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DESIGNING WITHIN A COMPUTER-MEDIATED COMMUNICATION

ENVIRONMENT: Three studies into the potential of online learning environments for collaborative

design work in international educational contexts

Abstract

Computer-mediated communication has become a common part of higher education and of designers' professional practice in the twenty-first century. This research sets out to investigate student-centred group enquiry-driven learning in a distributed environment. The aim is to examine how students and instructors interact in online learning environments in the conduct of online collaborative design work in international educational settings, and thus provide the basis for the identification of factors that contribute to successful online collaborative work in design education.

Through the study of three examples of online collaborative design work, the research addresses the following specific questions: (i) how do distributed groups of students use synchronous and asynchronous interaction when seeking collaborative solutions to design problems? (ii) how do instructors use the facilities provided by an online collaborative environment in interacting privately and publicly with students and with each other? (iii) how do students handle the challenges of group dynamics and partnership in online collaborative group work? Together, addressing these questions enables design educators to develop an understanding of the ways in which the use of online collaborative work can be of particular benefit for design education, for instance in facilitating the forms of international and inter-disciplinary collaboration that lie at the heart of contemporary professional design practice.

This practitioner research suggests that, in the hands of committed design teachers, technology can support innovations that will improve student performance, help students develop cognitive design skills and can introduce a real-world design context for student learning. The findings indicate that a balance between dynamic synchronous and reflective asynchronous engagement is critical in establishing successful online collaborative design environments. The importance of privacy issues in the space used by design students is another interesting finding that can inform restructuring of collaborative interfaces for future design education.

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*Chapter One*

*Introduction: Utilizing computer-mediated communication in network-enabled collaboration between art and design students for knowledge development*

## 1.1 Introduction

A design culture is identifiable that values teamwork across borders and allows for the sharing of international perspectives in this age of globalisation. Over the recent past, this has resulted in a shift away from using technology solely as a design tool and towards also using it as a collaborative medium. The availability of alternative sources of authority and multiple frameworks of knowledge afforded by this shift may be contributing to the dissolving of the traditional boundaries of the design teacher.

The idea for this research arose from an institutionally focused study into student attitudes towards collaborative designing online (Fraser, 2001). An online collaborative design initiative called DesignLink provides the pedagogical context for my grounded practitioner enquiry into the potential of incorporating online collaborative learning environments in university design courses and the implications this might have for design educators. Working in distributed cross-institutional groups and facilitated by their instructors, design students take up the challenge of working collaboratively online, reflecting on design process and developing their cognitive skills while negotiating design solutions at a distance. The research stance adopted is that the use of communication technology in the classroom is a social practice and that the negotiation of design solutions through online communicative interaction needs to be problematised in order to reach an understanding of the ways in which the use of online collaborative work might benefit design education.

## 1.2 A rationale for the research within a design context

Design, as a singular profession, came into being with the industrial revolution, mechanization and Adam Smith's notions of division of labour. The craftwork of pre-

industrial design, with its synergy between designer and maker, was replaced by a separation of designing and production induced by the growing complexity of industrial design. Modern design uses intuitive design methods, knowledge of client domains and engineering knowledge of ergonomics and materials science, to affect practice. Good design is about making a product or design that serves a function better than anything else (Dyson, 2000). At the same time, contemporary design activity tends to be collaborative and involve multi-disciplinary design groups working together from different locations. Designers are members of an increasingly global profession, who are often employed by multinational companies in international markets. They can be involved in multi-disciplinary global group activity where participants rely upon simultaneous and distributed access to relevant information, immediate interchange of ideas, continual feedback, and expert decision-making. Design is a genuinely cross-curricular activity and designers draw upon knowledge from many different domain areas (Thistlewood, 1990). However, while emphasising design's co-coordinating role as a context for the re-association of a range of other subjects, design's essential discipline lies within the way designers engage with and process externally derived information.

> This is its educational essence and how design reciprocally enhances learning
> in other critical areas of the curriculum (Thistlewood, 1990, p. 18).

Yet, the business of processing information and collaborating at a distance has been fundamentally affected by the widespread take up of information and communication technology. The use of digital technology to enable international collaboration allows increasingly diverse global design teams, who might otherwise be unable to meet, to work together. The question for design educators is whether design students might benefit pedagogically from the experience of working in online, interactive and collaborative spaces. Some research suggests that incorporating aspects of communication technology into education might help to develop students' higher order thinking (Goodfellow & Kukulska-Holme, 1996). Designing involves brainstorming and idea generating sessions and an ability to play around with the most unlikely of ideas and this type of conjectural

reasoning might be encouraged through computer-mediated communication between design group members in online environments. If the use of technology promotes higher order thinking and autonomy in decision-making then this might encourage design students engaged in online design projects to reflect upon their solution-seeking strategies to resolve their different definitions of the problem and work together to come up with joint solutions.

The continuing growth and impact of the use of computers for data storage, knowledge management and communications is having an enormous affect upon 'information flow'. In 1997, the 'Dearing Report' (the report of the National Committee of Inquiry into Higher Education) emphasised the importance of information and communication technology to the future of Higher Education in the UK. One submission to the enquiry described how the unwillingness, or unprepared ness, of higher educational institutions to adopt new methods of working might slow down the implementation of information communication technology (Dearing, 1997). In assessing the future demand for design education the report linked the development of online learning and consequent increasing competition from developed and developing nations and sees these as a challenge in providing quality education and training. A critical design education should strive to provide the reflexivity that the complexity of modern society deserves (Thistlewood, 1990). If educational design practice is to successfully employ communication technologies then, design teachers will need to adopt a professional attitude towards its use and students will need to develop skills and abilities to deal with it for learning and research.

In design education in the early nineties, developments such as computer conferencing began to offer an opportunity for encouraging shared experience and co-operation between design students by opening up alternative pathways for distance collaborative activities. It was predicted that technology would continue to develop rapidly and before too long we should be accessing semi-immersive sites on the Internet that allow us to interact in audio-visual shared spaces in the same way as we now communicate using

e-mail and newsgroups (Gulbransen & Rawlings, 1996). That this prediction has been realised is evidenced by a number of recent developments in online collaborative activity within the art and design university sector in the UK. These include the ECSTASY project (enhanced collaboration with shared tools for art/design systems) at Ravensbourne College of Design and Communication and the VEnue (virtual environments for urban environments) project at University College London (ADAM, 2004). Other significant collaborative design projects have included DesignNet at the University of Derby and the Distributed Interactive Virtual Design Studio at Loughborough University (Scrivener & Vernon, 1998, ADAM, 2004).

The Australian National Association for the Visual Arts (NAVA) in association with the Australian Council for University Art and Design Schools (ACUADS) has developed a Visual Arts and Craft Professional Practice Curriculum Unit for use by university art school lecturers in the teaching of professional practice. The aim of the unit is to help ensure that information taught to design students within professional practice courses accurately reflects the realities of the industry they are aiming to become a part. They suggest that:

> new technologies are driving new collaborative forms of practice. Whilst this often occurs because of the need for the practitioner to gain access to a range of skills and equipment not otherwise available or affordable, this new way of working encourages dialogues and outcomes that can ultimately be central to a new form of practice (NAVA, 2004, p. 1).

If new forms of collaborative design practice are emerging then design educators will need to develop an understanding of the ways in which the use of online collaborative work might be determining this activity. Some research is investigating knowledge networks by focusing on how different disciplines structure the social practice of reviewing and filtering the communications accompanying technologies (SCIT, 2004). The research consists of a comparative empirical study of the changes in the structure of knowledge networks in fields such as human-computer interaction and information systems that have adopted different forms of electronic media as important nodes in their knowledge networks. The

research emphasises the danger of a 'best practice' approach that holds up good communication practice used in certain fields as a model for all other fields. The findings are also critical of the assumption that appropriate use of technology for different disciplines will simply develop over time.

Looking more widely at the use of technologies in learning, many of the pedagogical improvements promised by educational technologists remain unfulfilled. Some studies argue that incorporating technology into teaching and learning is more complicated than ever before (Spector & Anderson, 2000). Problems concerning teacher training, restrictive institutional practices and shortsighted policy planning can all occur when introducing technology into the classroom (Feldman et al, 2000, Rosenberg, 2001). The complexity involved in these changes and the need for special knowledge and skills are often far more time-consuming and problematic than a traditional approach to teaching a course (Spector, 2001). In addition, rapid technological developments have not always delivered their intended benefits because our understanding of how such technologies should be designed to maximise their benefits to users has been inadequate. Dowell and Finkelstein (2004) argue that most learning technologies are used by co-located students at a single terminal, rather than for collaborative group projects. They suggest that further research is needed into the social and organisational characteristics of groups as they relate to, and interact with, communication technology.

## 1.3 DesignLink, a professional and pedagogical context

I conceived of DesignLink as a series of short inter-institutional projects to give my students of design some relevant vocational experience in online collaborative projects across national borders. As an associate professor of design and computer graphics, I teach a range of graphic design and multimedia-oriented university undergraduate courses that require my students to have familiarity with design theory and the production of computer-developed artwork. I introduced DesignLink into the course content of 2 multimedia graphic design classes between 2001 and 2003. The collaborative online project was one of

a number of practical design assignments taken by the students in their course. The aim of the project was to work out real design problems using computer-mediated communication in an online learning environment. Between 2003 and 2004, I spent a sabbatical year in the US and while there I introduced DesignLink as a course assignment into 2 of the online third year design classes that I was teaching. The DesignLink teaching initiative relates to the practice and use of online environments for teaching and learning within all the participating universities.

| Phase | phase 1 | | phase 2 | | phase 3 | |
|---|---|---|---|---|---|---|
| Time period | Spring 2001 | Spring 2001 | Jan/Feb 2002 | Mar/Apr 2002 | Nov/Dec 2003 | Mar/Apr 2004 |
| Participating universities | UK – RAIUL<br>US - UNK | UK – RAIUL<br>US - UNK | UK – RAIUL<br>UK – UM<br>US – IUPU<br>US – MC<br>UK – SIHE | US – DE<br>UK – RAIUL<br>US - UNK<br>Colombia – IC<br>Canada – YT | US - ISU<br>UK - CSM<br>UK – RAIUL | US - ISU<br>US - MC<br>Singapore - LS |
| Composition of student groups e.g. 7*2 is 7 groups of 2 students | 7 * 2 co-located<br>2 * 2 distributed | 8 * 2 distributed | 15 * 3 distributed | 9 * 3 distributed<br>1*2 co-located | 10 * 3 distributed | 10 * 3 distributed |
| Total number of students involved | 18 students | 16 students | 45 students | 29 students | 30 students | 30 students |

*Table 1 Collaborating institutions and participants involved in DesignLink 2001 – 2004.*

Since 2001, 59 distributed and co-located student groups and their faculty from 12 universities in Europe, North and South America, and Asia have been involved in 3 phases of the DesignLink initiative (see Table 1 and Appendix 1). Although requiring a great deal of effort and commitment from facilitators and students, the introduction of DesignLink into the various courses has proved worthwhile, pedagogically and socially. Most instructors and students who have been involved in these projects consider the online collaborations to have been stimulating and effective experientially with a relatively high quality of artwork produced.

## 1.4 A statement of the problem in practical and theoretical terms

Despite an increase in the use of computer-mediated communication in university education, many of the pedagogical issues to do with the incorporation of technology into teaching and learning are only now beginning to be addressed. In developing online learning environments for design students, design educators may choose to adopt an instructionally focused or a constructivist approach (Cross, 2001). The former approach would tend towards the principles of systematic design advocated by proponents of design science. On the other hand, Schon's 'reflective practitioner' approach might be more appropriate if a constructivist paradigm is adopted for the design of the online environment (Schon, 1987). Either way, perhaps answers are to be found in the findings from educational research into systems design that provide evidence that the scaffolding of collaborative work in online learning environments holds the key to the way students learn (Jonassen et al, 1999, Savery & Duffy, 1995). Although information and communication technologies are increasingly affecting every aspect of our lives, rapid technological developments have not always delivered their intended benefits. Further research is needed into the social and educational implications of the increasing use of technology in the classroom. Distributed collaborative training has been under-represented in the development of learning technologies, because it presents some of the most advanced challenges in cognitive design.

Could design education benefit from a formal scaffolding of the design process? Jonassen has suggested that different sorts of cognitive skills are called on in problem-solving depending on the domain and the context of the problem (Jonassen, 2000). One of the aims of this research is to investigate whether introducing online collaborative projects into design courses holds some potential for developing students' cognitive design skills. Design education might benefit from this pedagogical strategy if it allows students to acquire critical capacities not taught but won by the students. This might be achieved by developing online learning environments that allow for epistemological space and personal space as well as practical space to encourage problem-solving skills,

flexibility of idea formulation and information handling skills (Barnett, 1997). The growing use of technology into the classroom, in particular the tremendous increase in the use of proprietary software such as Blackboard, WebCT and First Class to introduce online courses at university level, is introducing alternative sources of authority, via the Internet, as well as multiple frameworks of knowledge. The use of computer-mediated communication for design collaboration in online environments could formalise the modes of communication and negotiation that students use. This emphasis on organization and structure within the designing process could, in turn, encourage an instructional approach to team building, role-playing, and the negotiation of ideas, decision-making and solution seeking.

The communicative interaction involved in online collaboration can be described as the changing relationship that occurs between internal states and sets of intentions. The development of cognitive design skills occurs as design students gather information, ideas are generated, and sketching and reflection takes place and the design group fix on solutions. Higher order cognitive skills associated with this design making process are active thinking, flexibility of idea formulation, and autonomy in decision-making. The primary and abductive part of the designing process involves conjectural thinking, problem identification and brainstorming. Design students might be facilitated in idea generation activity by engaging collaboratively online and researching information sources through the Internet. Similarly, interactive and collaborative environments might support the evaluation and communication aspects of the solution-focusing stage of the design process. Decision-making strategies, central to design, might also be encouraged by design students accessing on-line information and participating in on-line discussion forums to resolve problems and arrive at joint solutions. Working collaboratively in on-line environments might also encourage students' problem solving and information handling skills. However, while design procedures affect design outcomes, affective aspects, such as changes in perception, are just as important for design students' cognitive and intellectual development. The research considers how design teachers might be able to begin to

address these multiple possibilities and take up the challenge to frame online learning environments for design education.

## *1.5  The research questions*

The research focuses on design activity and investigates the thinking that is taking place in design teams within the DesignLink initiative. The research examines how students and instructors interact in online learning environments in the conduct of collaborative design work in international educational settings, and thus provide the basis for identification of factors that contribute to successful online collaborative work in design education. Through the study of three examples of online collaborative design work, the research addresses the following specific questions:

1. How do distributed groups of students use synchronous and asynchronous interaction when seeking collaborative solutions to design problems?

2. How do instructors use the facilities provided by an online collaborative environment in interacting privately and publicly with students and with each other?

3. How do students handle the challenges of group dynamics and partnership in online collaborative group work?

The research, by addressing these questions, will be instrumental in enabling educators to develop an understanding of the ways in which the use of online collaborative work can be of particular benefit for design education, for instance, in facilitating the forms of international and inter-disciplinary collaboration that lie at the heart of contemporary professional design practice.

## *1.6  Conclusion*

Contemporary design activity is a collaborative multi-disciplinary activity requiring engagement with and processing of information. However, despite the growth in the use of computers, the uptake of computer-based techniques for collaborative learning

in the design domain is only slowly beginning to occur. Higher education in late modernity should cultivate an openness of mind and a continual re-evaluation of assumptions and frameworks of knowledge (Barnett, 1997). Although it may be uncomfortable for we design teachers, our students need to test ideas and themselves with critical evaluation in a collective environment that has relevance to the real world. Design teachers need to provide an environment in which students acquire critical capacities, not taught but won by the students. Consequently, design teachers should provide for a pedagogical environment that allows for epistemological space and personal space as well as practical space (Barnett, 1997). Critical perspectives need critical frameworks and we should organize our pedagogical practice aware of the potential of technology, as demonstrated in commercial design practice.

