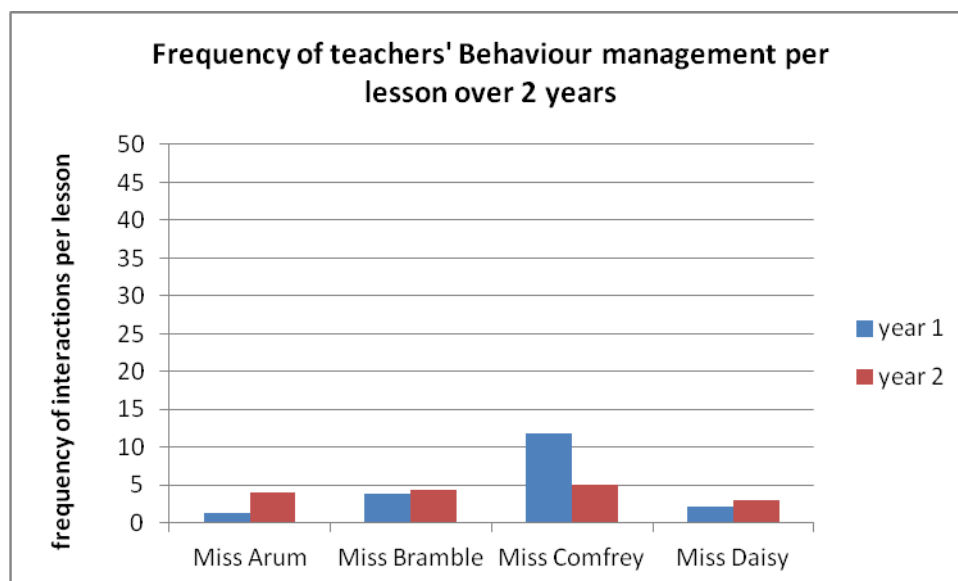


Figure 7. 9 Frequency of teachers' behaviour management interactions per lesson over 2 years

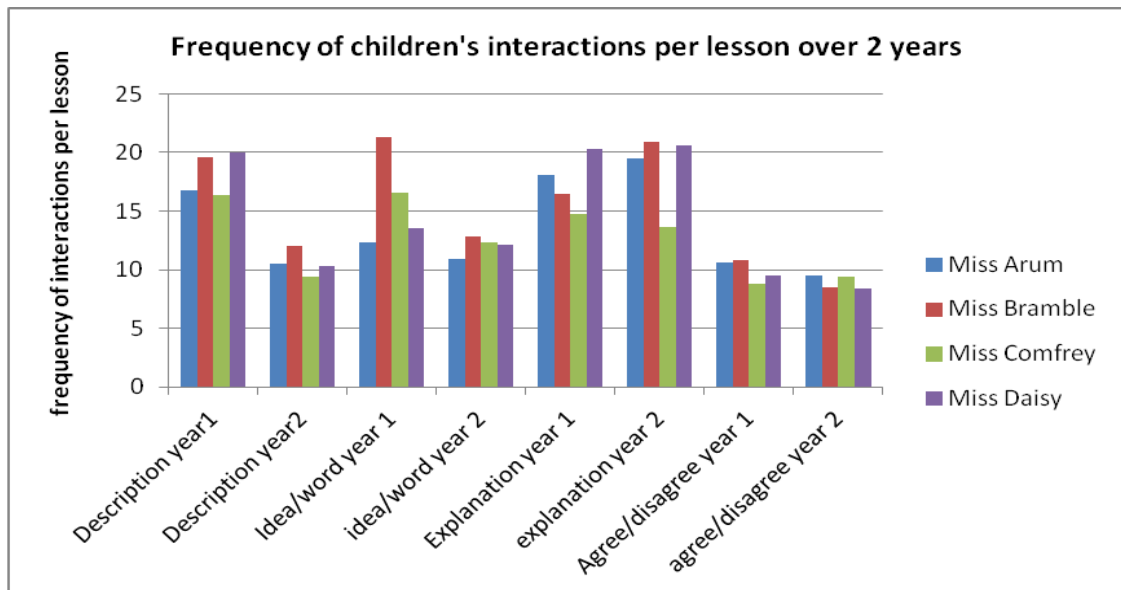


Figure 7. 10 Frequency of childrens' interactions per lesson over 2 years