In the next chapter the literature review addresses contemporary design theory and the fostering of design knowledge in online collaborative work. Chapter 3 outlines the various assumptions underpinning educational research into online collaboration and describes the research methodology. Chapter 4 describes the pedagogical context for the research. Chapter 5 describes a Pilot Study into the working practices of collocated and distributed groups in online learning environments. The stories of the 3 studies of online collaborative group work are developed in Chapter 6. These involve a conversational framework for design practice, the dynamics of student-instructor online participation and group dynamics and partnership. The findings of this thesis indicate the possibility that there are positive benefits in introducing online collaborative projects into the course content of design classes in university education. They suggest that structuring online environments for collaborative group work can encourage cognitive design skills in students. Specifically, orchestrating a balance between synchronous and asynchronous interaction and encouraging student autonomy in the developing public and private spaces may scaffold cognitive skill acquisition. These findings are summarised in Chapter 7, where I describe the implications for further work in this area.

A teaching professional is reflective (Schon, 1987), critical (Barnett, 1997), and exercises authority over an area of knowledge (Foucault, 1980) in collaboration with other professionals. The position taken in this thesis is that design teachers ought to respond to the challenge of the exponential growth in the flow of information that is freely available and be aware of how this is altering professional control over bodies of knowledge. At the same time, design educators need to exercise a social responsibility for educational provision by taking responsibility with others for their own professional self-renewal (Marsland, 1995). This research into the potential of incorporating online collaborative learning environments in university design courses can encourage other design teachers to negotiate those multiple discourses and take up the challenge to frame online environments for the benefit of design education. This research contributes to the development of an appropriate pedagogy and methodology for the developing use of communication technology in design education.

*Chapter 2*

*The nature of design practice, design for the emergence of knowledge and online learning environments; a literature review*

## 2.1 Introduction

A number of literature review methods are well established. An integrative review searches the literature for research connected to the topic under review and attempts to draw general conclusions. A comprehensive review additionally presents and compares different theoretical stances (Cooper, 1989). Throughout the thesis I have engaged critically with the literature when appropriate but, in this chapter, I adopt a selective approach to the literature review. My comprehensive approach is limited to literature which is most appropriate to the theme of my research and focuses on student online design activity, contemporary design theory, ontological conceptions of design and the culture of the design classroom. Since the essence of my thesis is on learning through interaction in online environments, I also review some of the extensive literature that deals with the following: collaborative group work, communities of practice, communicative interaction in computer-mediated environments and the fostering of design knowledge in online constructivist learning environments. The review first describes the contemporary context by highlighting some of the educational research currently taking place into the pedagogy of teaching and learning online. I then attempt to draw a clear distinction between the creative design process that the student participants in DesignLink are engaged in on the one hand and the design of online learning environments on the other hand. This is particularly important since there is a great deal of overlap in terminology and theory that may cause a possible confusion for the reader unless the two areas are clearly and separately identified in the text.

## 2.2 The contemporary context

Accompanying the movement of graphic design from print to new media, some observers have noted an equivalent change of movement in the research field. Design research grounded in communications principles and visual-cognitive theories is beginning to take an interest in new media collaborative activities (Blackwell, 1996, Cross, 1995). This migration of media expertise to diverse collaborative initiatives is redefining graphic design scholarship and practice. It is in some ways exemplified by the Centre for Multimedia Arts in the FedEx Institute of Technology at the University of Memphis where key initiatives include media solutions for the National Civil Rights Museum and the creation of a Native American artefacts database for archaeologists (Schmidt, 2005). There is now a growing commitment worldwide to the use of online environments for communications, teaching and learning which has been generated through many recent initiatives. In the US the governmental interagency working group on information technology, research and development described the activities of a $2 billion dollar federal networking and information technology research and development programme and the organisations that implement them (NITRD, 2004). The research focuses on the nature and dynamics of information technology and how it affects technical and social systems and the role of innovative information technology applications in training and education. In the UK, the joint information systems committee (JISC) provides strategic guidance and opportunities to use information communication technology to support teaching, learning and administration. Through the joint academic network, JISC has supported over 150 collaborative projects since 1995. Some interesting educational research is currently underway in the UK into the pedagogy of teaching and learning online. This research includes:

- An internet-based virtual teaching and exploration environment at the Open University;
- The development of a high level authoring shell for online interactive instructorials and assessment at the University of Leicester;
- Video-conferencing and collaborative working at the University of Wales, Cardiff;

- Shared virtual learning environments at the University of Leeds;
- A virtual community for student group works at UMIST.


## *2.3 Design activity and learning*

Design is concerned with how things ought to be and is produced through a process of developing novel forms. Eggleston describes a design process that begins with a detailed preliminary identification of a problem and a diagnosis of the needs that have to be met by a solution. The process then:

> goes through a series of stages in which various solutions are conceived, explored and evaluated until an optimum answer is found that appears to satisfy the necessary criteria as fully as possible within the limits and opportunities available (Eggleston, 2001, p. 28).

Eggleston (2001) argues that the design process is one of rational logical analysis. He describes the influence of the Bauhaus and design educators such as Gropius in introducing a new wave of industrial and commercial design in the early twentieth century. This, in turn, encouraged the study of the process of design and was instrumental in the development of foundation courses in most art school courses. These courses focused on simplicity of form and its relationship to function and the property of materials. In the recent past, he argues, there has been a reaction against such a designer ethic and an inclination towards the participatory nature of design processes.

Peirce's theory of abduction makes a distinction between inductive reasoning (something must be), deductive reasoning (something follows on from something else) and abductive reasoning (conjecture) and associates the latter, the creative leap, with what goes on during design activity (Eggleston, 1976). At the same time it has been proposed that in order to arrive at design solutions designers must negotiate meaning and come to decisions. In other words, decision-making is a key part of the design process (Thistlewood, 1990). Consequently the design process can be considered as a method for resolving ill-defined problems by adopting a solution-focusing strategy and abductive or appositional styles of

thinking, mainly using non-verbal, graphic/spatial modelling media (Cross, 1995). Designers apply imagination and constructive forethought to practical problems, while using drawing and other modelling media as a means of problem solving. Simon (1973) describes a method for resolving ill-structured problems where the problem is not well defined and there is more than one possible solution. The way to solve such problems, he argues, is by reducing the problem into goals and sub-goals and then looking for partial solutions to the bigger problem. Kolb's learning cycle describes learning as occurring through an iterative cycle of experience followed by reflective observation, which is synthesised and then used to revise action (Kolb, 1984). Four learning styles are identified that Kolb terms diverging, assimilating, converging and accommodating. Learning styles associated with design students might tend towards reflective observation, concrete experience and active experimentation. This would fit with an accommodating or divergent learning style. According to Kolb, students with these learning styles prefer to work in teams, take a practical and experiential approach to problem solving and rely on intuition and analysis of externally gathered information to actively achieve an objective.

It has been argued that learning can be considered as a change in attitude, behaviour or cognition and most learning occurs without the benefit of any deliberate instruction (Seels & Glasgow, 1998). Gagne and Briggs (1974) in their classification of learning describe five types of learned capabilities: intellectual skills, cognitive strategies, verbal information, attitudes and motor skills and further divide intellectual skills into five hierarchical levels of discrimination, concrete concepts, defined concepts, rule using and problem-solving. Gagne and Briggs's concept of 'cognitive strategy' could relate to those aspects of 'successful design practice behaviour' that Cross et al (1994) identify. If we can ascribe Gagne and Briggs's learned capabilities of motor skills and verbal information to Wenger's 'competence' and 'shared experience' in the design domain then what remains, according to Cross et al, are the cognitive abilities of being able to produce novel and unexpected solutions and the ability to use drawing and other modelling media as means of problem-solving. These are both related to Gagne and Briggs's higher order intellectual

skill of problem solving. In relating their taxonomy of learning to Wenger's concept of a community of practice, I would suggest that discrimination, problem solving, cognitive strategy and attitude then become key identifiers in the communicative interaction that is vital to the building of a community of practice (Laferrier et al, 2000, Wenger et al, 2002). Jonassen's typology of problem solving makes a distinction between situated design problems and decision-making problems that are personally situated (Jonassen, 2000). This suggests another issue that may need to be taken into consideration.

It has been argued that a whole range of skills is subsumed within the design process. Kimbell et al (2000) describe a conceptual framework for design skills, gained in contextualised tasks but transferable to other domains, by identifying specific strategies that designers use to achieve such skills. They identify seven operational designing strategies; unpacking 'wicked' ideas, iterative thinking, imaging in the mind's eye, optimising values, modelling futures, coping with risk and managing complexity. In many current design programmes higher order thinking processes remain situated in highly focussed design contexts and need to be unpacked.

The term 'design critique' describes the formal study and discussion of an individual's design work that involves judging the function and form of the piece of work and explaining the ideas and meaning of the work. Critiques may be either formal or informal in character and may be individual critiques or group critiques. An individual design critique will generally involve an instructor giving feedback to one student. A group design critique allows a group of students to contribute their judgment to the evaluation. Design students develop attitudes, learn about technique and acquire critical skills through the design critique. One of the most startling outcomes of the Assessment of Performance Unit project in Design and Technology 1985 – 1981, funded by the Department of Education and Science, was the realisation of the role and importance of group critiques (Kimbell et al, 1991). Some recent research undertaken at Surrey Institute of Art and Design showed that online critiques presented a friendlier and therefore more useful environment than the traditional variety (ADM-HEA, 2005).

## 2.4 Creativity and problem solving

Research into creativity and problem solving has taken differing approaches: investigating personality traits (Baron & Herrington 1999, Mumford 2003); creative product (Guilford 1987, Sternberg 1999, Torrance 1990); and the creative process (Cross et al 1994, Jonassen 2000, Rowe 1991). Certain personality factors have been associated with creativity such as independence of judgment, intuition, self-confidence, a sense of autonomy and a sense of self as being creative (Baron & Herrington 1999). Some studies have linked creative personality factors such as self-esteem and control with divergent thinking and creative outcomes (Guilford, 1987). Other research suggests that certain aspects of cognitive behaviour can be identified in successful design practice (Cross et al, 1994). These behaviours are the ability to tolerate uncertainty and work with incomplete information, the ability to apply imaginative and constructive thought to problems and the production of novel and unexpected solutions. Jonassen argues that the business of solving these more complex and ill-structured problems, as designers do, is dependant on higher stages of cognitive behaviour. He cites Perry's model of intellectual development with its three separate levels of cognition representing increasingly higher order thinking (Jonassen, 2000). It would then follow that the cognitive abilities identified by Cross et al (1994) and occurring in design activity are examples of contextual relativist cognition. In other words, higher order thinking. If, the essence of design education lies in encouraging students higher order thinking to solve problems for themselves, then, the challenge for design educators using computer-mediated communication is to structure online learning environments that have a potential to enable students to acquire some of these higher order cognitive abilities required for successful design practice.

## 2.5 Design research paradigms

Differing responses to epistemological questions can be seen in the development of two contemporary paradigms in design research distinguishable from one another by the

assumptions underlying them: positivist responses adopting the scientific method; and ethnographic responses adopting an holistic methodology. Others have described these paradigms as either process-orientated or content-orientated approaches (Doorst & Dijkuhuis, 1995). These approaches can be compared to the 'design science' approach of Buckminster Fuller or Schon's 'reflective practitioner' approach, both of which I refer to later in this chapter (Schon, 1987). While agreeing that designing is realized by mental intention, Mitcham disagrees with the notion that the design process is driven by a systematic anticipatory analysis or modelling (Mitcham, 1995). Rather, he suggests, design has either emerged historically, alongside modern science and technology, from an engineering perspective emphasising the quantitative, analytic and iterative character of a multiphase process, or from an artist-architect viewpoint as embodied poetic thinking. Cross highlights the different problem solving strategies of design engineers and artist-architects citing Lawson's suggestion that these different strategies could, to some extent, be related to differing educational approaches to the study of design (Cross, 1995). Design researchers adopting a positivist approach tend to concentrate on problem-focusing strategies, a staged process paradigm, which anticipates correct answers. In contrast, the holistic research design approach tends to rely on solution-focusing strategies utilising a problem space paradigm, for solving complex, ill-structured problems having no ideal solution. I will explore and assess the strengths and limitations of these contrasting approaches to research into design in the following sections.

## 2.6 A staged process paradigm

This normative and systematic consideration of the design process, adopted by design methodologists, derives from a rational approach to the analysis of design tasks. It assumes problem solving can be adequately explained by observing measurable and replicable patterns of physical behaviour (Cross et al, 1994).

| Preparation | Task clarification | Design brief, design specification, project plan |
|---|---|---|
| | Concept generation | Sketches, simple models, mock ups |
| Incubation | Evaluation and Refinement | Technical information, concept sketches |
| Inspiration | Detailed design of preferred concept | Detailed component drawings, layout |
| Testing | Communication of results | Prototype, presentation drawing or model |
| Wallas's staged-process design model | Hales's 5 phase engineering design model | Design outcomes |

*Table 2 Relationship between Hales's design process model and Wallas's model.*

This approach supports the development of phase or rigid-state models of creative problem solving behaviour that conform to an episodic process of distinct, almost discontinuous, phases of activity (Rowe, 1991). The research, adopting this approach, tends to utilise empirical study and a quasi-experimental methodology. Large amounts of data are collected and hypothetico-deductive reasoning is used to establish patterns and test theories. Systematic introspection is used as a means for describing problem-solving behaviour where subjects are asked to reconstruct their sequence of thoughts during problem-solving exercises. Protocol analysis is used in much design education research and has been productive in establishing guiding principles for design education (Archer, 1979). A model for the staged process paradigm, developed by Wallas in 1926, incorporates four fundamental phases of sequential design activity: preparation, incubation, inspiration and testing and contemporary models of the design process rely on similar phased steps (Hales, 91).

Asimow, in a seminal study developing these ideas, identified two cycles in the design process (Asimow, 1962). His design process model is represented by a sequential model involving a similar phasing of design activities, enhanced by an iterative decision making cycle incorporating synthesis, evaluation and communication that is common to all phases (see Figure 1).

← synthesis →← communication →←evaluation →

↑        ↑        ↑        ↑

← preparation (1) →← incubation (2) →← inspiration (3) →← testing (4) →
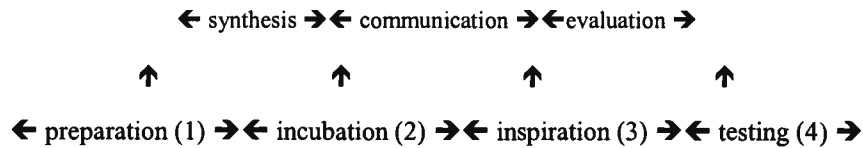
*Figure 1 Asimow's design process model.*

Feedback loops between each design activity are incorporated to account for the observable tracing back through the process in order to respond to new contexts and constraints. Archer proposed a similar operational model of designing as Asimow (Archer, 1979). These models of the design process discriminate between distinct phases of activity and assume such distinctions will advance our understanding of design. Advocates of this positivist perspective hold out the prospect of a totally objective approach towards design education where the previously esoteric and subjective realm of design can be emancipated and made accessible by the adoption off various staged-process models of design education. In this tradition, there is no attempt to venture into the realm of mental processes, the research being strongly based on structured observation of human behaviour. A criticism of staged-process models is that, while they illuminate certain commonly observable features of design activity, it is at a comparatively low level. A further criticism is that they do not take into full account the real world of 'wicked' design problems with fixed budget, tight deadlines and teamwork constraints (Jonassen, 2000). However, it is the case that protocol analysis and stage-process modelling, clarifying and systematising the design process, have been successfully used for educational purposes and I borrow from these models for coding online discourse in my analysis of Study 1 in Chapter 5 (Thornley, 1963).

### 2.7 A problem space paradigm

Rowe (1991) in his investigation of design thinking and having examined a number of studies of designers working, concluded that there is no such thing as an ideal systematic design process. Rather he identified common characteristics within different styles of

decision-making. Designing, he suggests, is a complex business incorporating individual styles of decision-making and value judgments often influenced by the constraints of the initial setting of the problem and sometimes by the personal attitudes of the individual designer (Rowe, 1991). The problem space paradigm utilises a solution-focusing strategy for solving complex, poorly structured real life problems. In this paradigm, the reality of designing is considered subjective and multiple with interaction an important element in the process and the relationship between design group members is considered informal, value-laden and biased (Rowe, 1991). The design process is seen as context bound with the identification of patterns and theories within the design process developing in time. An inductive methodological process encourages this emergence of design categories during the research. This ethnographic or holistic approach to the field of design research utilises a more broadly behavioural and interpretative methodology and reasserts the primacy of essentially cognitive processes in explaining creative problem-solving behaviour. Designing is considered to be essentially purposeful with the design brief acting as a controlling mechanism and creative problem solving being directed behaviour, involving a schemata or organizational framework for structuring information. This problem space paradigm has informed my research (Wertheimer, 1945). I would suggest that practitioner research into experimental teaching methods holds more potential for design pedagogy than empirical methods, such as protocol analysis, that are based on critical observation of current teaching methods (Oxman, 2004). Grounded practitioner research will encourage experimentation with learning theories and involves theoretical modelling based on cognitive theory to do with thinking, creativity and learning in design.

Information-processing theory incorporates the concept of a problem space whose elements are knowledge states, some of which represent solutions to a problem. Basic mechanisms process the information contained in these knowledge states allowing complex problems to be solved. Each solution space represents a trade off between advantages and disadvantages of the given design solution and the design goals with the optimum design solution minimizing these trade offs. Analysis and evaluation are seen as

being at the core of the collective design process. The solution space is kept to a manageable complexity by an iterative process of widening the space through analysis and then narrowing it though evaluation. The 'geneplore' model identifies two distinct cognitive operators, generation and exploration (Finke et al, 1992). Design solutions are generated and explored in an iterative process, within the context of a goal space and a solution space, until an optimum design solution is arrived at. Both cognitive operators might tend to widen the solution space and so the model has been developed to incorporate a further two cognitive operations, comparison and selection, in order to narrow the solution space to manageable proportions as the iterative process develops (Stempfle & Badke-Schaub, 2002). A recent study argues for a two-process theory of thinking in design teams. Design teams will try to evaluate ideas for a design solution immediately. This saves time and cognitive effort although it is more likely to produce errors. Given certain conditions however, the study suggests that teams will adopt a different process that will involve spending more time and greater thought on evaluating each idea before making decisions that tends to lead to qualitatively better results for complex problems (Stempfle & Badke-Schaub, 2002).

## 2.8  The culture of the design classroom

The culture of the design classroom has changed dramatically with the influx of technology. The contrast in expectation, illustrated by recommendations drawn up by various reports, highlights the remarkable changes that have taken place in the spread of technology-enhanced learning. These include a report on the impact of educational technology in Art and Design in the British higher education sector in the 1980's (Baker, 1983), a report on the use of digital technology in UK higher education (SIMA, 1996) and the situation today (Brown & Davis, 2004). In the first, a report on the provision of computing for higher education art and design schools that I attended in London, it states that if each college supported at least one specialist workstation, then this would provide the basis for a sound and comprehensive overall provision (Baker, 1983). The second

report provided a description of a 'virtual' art and design studio where students could experience the full creative process from concept to realization and evaluation (SIMA, 1996). Today this scenario exists in most art and design schools around the world. Brown & Davis (2004) describe the current pervasive use of digital technologies and the changing roles of teachers and learners as they enter into global networked communities of learning.

Differing epistemological approaches to design may influence the prevailing culture of the design classroom. Design science, a term first used by Buckminster Fuller (Fuller & Loeb, 1978), is concerned with the establishing of a systematic knowledge of the design methodology and design process, as well as the technological underpinnings of the design of artefacts (Cross, 2001). However, the empirical approach adopted by this doctrine, though useful for solving well-formed problems, has been criticised for not standing up to the real life messy problem situations faced by professional practice. Schon offers instead a constructivist paradigm and talks about the language of design as that discourse which goes on between teacher and pupil when discussing and developing thoughts, or verbalizing ideas, or giving advice about a piece of design work (Schon, 1987). The discourse that Schon describes as between teacher and pupil might be applied to that taking place between members of collaborative design groups. I suggest that this social process paradigm might better prepare design students for the complex, ill-structured problem-solving experience that they are likely to encounter in their professional lives (Jonassen, 2000).

In any case, irrespective of the approach adopted, a 'late-modern culture' is forming in design education which requires the nurturing of creativity, imagination and autonomy in recreating information patterns through the critical evaluation of communication, while preserving a sense of meaning and identity in a high-technology environment (Barnett, 1997). This culture values knowledge of how systems work and the ability to select the relevant from the superfluous. It is characterised by a willingness to tolerate diversity and ambiguity and to share information. I feel that as a design teacher I need to be aware and sympathetic to this changing culture, while realising that there is

nothing inevitable about the form that technology takes as it can both shape and be shaped.

## 2.9  Knowledge building in online environments

Barnett, in his critique of higher education, has argued that late modernity requires openness of mind and a continual re-evaluation of assumptions and frameworks of knowledge (Barnett, 1997). Frameworks of knowledge can be understood as something out there to be discovered or as inner cognition that makes sense of an observed world. Viewed from a social pragmatist view, and emanating from the writings of John Dewey, knowledge comes as a result of involvement in some effort or activity, resulting in some meaningful interaction with and action upon information (Dewey, 1979). The emergence of knowledge, from this point of view, cannot be deconstructed but can be cultivated through the devising of engagements and experiences. The growing educational research interest in the use of technology for knowledge building and learning is focusing attention on engagement within online learning environments. At the same time, a great deal of educational research activity in the domain of distance and flexible learning is concerned with instructional delivery systems design. The literature suggests that many of the design decisions affecting online learning environments will be dependant on which learning paradigm, behaviourism, cognitive science or constructivism, is adopted by the educational systems designer (Seels & Glasgow, 1998). These paradigms, I would suggest, relate to the design paradigms of embodied poetic thinking, phase models of creative problem solving and information processing theory that I discussed earlier. My epistemological approach tends towards the latter. A national survey, concerning design and technology capability in the UK in 1988, helped to identify a number of factors crucial to student performance in design tasks (Kimbell et al, 1991). In many ways these factors echo the constructivist approach described earlier. The factors include: establishing meaning for the students through the context of the task, allowing students ownership of the task, encouraging a variety of ways of responding to the task and encouraging collaboration and group work.

The use of online learning environments has been developing rapidly and we can now access sites on the Internet that allow us to interact in audio-visual shared spaces in the same way as we are used to communicating using cell phones or e-mail. What Metcalfe enthusiastically described only eight years ago as his vision for the future of communication, tele-presence, could realistically be a description of online learning environments today.

> Being somewhere tele-presently by using networks and computers will be better than being there physically... because groups of people will be able to join together and their interactions will be enhanced by computers. They'll be able to see each other, have side conversations, have discussion moderated in a constructive fashion, in addition to being able to access information and data on the spot (Metcalfe, 1997, p. 2).

Although learning environments hold exciting possibilities for creating experiential scenarios for interacting and collaborating on-line, some theorists have argued that 'technologists' often inflate the democratic potential and educational worth of computer-mediated communication, while ignoring many of the technological problems (Rheingold, 1993). They criticise the disempowering nature of many technological initiatives and describe computer-mediated communication as disembodied communication lacking the immediacy of face-to-face contact and body language. I take up these themes in my analysis of the 3 Studies in Chapter 6. Barnett has argued that it is the responsibility of educators to create new frameworks of meaning where discovery can take place (Barnett, 1997). I suggest that this is particularly true for design educators.

### 2.10  Critical elements for online learning

A number of online learning models have been identified (Oliver & Herrington, 2001). Systematic design instruction has its roots in systems theory and cognitive psychology and responds to explicit behavioural objectives. This approach has been criticised as being over instructional, linear and difficult for individual teachers to customize. Various constructivist models describe learners actively constructing meaning,

by interacting with their environment, and incorporating new information into their existing knowledge base. In situated learning, knowledge emerges from social interaction and communities of practice and is best suited to work-integrated, performance improvement models of learning. Problem based learning involves using domain knowledge, semantic mapping, goal setting, motivational and attitudinal components and meta-cognitive processes (Jonassen, 2000). Problems can be structured or ill structured. Although these models are neither exhaustive nor mutually exclusive, they can be seen as frameworks for identifying the design of online learning environments. A lot of research supports the use of situated learning as a model of instruction (Griffin, 1995). Although some critics might suggest that, the need in this model to expose students to experts in the field argues against its use in the classroom (Trip, 1993). In problem-based settings, popular in medical training, students develop higher order thinking in solving problems through set activities and tasks. This problem-based approach requires a structured framework and appropriate scaffolding for learning (Schwartz et al, 1999). Project-based learning models involve students in designing and producing products chosen to reflect real life applications. Oliver et al describe the characteristics for this model. They involve collaborative integrated learning using authentic tasks that are product and process-orientated. Students, involved in these tasks, are able to apply their own investigative, planning, designing, evaluation and production strategies in the development of an artefact or product (Oliver & Herrington, 2001). One of the criticisms levied against this type of model is that the task set, although requiring critical thinking, provides little support for the learning activity (Land & Green, 2000). One way of countering such criticism would be to ensure that participating students have sufficient prior knowledge and experience of the design process. Similarly, the online environment could provide support for instructional processes such as scaffolding and learning processes like planning, presentation, and collaboration. It has been argued that the difference between project and problem-based learning lies in the problem set. In problem-based situations, the solution tends to be fixed, whereas in project based situations it is based on required specifications for a product.

Learning by doing underpins learning in project-based settings. Strategies such as online discussions and access to expert guidance and support work well in project-based settings (Oliver & Herrington, 2001). A set of elements has been identified as critical for adopting a constructivist approach to online learning environments. These are learning tasks, learning resources and learning supports. Each of these elements assist the learner in constructing knowledge with multiple perspectives and encourage ownership of the learning process, while embedding learning in realistic contexts and social experience. Learning tasks are based around learning activities, such as computer-based interactions, or, collaborative tasks that engage the learner and upon which the learning is based. Learning resources, such as computer based tools or web links, provide information and resources to allow learners to complete the tasks. Learning supports, such as discussion boards and chat facilities, are used to provide learners with help to operate beyond their immediate level of comfort and to fade as learners develop expertise. These critical elements might be useful for identifying aspects of online learning environment for development.

## 2.11 Constructivist learning environments

Constructivists regard knowledge as personally constructed but socially negotiated. Knowledge, they say, is both individual and social and through negotiation and consensus building, verifiable properties, that fit our experience, are socially mediated (Bauersfeld, 1992; Von Glasserfeld, 1992). Adopting this student-centred perspective:

> environments that foster personal meaning making, as well as the social construction of knowledge and meaning through interactions with communities of learners, are preferred to instructor interventions that control the sequence and content of instruction. (Palloff and Pratt, 1999, p. 16)

Constructivism has been described as: a referent for a set of beliefs about knowing and knowledge, to explain why learning occurs and as a reflective tool. In the constructivist paradigm, learning is considered an active and engaged process, involving

social negotiation to construct knowledge, with learners functioning at a metacognitive level (Savery & Duffy 1995). Four components are identified: prior experience, social process, making sense and extant knowledge. In order to apply constructivism as a method of teaching one begins by taking account of students' prior experience. Social interaction is maximized between learners to encourage learning. Students build up knowledge by negotiating meaning through a variety of sensory experiences (Tobin & Tippins, 1993). Learners collaboratively engage in critical thinking and problem solving, while working autonomously in open-ended learning environments (Hannafin et al, 2001). This has implications for the teachers' role, in online learning environments, in balancing support and intervention with the autonomy that active learning needs. The focus is on learners rather than the discipline being studied. In the constructivist approach the instructor has to be willing to step back and allow control to be taken by groups in constructing their own knowledge enabling increased student collaboration and deeper learning to take place. Constructivism can also play a significant role as a tool in evaluating student learning through scanning for off-task behaviour, examining the nature of student engagement and checking student understanding. Constructivist learning environments involve building interpretative and intellectual support systems within a carefully structured and scaffolded environment. The focus or goal of this learning environment is to develop solutions to a problem, question or project. Constructivist theory suggests that meaningful learning requires ownership of the problem to be solved. The problem should be open, relevant and engaging. Jonassen identifies three integrated components of constructivist learning environments: problem context, problem representation or simulation and a problem manipulation space (Jonassen, 1994). Constructivist learning environments can support learning by scaffolding student experience, by enhancing cognitive flexibility, and by providing multiple perspectives, to convey complexity inherent in the knowledge domain (Jonassen, 1994).

Values associated with an experiential model of learning include active thinking, autonomy in decision-making, and collaborative work rather than activity focused on

teacher-directed, didactic learning. If, as constructivists would argue, the use of computer-mediated communication in online learning environments encourages student-student rather than teacher-student interaction, then this would weigh towards an experiential rather than an acquisition-learning model and might in itself encourage exploration, flexibility and information handling skills (Goodfellow & Kukulska-Hulme, 1996). Constructivist online learning environments may be appropriate for those students who like to be personally involved in the learning situation and learn by listening and sharing ideas, perceiving information concretely and processing it intuitively. They are divergent thinkers whose strength lies in their innovation and imagination. Many students used to highly directed learning are at a loss, however, when given responsibility for negotiating their own roles and responsibilities. These students may be analytical learners, who tend to seek facts and learn by thinking through ideas, perceiving information abstractly and processing it reflectively. They like concepts and ideas and thrive on collecting facts and experts' opinions. Some research demonstrates that these students find online learning difficult and problematic in their initial exposure and

> 'often are quite critical of their teachers for what they see as a failing in
> instruction' (Oliver & Herrington, 2001, p. 56).

## 2.12 Learning in online communities

Rheingold (1993) first used the term 'virtual communities' to describe groups of people engaged in mutual discussion over time on the Internet that allowed them to forge a group relationship in cyberspace. While, communities of practice have been characterised as a critical mass of people with a shared purpose interacting socially to satisfy a common need (Preece, 2000), Wenger et al (2002) cite the more important features of building up an online community as mutual engagement in doing something, competence in a shared domain knowledge and negotiation and ownership of the shared experience. Wenger et al (2002) also suggest that the essential elements of community practice are the use of substantive online discourse, being involved in authentic online activities and the

negotiation of a shared understanding. Some research indicates that group collaboration leads to more task related interaction (Johnston et al, 1986), that the reward systems in collaborative environments encourage student motivation and that the dynamics of group interaction may lead to higher levels of student achievement (Hoyle et al, 1992, Moriarty et al, 1995). A number of themes have been identified in online learning communities that it may be necessary to deal with including themes to do with connectedness, shared rules and norms, and privacy issues (Palloff & Pratt, 1999). Some of these themes are addressed in the three studies in this research.

Computer-mediated communication technologies have developed to support and sustain effective distance learning. For almost a decade now video conferencing, multi user domains, special interest groups and electronic mail have all been the subject of increasing interest in education and training (Howard et al, 1996, Schnurr & Smith, 1995, Starling, 1994). Some studies have stressed the need for a purposeful focus required by communities of practice for effective collaboration with participants needing to engage in mutually beneficial shared repertoires (Duffy & Cunningham, 1996, Laferrier et al, 2000). In other words authentic engagement in fruitful interaction dedicated to professional involvement. Other work suggests that threaded discussion boards can encourage understanding of set tasks and give direction to problem solving (McLouglin & Oliver, 2000). The constructivist argument hypothesises that students working collectively online negotiating norms, goals, ethics and communication styles can build up a sense of community. Members of these communities will feel a sense of participation in making the rules and so will take over ownership of their learning (Palloff & Pratt, 1999). A number of strategies have been proposed for developing online learning communities:

- Establish a failure safe space in which to work and communicate;
- Assist the learner to establish structural dependence;
- Encourage the learner to set priorities regarding reading messages;
- Remind the learner that someone is out there;

- Establish well organized structure to facilitate efficient interactions;

- Provide the learner with multiple means of access;

- Work to minimize technology glitches and provide training for how to cope with them (Hill, 2000).

Participation in online communities may certainly be a powerful form of learning but learning need not come about simply based on participation in a joint endeavour. Online environments allowing some sharing and exchange of views, though perhaps showing evidence of collective endeavour, need not constitute communities of practice or places of learning.

## 2.13 *An analysis of communicative interaction*

A significant body of research from a variety of disciplines suggests that computer-mediated communication allows distributed design groups an opportunity for interactive communication and a group social dynamic that the literature suggests is supportive of learning (Scrivener & Vernon, 1998). This includes work related to the psychology and sociology of groups (McGrath, 1984), the sociology of organizations (Pugh, 1990), and the psychology of media (McLuhan, 1988) as well as collections of original papers on groupware and computer-supported collaborative work (Greenberg et al, 1993, McLuhan, 1988). Other work includes research into instructors' behaviour when using computer-mediated communication in a classroom situation (Ahern et al, 1992); teacher discourse style on the frequency and complexity of student responses (Tagg & Dickinson, 1995); and the effectiveness of styles of instructor intervention on encouraging student participation (Levin et al, 1990). Some research into patterns of communicative interaction in online collaborative design environments describes a sequence of novel or unexpected idea generation, followed by episodes of decision-making and design development. However evaluation frequency or 'patterns of time' message maps show computer-mediated discussions are not linear (Harasim, 1990). The impact of the introduction of computer-mediated communication in educational contexts has been described in a number of studies.

One comprehensive survey of research into computer-mediated interaction has identified some of the main areas that are currently being investigated (Mellar & Howell-Richardson, 1999). These include: the development of better software design, the comparisons between computer-mediated discourse and discourse that is conducted face-to-face and research into patterns of traffic between schools (Hassel & Christenson, 1996, Hepp et al 1996, Newlands et al 1996),

Content analysis involves the analysis of communicative interaction used in social contexts and is used to illuminate social processes by examining conversations or the texts in which they are carried on (Cameron, 2001). These texts can include survey responses, interviews and group discussions. Cameron argues that the distinction between conversation and written language has become blurred. The informal and egalitarian online communications recorded in chat rooms and discussion boards is interactive and spontaneous and is therefore more similar to face-to-face conversation than to written language. Mills described the social psychology approach to discourse of ethno-methodologists and conversation analysts. This approach focuses on production of knowledge through the discursive construction of reality using content and thematic analysis (Mills, 1997). Analytical methods have been developed to document discourse and particularly the structure of argumentation (Wetherell & Potter 1992, Wilkinson & Kitzinger, 1995). Cameron cites Schriffen (1994) in identifying two important trends in twentieth century linguistics. One trend, structuralism, is concerned with the structure and form of language, about how turn taking happens, or whether the form of the question affects how it is answered. The other trend, functionalism, is concerned with the purpose of language. Habermas's theory of communicative action argues that good quality social scientific research is dependent on adequacy, explicitness and reflexivity between the participant researcher and the students taking part (Coenen & Khonraad, 2003). A 'dual hermeneutic' approach might suggest that while researching the students'interactions, the researcher is not investigating abstract facts but rather interpreting a reality already interpreted by the participating students (Giddens, 1979).

A common ontological approach can be associated with some contemporary educational theories such as critical theory, structuration theory and engagement theory. Critical theory refutes the idea that the world is objective and independent of the observer and argues that social and cultural reality, already interpreted by participants through a cultural and symbolic meaning system, can be changed over time (Blaikie, 1993). Structuration theory attempts to construct an ontological framework incorporating agency and structure (Giddens, 1979). This approach perceives the study of human social interaction as the study of social actors engaged in both producing and reproducing their social world. In order to reflect the contemporary design context, as well as the increasingly global nature of teaching and learning, the students participating in DesignLink are drawn from internationally disparate educational institutions. However, while I understand the importance of questions to do with the impact of social and cultural difference on the shared environment that the students are creating, this aspect is not addressed in this research. Gidden's structuration theory views human action as social practice where values and interests are defended. Participants and researchers give meaning to existing natural and social conditions while trying to influence a change in conditions (Coenen & Khonraad, 2003). Structuration theory would suggest that in any investigation into the interaction of students collaborating online the collaboration might be understood based on the knowledge available to the students and on the basis of their knowledge of social structures. While engagement theory suggests that:

> learners must be actively engaged in meaningful tasks for effective learning to occur (Kearsley, 2000: p. 67).

I have adopted a functional approach to an analysis of the themes and content of the online interactions of participants in the 3 studies. In Chapter 6, I try to evaluate how meaning is negotiated through the communications stratagems developed by the participants.

## 2.14 *Fostering design knowledge as an iterative conversation*

Topic goal (1) →

← conceptions (2)

idea re-description (3) →

← conception re-description (4)

| THEORY OF DESIGN | | STUDENT'S CONCEPT | |
|---|---|---|---|
| | ↑ reflection (12) on student 2's actions to modify description | adaptation (10) of action in light of theory goals and feedback ↑ | reflection (11) on concept in light of experience ↑ |
| Adaptation (5) of task goals in light of student 2's re-description ↓ | | | |

CONSTRUCTED ARTWORK

STUDENT'S DESIGN ACTION ↓

Student 1 sets goals (6) →

← student 2's actions (7)

student 1's feedback (8) →

← student 2's modified actions (9)

*Figure 2 A design framework (adapted from fig11.1 p87, in Laurillard, D. 2002).*

Laurillard has developed a conversational framework for e-learning activity that describes an iterative cycle of idea-generation, questioning, practicing, adapting actions, interactive feedback, adaptation, and reflection and developing solutions (refer to Appendix 2). These conversational frameworks, representing students in networked relationship, have been developed for a variety of video-conferencing environments (Laurillard, 2002). I have adapted the sequence of activities proposed by Laurillard to build a framework for an online collaborative design environment (see Figure 2 above).

## 2.15 *Conclusion*

I have engaged critically with a selection of the extensive literature that has direct relevance to the themes of this research. Some educational research has focused on the evaluation of instructional systems design (Brown & Davis, 2004, Dick & Carey, 1996, Jonassen et al, 1999, Willis, 2000). Some studies have argued that web based group design activity can stimulate productive environments for learning to design (Scrivener and

Vernon, 1998). Eggleston (2001) and Thistlewood (1990) have pioneered work into the nature of design education and the central notion of the design critique in learning through design activity. Design research paradigms are explored for their usefulness as methodological approaches and this is developed in the next chapter. The growing commitment to the use of technology for teaching and learning is described using some examples from the design domain. I then refer to further research focusing on computer-mediated communication interaction (Mellar & Howell-Richardson, 1999, Walther & D'Addario, 2001) and on knowledge building in constructivist learning environments (Brown & Davis, 2004, Sorensen, & Takle, 2003). Other work identifies and examines new and effective methods for scaffolding and structuring online learning environments (Jonassen et al, 1999, Stumpf & McDonnel, 2002). The educational research interest in these environments is now beginning to address the use of pedagogical studies to evaluate the different scenarios that might present themselves in an education setting. Some critics argue that the development of online learning environments depends on expert knowledge of systems not typically found in teachers and rare among instructional designers and this makes the task of designing meaningful learning experiences more challenging than ever (Spector, 2001). Although the possibilities for incorporating online learning environments into design education are exciting, design teachers need to be aware of the danger of assuming best practice from other domains. A balance should be struck between using technology appropriately in the classroom and communicating the values of our domain knowledge. I propose to use a conversational framework model, adapted from Laurillard (2002), as an analytical tool for investigating online collaborative design work.

Some theorists remain sceptical of the claims made for technology's enfranchising and educational benefits citing security issues, the privacy issue, and problems to do with access (Rheingold, 1993, Lengel, 2000). Similarly, criticisms have been directed at the use of virtual design spaces for undermining the traditions of craft design with its emphasis on the exploration of materials (Virilio, 1997). However, I argue that design practitioners should take responsibility for their own professional self-renewal and exercise independent

judgement in trying to meet the educational needs of their students by researching the pedagogy of teaching and learning online (Marsland, 1995).

# Chapter 3

## The methodological approach to the research

### 3.1 Introduction

The most important and difficult responsibility of the researcher is in the choice of research methodology. Methodological choices require both knowledge of methods and their appropriateness for the substantive area of investigation (Shulman, 1988). Yet, far from being neutral, techniques of data collection and analysis in educational and social research methods are underpinned by cultural assumptions. In this chapter, I examine this filtered perspective in relation to my research into identifying factors that contribute to successful online collaborative design work. The differing ontological, epistemological and methodological assumptions underpinning research in this area are identified and the strengths and limitations of different approaches are explored. Design's essential discipline lies within the way designers engage with and process externally derived information. Yet, the increasing impact of technology in education is having a major effect upon how students acquire and process information. The chapter describes the methodological approach that I adopt to investigate the potential of online learning environments for design education and aims to inform research methodology in this challenging area of design education.

### 3.2 Cultural assumptions

Jarvie contends that:

> all assessments are assessments relative to some standard or other, and standards derive from cultures (Jarvie, 1978, p. 15).

This relativist view suggests that norms and values are relative to cultural contexts, which are unique and that culture shapes and constrains even perceptions of colour, shape, time and space. Denzin and Lincoln, in their review of educational research methodologies describe how qualitative researchers

stress the socially constructed nature of reality and the situational constraints. They seek answers to questions that stress how social experience is created and given meaning (Denzin and Lincoln, 1998, p. 8).

In the mid-sixties through to the mid-nineties, there was a move towards this qualitative and ethnographic approach that shifted the focus of much educational research back into schools and classrooms. The effect of this was to replace quantitative studies using large samples and statistical analysis as the main source of information on how learning takes place with more qualitative studies. However, in the past decade the pendulum of research methodology has swung back towards more quantitative studies. My research adopts an essentially qualitative stance while focusing on context and meaning that recognizes that classrooms have a culture and an ethos. That is to say, what happens in the classroom generally has complex layers of meaning, interpretation, values and attitudes. I adopt an empirical but not positivistic approach to investigating these layers.

### 3.3 Ontological and epistemological assumptions

The criteria for selecting suitable research methods and the process of analysis adopted, is often influenced by the researcher's basic set of beliefs in the nature of reality and how we know and gain knowledge of the world. This matrix of ontological and epistemological assumptions and methodological choices can form a framework for the processes of research, data collection and data analysis with different theoretical traditions providing different interpretative contexts. Ontological questions are to do with the essence of things or being in the abstract. How we are. Such perspectives can be firmly held with the researcher attempting to follow them through or may be tacit assumptions where the researcher will need to go through a process in order to reveal implicit assumptions. Ontological assumptions that might underlie approaches to research and research methods would be to do with the nature of social reality. Design scientists would argue that reality is objective being external to and imposing itself on people, that the design process is cognitive, logical and a knowledge-producing affair, where one can derive a set of

principles or procedures that permit effective control over it. The nominalist or constructivist argument adopted for this research, on the other hand, identifies reality as subjective and created by individual cognition and argues that the design process is somehow a more intuitive practice that can be experienced and adopted but not necessarily imposed on our students.

Epistemology is to do with a theory about the essence or grounds of knowledge. How we learn. Epistemological questions surround the issue of knowing and the nature of knowledge. This involves discussion of what can be known. How can knowledge be obtained or communicated to others? Can knowledge be obtained only from personal experience or can it be obtained indirectly by other means? It has been suggested that: ontological assumptions will give rise to epistemological assumptions, which have methodological implications for the choice of qualitative or quantitative data collection techniques (Hitchcock & Hughes, 1989). However, methodologies should not be confused with theories of knowledge since different epistemologies do not necessarily lead to different research practices (Bryman, 1988). There is no clear correspondence, between epistemological position and technique, in decisions to use quantitative or qualitative approaches to research. Similarly, it is important to realize that the distinction between alternative methodologies in educational research is not simply the procedures that they employ but more importantly the type of research questions they may answer. Shulman notes that the underlying theoretical, political and social purpose of the research ought to be taken into account when considering suitable research methods and techniques (Shulman, 1988). He notes that the most important and difficult responsibility of the researcher is in the choice of research methodology and this requires knowledge of methods and their appropriateness for the substantive area of investigation.

## 3.4 A methodological approach

Methodology concerns theories of how research should operate and so refers to the ways in which procedures are acted out in the research situation. Consequently, questions

about the collection of quantitative data through protocol analysis or qualitative data through participation and involvement are described as methodological questions. In order to reflect the contemporary design contexts as well as the increasingly global nature of teaching and learning, the students were drawn from universities in different parts of the world. The scaffolding of the online learning environment concentrates on providing group support systems for students working in culturally homogenous environments with similar educational backgrounds and levels of prior experience. The larger set of pedagogical circumstances and the wider educational context to do with gender, institutional and national differences are only tangentially addressed. The methodological approach, while acknowledging the importance of cultural difference in international collaboration, focuses on how design students negotiate meaning as they generate their ideas and develop their group work.

## 3.5 Ethical Considerations

I adopted a set of ethical guidelines based on guidelines developed by the British Educational Research Association and the ethical standards of the American Educational Research Association. These included conducting the research with respect for all the participants, respect for knowledge, respect for democratic values, and respect for the quality of educational research generally. I am committed to avoiding fabrication or misrepresentation of evidence, data, findings, or my conclusions. My intention is to report my research procedures, analyses and results in sufficient detail to allow other researchers to understand and interpret them. I will also communicate the findings of this research to all relevant parties. I asked for informed consent from all the participants before they were involved in the research. I described the aims, purposes and likely publication of findings involved in the research and let them know that they had the right to withdraw from the study at any time (Cohen & Manion, 1994). In order to ensure confidentiality I have removed references in the body of the report to names of students and faculty participating in the specific studies. The figures used are illustrative rather than specific to the studies.

However, the participating institutions and faculty with their agreement are acknowledged in Appendix 1.

I use the DesignLink teaching projects as the context for my reflective practitioner initiative. The cyclical educational research approach I adopt is as an ethical process that integrates:

> teaching and teacher development, curriculum development and evaluation, research and philosophical reflection into a unified conception of reflective educational practice (Elliot, 1992, p. 54).

I chose a practitioner research approach as a systematic method to determine how best to implement collaborative online projects into my classroom practice. The research has become an ethical responsibility for me as I monitor the effectiveness of my practice and the competency of my teaching (Parsons & Brown, 2002). However, ethical considerations can surround the issue of conducting a body of research in an educational program when the participating students are being evaluated on what they have learnt and experienced during the course of the program. Ethical problems can occur at each stage of the research process. The nature of the research objectives, the different institutional backgrounds and my expectations all come into play. Grading of all DesignLink projects remained internal to each participating college and the instructors at each location were free to adopt their own grading rationale and criteria. However, the differing expectations in terms of project output from the different instructors proved problematic. In some groups, a member of the group might be less enthusiastic in pursuing a group objective that held less priority for them in terms of their assessment than other objectives. The instructors had a strong involvement with the students and this created dilemmas for instructors whose epistemological stance favoured an instructional rather than a constructivist approach. I tried to avoid this dilemma by making instructors aware of the constructivist approach adopted for the teaching project. However, an ethical dilemma arose during the 2nd DesignLink phase over autonomous student group work and the instructors teaching role. This is the context for Study 3 (see Chapter 6).

Robson (1999) reminds us to observe protocol by making sure to consult with and inform all the appropriate people, committees and authorities and to make sure that all the necessary approval and permission has been obtained. Ethical approval was obtained from the Academic Management Committee of Richmond and research ethics approval was obtained from the Institute of Education, University of London and the other participant universities. I am also aware of the introduction of codes of conduct by professional associations, the establishment of academic monitoring and review boards, and the now common requirement for research proposals to include some form of ethical statement. Overall, I attempted to balance the ethical and educational themes contained within this research.

## 3.6 A conversational framework for online designing

The social process paradigm I adopt in this research argues for a design practice dynamic of consensus through argumentation. It has been suggested that this can result in a design method comprising of negotiation and conflict resolution in which completed designs are then realised through collective approval (Stumpf & McDonnel, 2002). I investigate the collaboration between design students by focusing on the changing relationships that occur between internal states and sets of intentions as the students gather information, discussion and ideas are generated, sketching and reflection takes place and solutions are arrived at by the design groups. The systematic online discourse of design students and instructors is examined as they generate ideas, negotiate meaning, come to decisions and develop solutions to a design brief. This on-line conversation is analysed to elicit understanding of students' and instructors' communicative interaction, while decision-making, and how they negotiate meaning collaboratively, through their actions and behaviour. The group discussions (texts) are initiated by the students to negotiate meaning and generate common approaches to developing ideas for the solution of the brief. The texts are a record of their doing something and can be examined to discover any patterns of communication or

structures and organization, which might shed light on how their understandings are developed and their decisions made. In the 1st Study of online design work, I have modified Laurillard's model of a conversational framework to analyse the communicative interaction that takes place. My interpretation of a conversational framework represents the learner-centred active learning and constructivist DesignLink environment in Study 1 (see Chapter 6). The framework models the descriptions of the sequence of design activities taking place online during the design students' collaborative activity. The sequence of design activities is interpreted by an analysis of the groups' discourse in their discussion board.

Idea generation (1) →
← conception (2)
idea re-description (3) →
← concept re-description (4)

| PROBLEM SPACE | | SYNTHESIS & ANALYSIS | |
|---|---|---|---|
| | ↑ | | ↑ |
| Adaptation (5) | reflection (12) | adaptation (11) | evaluation (10) |
| of design development | on solution | of action in | of concept in |
| in light of | to modify | light of evaluation | light of |
| re-description | description | and feedback | experience |
| ↓ | | ↓ | |
| FINAL ARTWORK | | SOLUTION SPACE | |

Student 1 sets goals (6) →
← student 2's actions (7)
student 1's feedback (8) →
← student 2's modified actions (9)

*Figure 3 A conversational framework by design students to negotiate meaning and generate common approaches to developing ideas for the solution of the brief.*

In the DesignLink environment the student's description and re-description of their views are complemented by the exchange of graphic files supporting the task based activity. This activity is illustrated in Figure 3 by my interpretation of Laurillard's' conversational framework' for an online collaborative environment designing corporate

identity for a merged global airline. My approach to analysing the function of the students' and instructors' discourse, its meaning and significance, is to examine the conceptual frameworks of the design students as a source of evidence or insight into the process of designing collaboratively online. Epistemologically knowledge about designing is derived from the students' and instructors' discourse and descriptions of their role in the design process, their conversational framework. This adaptation of Laurillard's conversational framework informs my approach to each study although it is only in Study 1 that the model is used as a specific instrument of analysis.

## 3.7 Grounded practitioner research

As a 'reflective professional' (Schon, 1987), I take on a 'practitioner-researcher' role (Robson, 1999) and carry out a systematic grounded enquiry into the issue of online collaboration in university design education. My research is located within the context of the growth in the exploitation of telecommunication networks for teaching and learning and addresses the question of the potential of online learning environments for design education. My methodology is broadly constructivist. I consider that reality is subjective and that knowledge building is explainable in terms of the interactions of students' online design activity. The research involves a spiral of iterative cycles of planning, acting, observing and reflecting. This approach allows me to refine my methodological approach in each successive phase of DesignLink.

A Pilot Study was developed focusing on a collaborative project between two universities. The Pilot Study compared the attitude and reflection of students participating in both co-located (students working together on the same campus) and distributed groups (students working at a distance in different universities). This developed into a series of online collaborative projects involving a number of universities from which three studies of online collaborative design work emerged. One study is drawn from each of the DesignLink phases. I structured each of these studies to gain insight into specific themes to do with online collaborative design practice.

| Study | Pilot study | study 1 | study 2 | study 2 |
|---|---|---|---|---|
| Time period | Spring 2001 | Jan/Feb 2002 | Jan/Feb 2002 | Mar/Apr 2004 |
| Participating universities | UK – RAIUL US - UNK | UK – UM US – IUPU UK – RAIUL | UK – RAIUL UK – UM US – IUPU US – MC UK – SIHE | US - ISU US - MC Singapore - LS |
| Group composition | 6 * 2 co-located 6 * 2 distributed | 1 * 3 distributed | 5 participants | 10 * 3 distributed |

*Table 3 The research 2001 – 2004.* (Note: 6*2 is 6 groups of 2 students)

I employ a purposive rather than a random sampling model to investigate the research questions (Stake, 1998). The positive and negative instances considered as material for each study include examples of specific types of collaborative practice, or examples of particular approaches to negotiating group dynamics in developing problem solutions. Each study led to an identification of themes that led to the design of the next study.

The 1st Study focused on synchronous and asynchronous communication. The 2nd Study concerned the dynamics of student and instructor online participation and the 3rd Study concentrated on group dynamics and partnership negotiation. The research questions are:

- How do distributed groups of students use synchronous and asynchronous interaction when seeking collaborative solutions to design problems?

- How do instructors use the facilities provided by an online collaborative environment in interacting privately and publicly with students and with each other?

- How do students handle the challenges of group dynamics and partnership in online collaborative group work?

## 3.8 Methods of data collection and analysis

Method is the description of the various techniques and approaches used for gathering data in educational research. In this section, I describe my pluralist data

collection methods. My methods involve interrogation of online social interaction of student and instructor discourse. Qualitative data analysis is used to interrogate discussion boards, questionnaires and transcripts of interviews. The unit subjected to analysis is either the whole or part of a posted message. This can range from phrases through sentences to whole paragraphs. Multiple sources of data are used in an attempt to triangulate and so substantiate the data recorded. Data collection is designed to be appropriate to investigating online communicative interaction and descriptions of how meaning is negotiated collaboratively through actions and behaviour. Student opinion suggested that there was an enthusiasm for international collaboration, which offset any reluctance on the part of students to be involved in collecting data such as collecting e-mails and accurately recording their sequence and timing of activities.

I adopted a variety of methods to gather data that will answer relevant pedagogical questions to do with the functionality of the DesignLink learning environment. My primary data collection came from:

- Observation logs, interviews and questionnaires of 6 co-located and 6 distributed groups in the Pilot Study (appendices 3, 4 and 5);
- The online discourse of one distributed group in Study 1 (Appendix 9);
- Instructor and group online discussion boards in Study 2;
- Online communication, observation logs and outcomes of 5 co-located and distributed groups in Study 3 (Appendix 6).

The reflective journals and the questionnaires were made available electronically in the DesignLink site and it was possible for the students to open up both documents from the 'course documents' area directly into Word. When they had completed these, they were instructed to use the digital drop box in the communication area to send them to their instructor. This eased the business of gathering student responses and was a useful addition to the online environment.

*Observation logs*



Figure 4 *Phase 1 Screen shot of DesignLink activities sheet.*

Students were asked to keep timed and coded observations logs of the various activities they engaged in during the problem-solving process (see Figure 4). They were also asked to keep a record of any exchanges they were involved in outside the Blackboard site. In terms of data gathering, many students were not aware enough of the importance of detailing the sequence as well as the timing of their activities in their time sheets and simply totalled their various activities. In Study 1, activity sheets replaced the log sheets to describe the sequencing of activities such as visual research, brainstorming, idea-generation, sketching, discussion, and decision-making and design development. In Study 3 student movements between groups was recorded as flow diagrams (Figure 19, p. 110).

*Videotaped semi-structured interviews*

Students took part in short videotaped interviews were they described their performance in the project and their views on how they negotiated meaning collaboratively through their actions and behaviour. In the Pilot Study, semi-structured interviews were used to gain insights into the students' reflections on their collaboration and interaction online while developing their designs. The interviewers maintained a balance between

providing enough openness to allow the students to tell their story and enough focus to get them to concentrate on the experience of their collaboration. These open-ended interviews allowed the students the opportunity to give a detailed record of their rationale and provided greater insight than simply observation of surface activity.

*Student questionnaires*

In the Pilot Study, multiple-choice Lickert scale questionnaires elicit students understanding of their behaviour, attitude, approach and method while decision-making and problem solving (see Figure 5). Students were asked to describe their collaborative activities and behaviour by filling in an initial and a final questionnaire about student's behaviour, attitude, approach and method while problem solving.
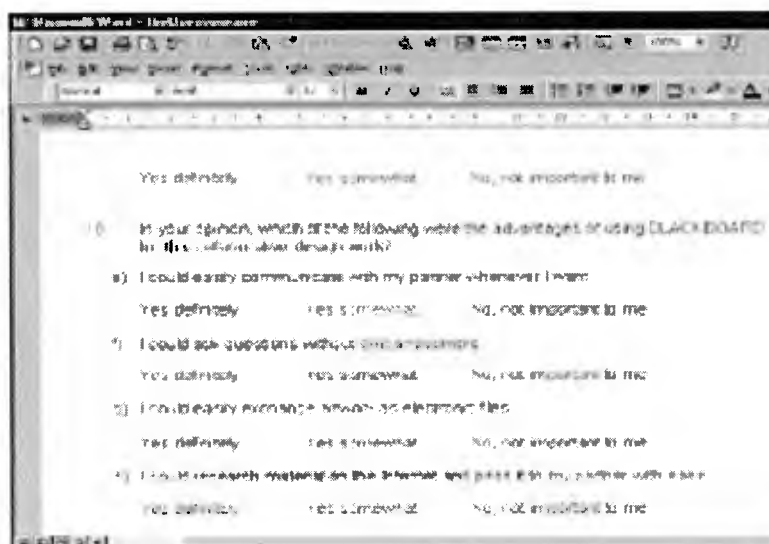


*Figure 5 Screen shot of online student questionnaire. (also in Appendix 4)*

The semi-structured student interviews were repeated but because of an ongoing analysis of the data from this study, the questionnaire questions were redesigned to elicit more appropriate information (see Appendix 4).

*Systematic recording of synchronous and asynchronous discourse;*

In all three studies records of online discourse, e-mail communication and synchronous sessions were downloaded and transcribed.



Figure 6 *Phase 1 Screen shot of the links to k group areas.*

These produced a comprehensive record of communications that illustrated the way distance was overcome in developing ideas and reaching decisions. In Study 1, the data came from the detailed threaded discussion board of one distributed group. In Study 2, data was gathered from the online debates that instructors and students entered into during the course of the collaboration. The data was interrogated and assessed to elicit the attitude and behaviour of participants to using communication technologies and the effectiveness and efficiency of their social interaction and collective performance when engaged in collaboration.

### 3.9 Conclusion

This chapter has described the practitioner research approach to investigating the potential of online learning environments for collaborative design work in educational contexts. The empirical and nominalist research methodology adopted for this research comes from an understanding of designing as a social process, realised through a process of argumentation, resulting in consensus. The act of designing is regarded as the product of

processes through which the students together negotiate the meanings and understandings that underpin their design actions and processes. An interpretive approach is used to search for an understanding of the meaning in the students' and instructors' discourse, reflections and experiences, rather than testing a pre-determined hypothesis. According to some research, if students adopt autonomy in decision-making, collaboration, and participation this should encourage social learning (Jonassen et al, 1999, Sorensen, & Takle, 2003) Design students are establishing conversational frameworks for knowledge building by making decisions and negotiating meaning through synchronous and asynchronous communication. In order to facilitate social interaction and the engagement necessary for meaningful design collaboration a great deal of attention is paid to the scaffolding of the DesignLink sites, including developing threaded discussion topics and embedding advice and guidelines on completing projects (Kearsley 2000). The collaborative interface is regarded as constructivist in that the participants take ownership of the design brief, negotiate and reconcile their differing realities to arrive at design knowledge.

The methodology involves a detailed analysis of the social interaction that participants adopt while working on collaborative projects. The research addresses the following specific questions: (i) how do distributed groups of students use synchronous and asynchronous interaction when seeking collaborative solutions to design problems? (ii) how do instructors use the facilities provided by an online collaborative environment in interacting privately and publicly with students and with each other? (iii) how do students handle the challenges of group dynamics and partnership in online collaborative group work?

The next chapter describes the context for this research, the DesignLink initiative.

# Chapter 4

## *DesignLink, the pedagogical context for the research*

### *4.1 Introduction*

The research was situated within successive phases of the collaborative teaching project DesignLink between the spring of 2001 and the spring of 2004.

| Phase | phase 1 | | phase 2 | | phase 3 | |
|---|---|---|---|---|---|---|
| *Time period* | Spring 2001 | Spring 2001 | Jan/Feb 2002 | Mar/Apr 2002 | Nov/Dec 2003 | Mar/Apr 2004 |
| *Project* | Project 1 | Project 2 | Project 1 | Project 2 | Project 1 | Project 2 |
| *Participating universities* | UK – RAIUL US - UNK | UK – RAIUL US - UNK | UK – RAIUL UK – UM US – IUPU US – MC UK – SIHE | US - DE UK – RAIUL US - UNK Colombia - IC Canada - YT | US - ISU UK - CSM UK – RAIUL | US - ISU US - MC Singapore - LS |
| *Student numbers* | 18 students | 16 students | 45 students | 29 students | 30 students | 13 students |

*Table 4 Collaborating institutions and student numbers involved in DesignLink 2001 – 2004.*

The students collaborated using a Blackboard class site on the RAIUL server in the first two phases and a WebCT class site on the ISU server in the 3rd Phase (Table 5). Both proprietary systems had facilities including e-mail, discussion lists, a shared whiteboard, and a synchronous chat board and file exchange. Occasional use was made of other proprietary instant messaging systems by some of the participants.

| Phase | phase 1 | | phase 2 | | phase 3 | |
|---|---|---|---|---|---|---|
| *Time period* | Spring 2001 | Spring 2001 | Jan/Feb 2002 | Mar/Apr 2002 | Nov/Dec 2003 | Mar/Apr 2004 |
| *Project* | Groups of two students | Groups of two students | Groups of three students | Groups of three students | Groups of three students | Various sized groups |
| *University* | RAIUL | RAIUL | RAIUL | RAIUL | ISU | ISU |
| *Software* | Blackboard | Blackboard | Blackboard | Blackboard | WebCT | WebCT |
| *Student groups* | 7 * 2 co-located 2 * 2 distributed | 8 * 2 distributed | 15 * 3 distributed | 9 * 3 distributed 1*2 co-located | 10 * 3 distributed | 2 " 2 co-located 1 * 2 distributed 1 * 3 co-located 1 * 4 distributed |

*Table 5 DesignLink platform base and the composition of participating groups 2001 – 2004.*

In total 151 students making up 57 distributed and co-located student groups and their faculty from 12 universities in Europe, North and South America, and Asia were involved in 6 online collaborative projects during the 3 phases of the DesignLink initiative (see Appendix 1). This chapter briefly describes this teaching initiative.

### 4.2 DesignLink, Phase 1 spring 2001

The 1st phase of DesignLink consisted of two four week collaborative projects in the spring semester of 2001. The 1st Project involved mainly co-located pairs of students from one UK and one US University who had the opportunity to develop the project both online and face-to-face. 5 co-located pairs from the UK and 2 co-located pairs from the US along with 2 distributed pairs participated. 2 'study abroad' students, who had returned to the US after a semester studying in the UK, each joined up with a UK student to make up the 2 distributed groups (see Table 6 below). All the students were either 3rd or 4th year (junior or senior) students majoring in visual communication or graphic design. They had all taken digital design courses and were familiar with working on group projects requiring a team approach to problem solving. In the light of the experience of Project 1 it was decided that the 2nd Project would only involve distributed pairs of students. The rationale for this was that those students who were working together in the same institution were less happy about the work they were engaged in feeling that they were neither getting the excitement of working across national borders or the experience of using computer-mediated communication in their design work. In addition, it avoided ethical issues to do with students' pedagogical experience and assessment of mixed projects (see Chapter 3).

| Phase 1 | Date | Participants | Platform | Group size | Group type |
|---------|------|--------------|----------|------------|------------|
| Project 1 | January 2001 | UK – RAIUL<br><br>US - UNK | Blackboard | Pairs of students | 5 co-located<br>2 distributed<br>2 co-located |
| Project 1 | March/April 2001 | UK – RAIUL<br><br>US - UNK | Blackboard | Pairs of students | 8 distributed |

*Table 6 Phase 1 DesignLink participants and group composition.*

The 2nd Project involved 8 UK students each of whom paired up with 1 design student from the US in distributed groups. Each group, comprising one student from each of the participating universities, was set a project with a four week deadline to produce artwork for a poster design brief. The brief required each group to collaborate to gain approval for their proposal, organise logistics and communication, divide individual responsibilities and develop their final artwork. The groups were required to produce design solutions to the brief taking into account regional and national demographic differences and reflective material describing the collaborative nature of their work. They were assessed on their artwork and their ability to organise themselves into collaborating international design groups.

The design of the initial Blackboard course site was heavily text-based with scrolling screens. Figure 7 below illustrates the primarily text based style of this phase of DesignLink. As well as text instructions, the page contains links to download data gathering instruments such as the student questionnaire.



Figure 7 *Phase 1 Screen shot of DesignLink homepage.*

In this 1st phase of DesignLink, Blackboard's capabilities for dealing with multiple groups were not fully realized and different course sites were constructed for the various distributed and co-located groups. Perceived weaknesses in the design of the interface included a lack of intuitive navigation through the site, the organisation and timing of the projects and the delivery of the project brief. Crucially I had not developed a facility for viewing artwork on line or a space for students to view other group's ongoing work.

## 4.3 DesignLink, Phase 2 spring 2002

The 2nd phase of DesignLink consisted of two five week collaborative projects in the spring semester of 2002. Some organisational changes were effected in response to some of the difficulties identified by students in the previous phase. These included slow download times, difficulties in identification of suitable file formats for exchanging project material and the general functionality of the system including the easing of external access to the Blackboard server. In phase 2 of DesignLink, all participating design groups collaborated through one course site using both group and public forums.



*Figure 8 RAIUL web site. Screen shot of Portal for DesignLink Phase 2.*

At the same time, I tried to design the layout of the pages to incorporate a more visually and user-friendly interface. This included clear signage for scaffolded instructions on site and the facility for students to download a hard copy of the brief, as well as the project description and timetable from the course information area. A page on the RAIUL web site served as a portal to the DesignLink site on the Blackboard server. This page included a hyperlink, which connected the distributed student design groups to two courses. A link called DesignLink was used for project 1 in January and February 2002 and DesignLink 2 linked to project 2 and ran in March and April 2002.

This improved ease of access to the site via the Internet. It was hoped that a web-cam link might be used during this phase but setting this up at each participating university proved too problematic. Instead, a number of enhancements were made to the Blackboard site for the 2nd phase including the incorporation of student and faculty biographies and photographs in the initial introductory forum. Additionally a great deal of restructuring was done with the introduction of a number of public discussion boards as well as the private communications areas. Each group was able to access public forums as well as a private group discussion area to develop their work The first of these was a public discussion forum entitled 'calling all students and instructors', where the students and instructors introduced themselves to other project participants. They described who they were and what their thoughts were on taking part in the project or any initial teething problems they might be having such as requesting assistance with aspects of the course site. An induction week was introduced at the start of the project. This allowed students to be introduced to the various aspects of the project including the subject matter of corporate identity, and to explore the Blackboard web site and to get to know their group members.

In the first week of the project, students used the discussion board, the virtual classroom and e-mail to brainstorm and develop their ideas and to collaborate in visual research. They also used the file exchange facility to submit their initial questionnaire. The initial design stage was followed by design development in the next 2 weeks when extensive use was made of file exchange and the synchronous and asynchronous facilities.

The design work shifted from a focus on problem identification and idea generation to solution seeking. In the final week, students were involved in finalising design work and uploading it for presentation. Students completed an activity sheet, a questionnaire and an interview. Online group and individual feedback was complemented by face-to-face feedback with the instructor from their home university. An analysis of student online activities is described in Chapter 6.

In Phase 2 of DesignLink, 15 distributed groups of 3 took part in the 1st Project and 9 distributed groups of 3 in the 2nd Project. The students came from universities in the US, the UK, Northern Ireland, South America and Canada and the groups were made up of 1 student from each of any 3 participating universities. The students were all taking graphic design courses and had access to a range of graphic applications and a web browser. The design brief required the groups to design corporate identity material for a merged airline following the events of September 11 (see Figure 13p. 92 for an example of one group's final artwork for this brief).

### 4.4 DesignLink, phase 3 fall 2003 to spring 2004

I spent the academic year 2003/04 at a university in the US as a visiting professor and international scholar teaching a range of blended and online courses. Among the classes I was responsible for teaching was a number of sections of a fully online design course, the content of which was a combination of theory and practical artwork.

Figure 9 *Phase 3 Screen shot of WebCT home page.*

Students taking this course were committed to a series of online quizzes and in addition were required to produce digital artwork for 4 assignments. This work was submitted online for evaluation and assessment. I was given permission by the College of Design to introduce an optional DesignLink Project into this class in the fall of 2003 and again in the spring of 2004 (see table 6 and 7). The DesignLink Project substituted for 2 of the 4 course assignments and this option represented an equivalent amount of work for participating students. 10 students volunteered to take part in the DesignLink projects in each semester. The DesignLink brief again required the students to produce artwork for a corporate identification project and post the final group artwork to their group presentation area.

I created a WebCT site on the ISU server, which incorporated many of the design decision suggested by previous phases of DesignLink. Additionally I introduced a number of features designed to encourage community building as my understanding of constructivist learning principles grew (Seels & Glasgow, 1998). Clear navigational signage to facilitate the success of ongoing communication and instructions for arranging

sequential online synchronous meetings were among the other changes introduced in this Project.



*Figure 10 Phase 3 project 2 Screen shot of group streamed video.*

The WebCT site incorporated streaming video clips of students introducing themselves to other group members and initialising idea generation (see Figure 10). All the students taking part in this phase were recorded in short video clips introducing themselves and talking about their initial ideas for the project. Other changes such as the inclusion of digital photographs of the participants allowed the students to associate a face with a name and at the same time encouraged a sense of community. Setting up homepages was another initiative that allowed students a private space away from collaborative activity where they could reflect on their activity and show artwork. Students commented that this kind of scaffolding helped them to feel more secure and comfortable and were effective in encouraging them to be more reflective in their learning process.

The students who volunteered to take part in DesignLink were keen to be involved in real life design scenarios and wanted to gain familiarity with working collaboratively online with partners from other universities. They felt that this experience would be an exciting and motivating alternative to the short environmental photographic projects they

would otherwise undertake. The students were either junior or senior (3rd or 4th year) students enrolled in the College of Design and had similar levels of prior experience of graphical applications. Appendix 10 contains some examples of students' final artwork for this brief.

| Phase 3 | Date | Participants | Platform | Group composition | Group type and size |
|---------|------|--------------|----------|-------------------|---------------------|
| Project 1 | Jan/Feb 2003 | US - ISU<br>UK - CSM<br>UK – RAIUL | WebCT | Each group consisted of one student from each of the participating universities | 10 distributed groups of three students |
| Project 2 | Apr/May 2004 | US - ISU<br>US - MC<br>Singapore – LS | | | |

*Table 7 Phase 3 DesignLink projects participants and group composition.*

3 universities were involved in each of the 2 projects that made up the 3rd Phase of DesignLink. In the fall semester 2003, 10 students from ISU joined up with 10 students each from CSM and RAIUL in completing the 1st Project. While 10 students each from ISU, LS and MC were involved in the 2nd Project in the spring semester 2004. Students from the other universities participating in this project had similar levels of domain and extant design experience to the ISU students and volunteered to take part in DesignLink.

### *4.5 Summary*

This chapter has described the teaching initiative called DesignLink that forms the context for my research into the potential of online learning environments for design education. Some critics argue that practical, hands-on design experience cannot be achieved in an online setting (Virilio, 1997). However, the pedagogical goal of these online collaborative projects was to give students insight into design processes in working practice and an understanding of collaborative and global aspects of working in design groups. The more specific learning objectives for the projects were to promote the ability to:

- Apply knowledge of design to designing a graphic product;

- Function as multi-disciplinary distributed teams;
- Identify, formulate, and solve design problems;
- Use the techniques, skills, and technology necessary for design practice;
- Communicate effectively using computer-mediated communication;
- Understand the impact of design solutions in a global and societal context;
- Grasp knowledge of contemporary issues.

The requirements for each piece of assessed work were clearly specified in the assignment details. Refer to Appendix 11 for the assessment criteria for the collaborative project. An important pedagogical element of each project was the students' reflection on their experiences while collaborating in online design groups. In addition to reflecting on their group collaborative processes another assessment criterion was the students' ability to organise themselves into effective collaborating design groups. Consequently, a distinction should be drawn between the reflective tools that were introduced into each project as a pedagogical device to encourage students' awareness about design process and their collaborative experience and the tools used to collect research data from each study.

The projects, while giving my students the experience of working in groups at a distance with other design students, encouraged me to consider using DesignLink as the context for researching the pedagogical potential of online learning environments for collaborative design work. My research stance was that incorporating aspects of collaboration into design projects might develop students' cognitive design abilities while allowing me to interrogate the notion of the 'added value' of the use of communication technology in the design classroom.

*Chapter 5*

*A Pilot Study of co-located and distributed group activity*

## 5.1 Introduction

I conducted an institutional-focused investigation of design students' feelings and attitude towards using information communication technology in the design classroom (Fraser, 2001). That evaluation of student attitude towards the use of information communication technology became the basis for these current 3 studies of the potential of online learning environments for collaborative design activity. The 2001 investigation constituted the preparatory research work for this thesis. I have used the same data set that I collected for the institutional-focused investigation to compare the working practices of co-located and distributed groups of design students who took part in phase 1 of DesignLink. This Pilot Study of co-located and distributed group activity will help me to develop an understanding of online collaborative design practice at a distance.

## 5.2 The Pilot Study

The Pilot Study compared the communication and collaboration occurring within 12 of 16 groups taking part in the 1st Phase of DesignLink in the spring of 2001. An examination was undertaken of the activity of 6 collocated and 6 distributed groups each of 2 students using communication technology in their collaborative project. One of the 7 co-located groups failed to complete the project due to 1 member being absent for most of the period. A random sample of the first 6 of the remaining 10 distributed groups was chosen in order to achieve a balance between the numbers of co-located and distributed groups in the sample. The primary data was gathered using an online student questionnaire. Data was also gathered from semi-structured interviews and students' systematic recording of their 'on-line' collaboration using activity sheets. The data identifies either face-to-face activity in a co-located group or collaboration at a distance in a distributed group.

## 5.3  A comparison of co-located and distributed students' attitudes

A set of questions was devised to elicit students' understanding of their behaviour, attitude and approach while working collaboratively (see Appendix 3 and 4). The questions were grouped around a series of topics. An initial set of questions identified the students and their previous experience. Other questions asked about: the design process, the perceived advantages and disadvantages of using computer-mediated communication, the usefulness of using computer-mediated communication at various stages in the design process, student assessment of the available facilities and student attitude towards using computer-mediated communication (see Appendix 4).

Student responses to the questions were analysed according to the extent to which students agreed or disagreed with the questions or statements. Each question offered students a positive, a negative or a neutral response. In analysing the responses to the questionnaire, a value was ascribed to each response where 1 equalled a positive response; 0 equalled a neutral response and -1 equalled a negative response. A mean response was calculated as an overall indicator of the extent to which the participating students agreed or disagreed with a particular statement. The number of respondents was small so the quantitative data obtained from the questionnaires was limited to basic arithmetic analysis to complement the qualitative data obtained from the interviews. All 24 students completed the questionnaire and an arithmetic table of the data is presented in Appendix 5.

On comparing the co-located groups to the distributed groups, certain differences were established. The co-located groups opted for Blackboard being most useful during the initial stages of problem identification and idea-generation. The distributed groups, who had to rely on using it, were very positive in suggesting that Blackboard was of most use during the later stages of verification and finalising artwork while being negative about its use in the early stages. Although the co-located groups expressed a negative feeling to the idea of using Blackboard for collaboration if the team were co-located nevertheless they used Blackboard even while working together in the same studio. This could be attributed

to the facts that the project emphasises communication, deadlines for the project were tight and Blackboard allowed them to continue developing their projects outside class times. Students considered that the most problematic issue in their collaborative activity was the lack of face-to-face contact. This was also identified as a major concern in the semi-structured interviews (see below). A frequent comment from distributed groups was the difficulty in fixing meeting times due to time differences, different class times on each campus and so the different deadlines. The co-located groups did not have the problems of time differences and benefited from weekly classes being face-to-face and verbal. Although the distributed groups expressed prior experience, the co-located groups rated their computer skills higher. This may have something to do with a more realistic assessment on the part of the distributed groups about the demands of the collaborative project.

## 5.4 Patterns of behaviour

Gregory (1966) suggests that problem solving can be adequately explained by observing the participant's measurable and replicable patterns of physical behaviour. His model of the design process discriminates between distinct types of activity and assumes such distinctions will advance our understanding of design. Categories were identified to code student activities including reflection, decision-making, general discussion, informal conversation, brain-storming, idea-generation, sketching and drawing and the students were asked to record their activities during the project (refer to the section on methods in Chapter three). The advantage of this sort of log is that it records the sequence of major events although it omits minute-by-minute detail and other real time variations in design behaviour. An analysis of the activity sheets however was inconclusive. Often the data recorded was sketchy or produced later on reflection. Sometimes the record was a summation of total activity ignoring either sequence or short intervals of activity that might have highlighted their thought processes during the design process (see Appendix 6). The random and different sequences of activities recorded by the students in this study are more

likely to support Rowe's argument that designing is a complex business influenced by the initial constraints of the problem and sometimes by the personal attitudes of the designers than Gregory's proposition (Rowe, 1991).

One of the aims of this Pilot Study was to discover whether different patterns could be established in the working methods of co-located and distributed groups. In fact, the design of the time sheets, adapted from Scott, to collect data about the sequence and pattern of student activity did not yield appropriate data (Scott, 1996). No significant patterns emerged to identify different group types or different patterns of activity (see Appendix 6). This however may have been due to a failure of the design for the coding of the activities and instructions on how to apply them rather than an inherent fault in the data collection method. Time sheets were abandoned in the next phase and replaced by a report form designed to gain information about student activity during the project (Appendix 7).

## 5.5 *A conversation with students*

The students also took part in short semi-structured videotaped interviews to explain their views and describe what they regarded as crucial in their design activities. The interviews were analysed to identify a detailed record that provided greater insight than simply observation of surface activity. In the interviews, many students talked about the difficulties, particularly at the beginning of the project, of being able to establish a necessary relationship and get across their varying points of view. Some students indicated that they were not too concerned about having immediate feedback on their ideas. However, this was at odds with most students who said that their greatest difficulty was not being able to communicate directly with their partners and who expressed frustration about a lack of immediacy and the difficulty with computer-mediated communication when trying to develop their ideas together. Half of the students felt that having some form of visual communication such as a digital camcorder facility might have helped at this stage. They were much happier about facilities for exchanging artwork. The file exchange facility was one of the most used and preferred facilities. E-mail was the other popular

communicative device. However these are both generally asynchronous methods of communication and one extra facility that many students identified as necessary was some form of easy to use synchronous chat device. Most students found the chat room facility in Blackboard difficult to use. This was more to do with technical reasons rather than those to do with time differences and different class days. The chat facility was not very robust and tended to freeze on many of the workstations. However, some students managed to work with the chat room facility successfully. These technical difficulties were resolved in the next phase of DesignLink. There was a significant difference between co-located and distributed groups as to when computer-mediated communication was most useful. This confirmed the findings from the questionnaire discussed earlier. Most co-located groups felt happy using it during the earlier stages. This use of Blackboard contrasted quite significantly with students working in distributed groups. 1 student identifying a common complaint from distributed groups about using computer-mediated communication for collaborating in this kind of creative work said

> *'we couldn't just sit down face to face and talk to each other. It took maybe about two or 4 or 5 e-mails back and forward – 'do you like this' or 'do you want to do this' which made it kind of difficult. Maybe a 5 or 10 minute conversation took us about two weeks.'*

Most distributed students used Blackboard productively in the solution focusing later design stages. This might suggest that some form of video instant messaging system (or embedded video streaming) might be useful in the early stages of any collaboration to allow students to speedily get to know each other and identify the problem and a range of approaches and ideas for developing a solution.

## 5.6 Conclusions

The results from the Pilot Study, growing experience of online teaching and the current research interest in the pedagogical aspects of online collaboration all encouraged me to continue to use DesignLink as the context for further grounded action-orientated

research. The use of activity sheets for data collection was scrapped in subsequent stages of the research. On the other hand, it became apparent that recordings of e-mails and other written material provided a rich illustration of the way the groups began to overcome distance in developing ideas and a body of work. Consequently, online records of group discussion boards and virtual chat rooms were used as a source of data in the continuing research.

Students described an increase in their levels of interest and motivation when working on the collaborative online projects. This is in line with findings from a range of research including questionnaires and evaluation studies undertaken in the early to mid nineties evaluating the use of computer-mediated communication in education in the UK (Starling, 1994; Schnurr & Smith, 1995; Mumford, 1996; Howard et al 1996). Students were less bothered about the question of anonymity. Most students were not concerned about showing themselves up when using the equipment and felt positive about sharing Internet research and very positive about working jointly on the artwork. This positive attitude contrasts with many studies where the benefits of being anonymous or being able to create new identities or the fear of not being able to cope with the equipment and therefore looking stupid to your peers is often quoted (Harasim, 1990, Myers, 1987, Turkle, 1995). The students were less positive about the notion that computer-mediated communication provided easy communications and surprisingly, given the popularity of the Internet for researching information, only a minority of students used this facility during the projects. This might simply reflect the tight time scale and subject matter of the project. After working on the project 85 % agreed that using information communication technology would improve their design skills and supported incorporating information communication technology into their design studies. This raised a number of important questions to do with differences in the nature of the pedagogical experiences the students underwent and how these experiences might encourage cognitive learning and skills acquisition in design students. At the same time I was aware of the danger of assuming best practice in online initiatives from other domains and interested by the fact that there was

not a great deal of research concentrating on distributed students working in collaboration on design projects (refer to Chapter 2).

*Chapter 6*

*Three studies of online collaborative design work: presentation and analysis of the data*

*6.1 Preface*

This chapter presents the data obtained from my grounded practitioner research and examines the results with reference to theory, established practice and practitioner judgment. The research consists of 3 Studies of online collaborative designing which together address the question of the potential of online learning environments for design education. The focus is on the online conversation of design students and their instructors as they generate ideas, negotiate meaning, come to decisions and develop solutions to a design brief. This on-line conversation is analysed to elicit understanding of students and instructors communicative interaction while decision-making and how they negotiate meaning collaboratively through their actions and behaviour.

The outcomes from each of the 3 studies are interrogated to gain insight into specific issues to do with online collaborative design practice. A purposive rather than a random sampling model is employed to identify studies where answers to the research questions are most likely to occur. The majority of the research is concentrated in Study 1. This 1st Study focuses on the question of how distributed groups of students use synchronous and asynchronous interaction in seeking collaborative solutions to design problems. However, the issue of the relationship between the use of private group areas and public community forums comes up in this study and this theme is taken up in the 2nd Study. The 2nd Study focuses on how instructors use the facilities provided by online collaborative environments in interacting privately and publicly with students and with each other. An issue that arose in this study was to do with student motivation and group cohesion and this was examined in the 3rd Study when problems arose to do with participation and drop out. The 3rd Study examines how students handle the challenges of group dynamics in online collaborative group work by focusing on group communicative interaction and placement negotiation. The research, in addressing these 3 questions, will

help to uncover the advantages and shortcomings of using online learning environments for design work in university design education. The knowledge generated should extend understanding of online collaborative work and the ways in which online learning environments can be of particular benefit for design education, for instance, in facilitating the forms of international and inter-disciplinary collaboration that lie at the heart of contemporary professional design practice.

## 6.2 Study 1: A conversational framework for design practice

### 6.2.1 Introduction

The 1st Study is drawn from Phase 2 of DesignLink that took place in the spring of 2002 and questions how distributed groups of students use synchronous and asynchronous interaction in seeking collaborative solutions to design problems. One of the 24 distributed groups in Phase 2 was selected for this study. The selected group's online design practice and interaction was extensive and creative and the group exhibited behaviour characteristic of those groups that were most productive and effective in their design activity. Primary data was collected from the online discussion board of this group as they formed a community of practice and collaborated in threaded discussions to realise the design brief. Other data examined included material from the public discussion boards and other group work areas. The students in the selected group came from UM in Northern Ireland, and MC and IUPU in the US.

| Phase 2 | Study 1 | Participant Locations | Platform | Group type and size |
|---------|---------|----------------------|----------|---------------------|
| Project 1 | Jan/ February 2002 | US – MC<br>NI – UM<br>US – IUPU | Blackboard | 1 distributed group of three students |

*Table 8 Study 1 participants and group composition.*

The design brief required each group to collaborate to gain approval for their proposal, organise logistics and communication, sort out their individual responsibilities and develop their final artwork for a corporate identity project. Groups were increased in size from 2 to 3 members based on the results of an analysis of optimum group sizes for productive working methods. Difficulties experienced by students over time zones and class time differences still existed. This was reduced by increasing development of scaffolding to support learning and included the introduction of collaborative requirements, more specific project deadlines than in the Pilot Study and more emphasis on the need for collaboration. The reader can refer back to Chapter 4 for details about the ongoing scaffolding of the DesignLink interface. The focus of group communication was contained within the threaded messages recorded in the group discussion board (see Figure 11).



Figure 11 *Study 1 Screen shot of group threaded discussion.*

The group discussion board was primarily used for generating and synthesizing ideas and reflective criticism and evaluation of the developing artwork being circulated through file exchange. The debates concerning the aesthetics and critical evaluation of form and function are an articulate reflective record of the group's knowledge building

from initial problem formulation to a defined solution space. However, the discussion board also contained references to two other elements. These were references to the frequent use of the virtual chat room for synchronous meetings and references to the regular exchange of artwork files. Other external elements that were referenced included external web sites and the public discussion boards on the DesignLink web site (see Table 12 p. 83 for a full listing of message references).

This study investigated the communicative interaction of the design group as they negotiated meaning to develop a solution to the design brief. An examination of the messages was undertaken in an attempt to discover the nature of any patterns of communication that might shed light on how group understanding developed and group decisions were made. The examination of the group's 'on-line' discourse and collaboration produced a number of outcomes that will now be discussed:

- The number of private group messages created and the contributions of the individual group members;
- The relationship between asynchronous discussion board communication, regular synchronous chat meetings and the exchange of artwork files;
- The balance of private group discussion and public communication;
- The role of the design critique and the analysis of meaning and significance in the online conversation of the design students.

### 6.2.2 Private group communication

The group posted 155 messages in their group discussion board over the 4 weeks of the project. This was the second largest set of messages for any of the groups in this project (see Table 9). The largest number of messages posted was 186 and the mean for all 15 groups was 48. The median was 25 messages.

| Group | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Messages | 186 | 155 | 92 | 55 | 49 | 39 | 27 | 25 | 23 | 21 | 17 | 16 | 9 | 8 | 7 |

Table 9 Study 1 total numbers of messages in each group discussion board.

155 group messages were examined. The messages were evenly distributed over the first 3 weeks of the project with a five fold increase in the final week.

| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Total |
|---|---|---|---|---|---|---|---|---|
| Week 1 | 2 | 1 | 3 | 10 | 2 | 0 | 0 | 18 |
| Week 2 | 0 | 5 | 7 | 2 | 1 | 1 | 0 | 16 |
| Week 3 | 5 | 6 | 0 | 1 | 2 | 1 | 4 | 19 |
| Week 4 | 5 | 15 | 9 | 10 | 6 | 15 | 26 | 86 |
| | 15 | 1 | | | | | | 16 |
| Total | 27 | 28 | 19 | 23 | 11 | 17 | 30 | 155 |

*Table 10 Numbers of messages sent daily and weekly over the duration of the project.*

The classes the group members attended at their own institutions occurred on Tuesdays for one student, Wednesdays for another and both Tuesdays and Thursdays for the third week.

This did not appear to have a noticeable effect on the distribution pattern. However there were more messages sent between Monday and Thursday than over the weekends, apart from the final weekend when approximately 30 % of the total number of messages was sent. The three members of this group sent different amounts of messages. Group member X sent 79 messages, member Y sent 55 messages and member Z sent 21 messages. Table 11 below illustrates the sequence of messages sent by each member of the group, X, Y and Z, over the period of the project. From an analysis of the content of the messages, it was established that 2 members of the group, X and Y, assumed the role of designers while the third member Z, whose experience lay in e-business and marketing, created the promotional strategy. Initially the marketing role consisted of commenting on and critiquing the development of the concept for the logo and later transforming critiques of the artwork to business plans and promotional strategies. Z played a background role in the collaboration sending only 13.5 % of the messages mainly concentrated in the final stages of the project when Z adopted a decision-making role to do with matters of presentation. The messages from Z were regular but sparse with 40 % of them presenting his marketing contribution to the project. Although X produced the most messages (51 % to Y's 35.5 %), both designers engaged in a regular pattern of interactive discussion.

*'Before talking about typography just some ideas about including other graphic elements. I like the idea of including a circle to express the global concept of our airline, In your sketch I'm just a little afraid if the circle and bird shapes will disturb each other , so what do you think of placing the bird inside the circle. I've visualized my ideas on file exchange (finaldiscussion.gif) I also will post this idea to the main board'*

| Day | Messages by group member X, Y, Z | Total messages by day | Total messages by week |
|---|---|---|---|
| Monday | XZ | 2 | |
| Tuesday | X | 1 | |
| Wednesday | YXY | 3 | |
| Thursday | XXXXYXXXYX | 10 | |
| Friday | YY | 2 | |
| Saturday | - | - | |
| Sunday | - | - | 18  (X - 11, Y - 6, Z - 1). |
| Monday | - | - | |
| Tuesday | ZZXZY | 5 | |
| Wednesday | XXYXYYX | 7 | |
| Thursday | XX | 2 | |
| Friday | Y | 1 | |
| Saturday | Y | 1 | |
| Sunday | - | - | 16 (X - 7, Y - 6, Z - 3 ). |
| Monday | ZZXYY | 5 | |
| Tuesday | YXZYXX | 6 | |
| Wednesday | - | - | |
| Thursday | Y | 1 | |
| Friday | YY | 2 | |
| Saturday | Z | 1 | |
| Sunday | XYYX | 4 | 19 (X - 6, Y – 9, Z - 4 ). |
| Monday | YXZYX | 5 | |
| Tuesday | YXXXYXXXXZYZXXX | 15 | |
| Wednesday | XXYXYXYXY | 9 | |
| Thursday | XYZXXXXXXX | 10 | |
| Friday | XXXZXY | 6 | |
| Saturday | XYXXYYXXYYXXXXZ | 15 | |
| Sunday | YXYXYXZZZZZXZYXXYXXYXXYXYX | 26 | |
| Monday | XYYYYYXXYXYYYYZ | 15 | |
| Tuesday | X | 1 | 102 (X - 55, Y - 34, Z - 13 ). |

*Table 11 Study 1 pattern of communication in the group discussion board according to member (X, Y, Z). N = 155.*

Both X and Y were equally proactive in generating ideas; amending ideas, evaluating and proposing changes to the artwork and deciding the direction the artwork should take.

> *'I have to decide on a font – for the logo type and the body text for website, letterhead and business card'*

> *'In the first file the fonts are braggadocio (on the left) and euro style (on the right). In the second file the fonts are terna cantante on the left and euro style extended again on the right'*

> *'It doesn't work as a black and white logo, which we need for a bitmap and for example for fax machines. In my eyes the black rectangle is too dominant and placed in front of the birds head prevents an aerodynamic feeling'*

### 6.2.3 The unit of analysis

The unit of analysis adopted for further analysis of the discussion board was a 'posting'. A posting represents a unit of information that might comprise the whole message or only a part of a message. All 155 of the group's messages may contain 1 or more postings. 227 postings were identified in the group discussion board. Postings and events were assigned symbols according to content or type and these are illustrated in Table 12 below.

| | |
|---|---|
| ☺ | posting for setting up synchronous online meetings |
| © | occurrences of synchronous online meetings |
| ©P | occurrences of problematic synchronous online meeting |
| . | artwork in file exchange posting |
| O | external web site posting |
| ♉ | posting referring to web sites set up by the group to market research their designs |
| ♈ | external instant messaging systems posting |
| M | final draft business plan posting |
| □ | external instant messaging system posting |
| ☑ | Posting re public discussion boards on the DesignLink web site |

*Table 12 A listing of symbols representing postings or events*

### 6.2.4 The pattern of synchronous and asynchronous interaction

Postings arranging regular synchronous online meetings in the virtual classroom and recordings of those synchronous online meetings were a significant part (22.5%) of the group communication throughout the duration of the project.

| | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Posting |
|---|---|---|---|---|---|---|---|---|
| Week 1 | | | ☺☺ | ☺☺☺☺☺ © | ☺ © | | | 8 |
| Week 2 | | ☺☺☺☺ | ☺☺☺ © | ☺☺ | ☺ © | | | 10 |
| Week 3 | ☺☺ | ☺ | | ☺ | © | ☺ ©P | ☺ | 6 |
| Week 4 | ☺☺☺ | ☺☺☺☺☺ ☺☺☺☺☺ ☺ ©P | ☺☺☺☺☺ | ☺☺☺ © | ☺ | ☺ © | | 24 |
| | ☺☺☺ | | | | | | | 3 |
| Total | 8 | 16 | 10 | 11 | 3 | 2 | 1 | 51 |

*Table 13 Postings related to synchronous online meetings over the duration of the project.*
*© - synchronous chat session: ©P - problematic synchronous chat session: ☺ - posting:*

Indeed 51 of the 227 postings referred to or recorded these meetings. The synchronous meetings allowed for immediate exchange of ideas and immediate feedback and evaluation of the designs being developed and exchanged through the file exchange. Table 13 illustrates the regularity and frequency of these meetings. Two problematic online meetings occurred, one on the Saturday of the third week and the other on the Tuesday of the fourth week. These were caused by technical problems that occurred and resulted in some tension and argument in the group communication. This is discussed later in the case. Generally, the postings illustrated the group's positive attitude towards working synchronously and highlighted the development of a strong community of practice.

> *'I feel like we have all put a lot of time and energy into this project. We have met online to chat regularly, and this was very helpful to keep us on task. We have also been posting our 'works in progress' to file exchange so we can continue to work together and provide feedback to each other as the project continues to grow.'*

However, the students were very aware of the shortcomings of having to work together solely online,

> 'the chat session is less effective compared to a traditional face-to-face session, as there was a little bit of a waiting game involved. I found myself waiting to see who would respond, and I think other members also waited.'

> 'There was less room for elaboration and clarification. I felt that our time for chat was limited, so I didn't always seek for elaboration/clarification. I wanted the chat to concentrate on the main issues, and that meant sacrificing the opportunity to ask for more details.'

The reflective nature of the asynchronous discussion board was also helpful. Students never felt the need to come up with an immediate answer.

> 'I found that I like the freedom of working alone and using asynchronous communication to keep in touch with my group members rather than having to schedule a specific time and location to meet. I believe that flexibility has been essential to our group project to accommodate for different work schedules,'

The attitude of the group to communicating asynchronously was summed up by the following message.

> 'I have really enjoyed the discussion board. The group members are able to work at their own pace at a time when it is convenient for them. We can them come back together and have a meaningful discussion in the chat area.'

The initial wave of communicative activity occurs during the initial introductions and a period of community bonding. This initial wave is followed by three successively smaller waves of activity. The pre-arranged online synchronous meetings occur at, or immediately following, the high incidence level of asynchronous communication (see Figure 12 below). However, in week 3 the synchronous meetings occurred during a second and smaller wave of activity and the last meeting occurred preceding the final wave of activity. A proportion of the postings at each peak of communicative activity concern the organisation of meetings. However, there is also an increase in asynchronous postings related to idea generation and design development signifying a widening of the solution space. Synchronous meetings might be the most effective way that the group has to evaluate and

arrive at decisions to narrow the solution space. This possibility is supported by some of the postings.

> *'the chat sessions we've had so far, I realize that synchronous communication is very important for our group project... to brainstorm ideas and make preliminary decisions within a relatively short time frame. Posting ideas in the discussion boards may work for small tasks but it would not be as effective for a bigger project.'*

The emerging pattern of synchronous and asynchronous communication developing over the period of the project indicate some support for the 'geneplore' model, discussed in Chapter 3, with cognitive operators first expanding and then narrowing the solution space (Finke et al, 1992). A cyclical pattern of the incidence of communication developed over time around arranged online synchronous meetings and class times. A high regular waveform (indicating communicative activity) can be observed at the onset, then variable in height as the weeks progressed and finally increasing again as the deadline approaches. Figure 12 illustrates how the greatest number of messages in any one week occurred in the final week of the project and this might be seen to support the finding from the Pilot Study that distributed groups found Blackboard of most use in the later stages of the design process. Alternatively, it might be construed that the increase in communication as deadlines approached simply indicates that many students put off work until the very last minute and then work as frantically as possible using whatever means are available. The variation in the type of posting being sent at this time indicates that this could only have a small influence on the final peak of postings. (Refer to Table 17 p. 94 for the pattern of postings over the period of the project). Further analysis might indicate methods for scaffolding discussion boards.
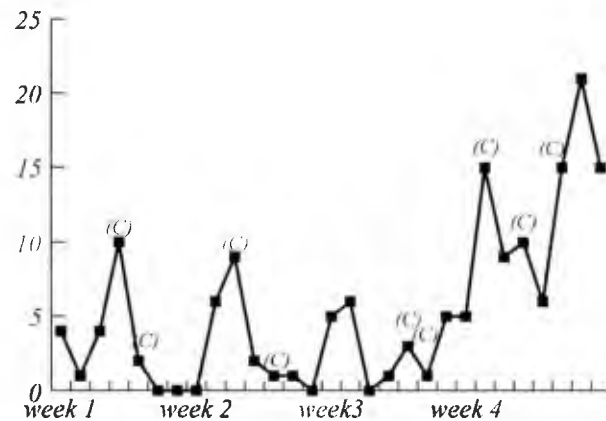
*Figure 12 Study 1 asynchronous communications over the duration of the project. ©
indicates the occurrence of synchronous online meetings*

Asynchronous communication did occasionally lead to misunderstanding. A
number of postings initially raised argument about differing European and American
perspectives, the influence of online instructors, assumed harsh criticism of members'
artwork or ideas, and then alleviated them, as positions were articulated and arguments
resolved. The analysis of the group discussion board traces the start of an argument
between designer X and designer Y. The argument began over the direction of the artwork
and then developed into something of a crisis in which instructor interventions, different
cultural perspectives and perceived lack of appreciation were raised as problems for the
group.

> *'America is not Europe and maybe there are some differences between people.'*

Y sent a posting to X just before the marketing partner Z made his major contribution that
illustrates some of the frustration that can so easily build up in online groups when relying
on textual rather than gestural communication for collaborative designing.

> *'It's really hard for me to stay in this group... because we are just two persons.
> Z just has sent a few quick notes but never joined a meeting or really sent
> sketches.... And why are you always criticizing me? You attacked me when I
> missed the meeting but you are always nice and friendly with Z, explain to me
> that you and Z want to go through this project and I am the bad guy who sent no
> sketches and so on... I really believe that I'm more involved in the project than
> him.'*

These postings show how strains in the group can easily arise and need immediate resolution if the collaboration is to succeed. Interestingly the internal disputes coincided with the build up of postings over the final week and as final deadlines approached. Technical difficulties were encountered with the synchronous chat facility on the Saturday of week 3 and then the Tuesday of week 4. At the same time there were also some technical problems to do with exchanging file formats of artwork in the file exchange. This produced a lot of artwork postings at the start of the final week (see Table 14 below).

| Week 4 | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday |
|--------|--------|---------|-----------|----------|--------|----------|--------|
| | ☺☺ OO ☑☑ | ☺☺☺☺☺ ☺☺☺☺☺ ☺ 🖫🖫🖫 Ⓒp | ☺☺☺☺☺ 🖫🖫🖫🖫 | ☺☺☺ 🖫🖫🖫🖫 ☿☿ Ⓒ | ☺ ☿ | ☺ 🖫🖫🖫🖫 🖫🖫🖫🖫 🖫🖫🖫🖫 ☿☿☿☿ ☑☑☑☑ MMMM MMMM Ⓒ | 🖫🖫🖫🖫 🖫🖫🖫🖫 🖫🖫🖫🖫 🖫🖫🖫🖫 🖫🖫🖫🖫 🖫🖫🖫🖫 ☿☿☿☿ ☿☿ |

*Table 14 Number of online meetings and postings sent daily over the final week of the project.*

All three members of the group participated through their postings in calming the situation and resolving the dispute. The following quote illustrates this and I think indicates how working collaboratively online can develop reflective and critical responses that are indicative of the higher order thinking necessary for designing (Seels & Glasgow, 1998). The quote also clearly shows those attributes that Wenger considers necessary for a community of practice that I described in Chapter 2: mutual engagement in doing something, competence in a shared domain knowledge and ownership of the shared experience (Wenger et al, 2002).

> '*I guess there has been a lot of misunderstanding between us, which is understandable due to the arrangement of our collaboration. Collaborations are tough enough as it is, but since we have to do this over the Internet it makes it much tougher – we can't have any real contact and talk about our ideas face to face. Instead we have to set up times to meet and, even then. The virtual classroom is no substitute for actual human contact.*'

This notion of antagonism existing within a successful group is rarely illustrated within the research, yet, seems to illustrate Wenger's argument that it is possible to have highly problematic communities of practice.

> *'We're both talented and intelligent designers, so I don't think blaming our differences on the fact that we're from different continents is fair to either one of us. Maybe we have different ideas about what a logo should be and do, so we disagree, but those disagreements would be much easier to work out if we could meet and talk about it face to face instead of typing it out on the computer.'*

What is particularly interesting here is how members of the group blame the problems on the technology that cannot answer back rather than on each other in order to move on from the conflict.

### 6.2.5 Design development and design solutions

However dispute aside and bearing in mind that some theorists argue that dissension contributes to the building of community the group communication was productive and successful.

The group developed their ideas through frequent synchronous chat meetings, exchanging their artwork in File Exchange and concentrating on design development and reflection on design solutions in approximately 60 % of the postings in the asynchronous discussion threads. Group members were also aware of the developing artwork of other groups. The 'design showcase' discussion area contained 232 messages and file attachments by the end of the project.

> *'If you guys haven't checked out the design showcase board yet, check it out – there's some good stuff happening there.'*

In the final week of the project, almost 30 % of all the postings were concerned with the placing of the groups design solutions on to the public design showcase and other groups' responses through critiques and evaluations.

|  | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday | Sunday | Posting |
|---|---|---|---|---|---|---|---|---|
| Week 1 |  |  |  | ▢ OOO ©  | © |  |  |  |
| Week 2 |  | ▤ | ▤▤▤▤ © |  | © |  |  | 5 |
| Week 3 | ▤▤▤▤ | ▤▤▤▤ |  | ▤ | ▤ O © | ©ₚ | ▤▤ ☑ | 12 |
| Week 4 | ☑☑ OO | ▤▤▤ ©ₚ | ▤▤▤▤ | ▤▤▤▤ © ȢȢ | ȣ | ▤▤▤▤ ▤▤▤▤ © ȢȢȢȢ ☑☑☑☑ MMMM MMMM | ▤▤▤▤ ▤▤▤▤ ▤▤▤▤ ▤▤▤▤ ▤▤▤▤ ▤▤▤▤ ȢȢȢȢ ȢȢ | 43 |
| Total | 4 | 8 | 8 | 5 | 1 | 8 | 26 | 60 |

*Table 15  the relationship between artwork postings ▤ and synchronous online meetings ©, external web site postings ȣ, other external web site posting O, and public design showcase board postings ☑ over the duration of the project*

> *'Sorry Y, but I really do not like the new ones. I think they are a step backward. The type is too big and dominant; the circle is almost away so we don't have the symbol of safety and the globe anymore. It looks like clouds or bubbles, which is not very serious or strong. The small circle elements are too much I think. The whole logo has too many curves and details, no strong form any more. Sorry, but I also do not like the type, it doesn't look very professional, e.g. the u looks like you made a mistake in Illustrator. Sorry about these harsh criticisms. But it's my opinion. If you don't agree with me we should meet in the virtual classroom again or maybe you should get other opinions.'*

Table 15 above illustrates the timing and sequence of postings that refer to the exchange of developing artwork through file exchange and its relationship with the synchronous online meetings. External web sites were used for visual research into various airlines and their corporate identity. 50 % of these postings took place early in the project with other references occurring as design development began. The group used the public 'design showcase' area for displaying the group work and canvassing other opinion. In addition, occasional postings were made to the public discussion board about the discussions going on there. The group also set up an external web site to publicise their designs, to

questionnaire opinion and gather advice and comments from other students involved in the project and students internationally that attracted comment from all over the world.

> *'Oh my god. There are about three hundred responses from the logo questionnaire and questionnaire (USA, Europe, Japan, Canada, Brazil, Bolivia, New Zealand). I really don't know how to analyse all the comments until tomorrow. I need a secretary !!!  ☺.'*

The group produced a fully functional web site for their proposed airline that incorporated a booking site as well as promotional and managerial functions. The website design was so professional and convincing that it attracted hundreds of hits and genuine requests for bookings before being closed down! A strong portfolio of artwork was created including logo designs that were incorporated into various promotional materials such as business cards, letterheads as well as designs for fascias, uniforms and transport livery. Figure 13 illustrates some of the artwork that was produced. A comprehensive business plan and marketing strategy were also produced. (Postings coded as M in Table 15 above refer to the marketing strategy).

> *'Hey Z, Great work! Thanks for the business report. I really like it. Maybe we have to make a few changes about the logo because we do not have the full circle anymore. For our final presentation I will summarise all our work on a website.'*

*Figure 13 Study 1 Screen shot of final artwork.*

The project ended with all 3 members celebrating a very intensive and creative partnership and arranging for future collaboration. The following extensive quote from the website illustrates the extent of the group's design collaboration.

> *'Blue airlines is the product of a much anticipated corporate merger between America's JetBlue airlines and Europe's Go airline, offering transatlantic service to over 50 destinations in the US and Europe. Shore to shore and coast to coast.......... its low fares will position Blue as the best value in the business.. Development of a corporate identity is an important element to any marketing strategy as this image should reflect the values of the company it represents as well as providing customers with a visual representation of the firm that will be easily accepted and remembered. After careful deliberation Blue airlines has developed the Bluebird logo. The bird in the foreground provides obvious reference to flight, but also contains in it elements of freedom.. The globe in the background provides an element of safety a soothing image absent of jagged edges or corners. This globe also represents the earth made smaller by bringing people together. The rich blue color has been chosen to compliment the name. The font influenced by the logos of the parent companies provides a strong and forceful representation. Development of this corporate identity was a painstaking process, leading to many ideological dead=ends, but it seems that the blue bird will be successful in communicating the values of freedom, safety and strength that Blue wants to project to its audience, while its image is easily recognizable and visually stimulating.'*

### 6.2.6 The role of the critique within the design process

The design critique is a major literacy event that helps set patterns of behaviour and practice that recur repeatedly in the ongoing group collaboration throughout all stages of the design process. Adapting Heath's (1996) ideas that each community has rules for socially interacting and sharing knowledge in literacy events, the design critique can be interpreted as a conceptual means for synthesising and evaluating meaning and significance in the online discourses of the design students.

The design critique in the design classroom might be considered as the implementation of Asimow's (1962) evaluation and decision cycle occurring at each stage of the design process and dictating the direction and nature of further design activity. The design critique then becomes pivotal to the student's ongoing interaction and their interpretative processes and strategies in dealing with online collaboration.

| preparation | - task clarification - synthesis - evaluation - decision-making | C |
|---|---|---|
| incubation | - concept generation - synthesis - evaluation - decision-making | G |
| illumination | - design development - synthesis - evaluation - decision-making | D |
| verification | - concept testing - synthesis - evaluation - decision-making | T |

*Table 16 Study 1 An adaptation of Asimow's decision-making cycle.*

The design critique could be represented in the group dialogue by those messages that are to do with critical evaluation, synthesis or decision-making at each stage of the design process. Developing this idea, the design critique would be represented, in Figure 3, p. 52, by actions 1 through 5 and 10 through 12 and, in Figure 14 below, by events a, b and c. An analysis was made of the 227 postings identified in the group discussion board. The online postings of the group were coded as belonging to one of the four design process levels. Table 16 above identifies this process (the table is adapted from Asimow, 1962). The analysis resulted in identification of 75 task clarification postings, 37 concept

generation postings; 80 design development postings and 35 concept testing postings (see Table 17 below).

| Week One | CCGGCCGCCGCGGGGCGCCGCC |
|---|---|
| Week Two | CCGGCGGCCGGCCCCGCCCGG |
| Week Three | CDCDCGDGGDGGDGDCCGCCCD |
| Week 4 | CGCDDDCCGGGGCCCCCDCGCDDDDDDDCCGDDGDGDCC GDCCCDCCDCCDDDDCCCDCGCCDCDDDCCDDCDDDDDCD DCDDDTTTCTTCDTTDTTTTTDTTTTDDDDTDTTTCDDDTTD DDDDDDTDDDTDDDTTDTDDCDDTTTCDDCDCTDCDTCTTT |

*Table 17 Study 1 pattern of postings in the group discussion board. N = 227.*
Task clarification (C), concept generation (G) design development (D) and concept testing (T)

The first 2 weeks of the project are wholly concerned with task clarification (C) and concept generation (G). Task clarification most dominant in the first 2 weeks recurs occasionally throughout the duration of the project. Design development (D) begins to appear in the third week gradually becoming increasingly the dominant process along with concept testing in the final week. The pattern that emerges appears to identify a tendency towards a linear sequencing of the design process (Table 17). This might support the observation made by X about the formal constraints imposed on the groups design development when working in an online environment.

> *This thing has to be so structured, and a lot of the times that's not how our ideas work – it's much more organic, and comes from conversations which are limited in our circumstance.'*

The discourse was then matched against the conversational framework model (adapted from Laurillard, 2002). This was developed as a template to accommodate the various designs and communication procedures engaged in by the group in their online collaborative design work. The postings, coded as belonging to one of four design stages, were then assigned to one of the 3 critical modifiers, synthesis (a), evaluation (b) or design decisions (c). This is illustrated in Figure 14 below.

← Task clarification (1) →
← concept generation(2) →
← design development (3) →
← concept testing (4) →

**STUDENT**                  **STUDENT**
**PROBLEM SPACE**        **SOLUTION SPACE**

↑                             ↓

Synthesis (a)       evaluation (b)       design (c)
of design goals in ← → of design action in ←→ decisions in
light of student     light of theory       light of
re-description      goals and feedback     experience

↑                             ↓

**STUDENT**                  **STUDENT**
**PROBLEM SPACE**        **SOLUTION SPACE**

← Illumination (3) →
← Student sets goals →
← student actions →
← student feedback →
← adaptation of design actions in light of feedback →

*Figure 14 Study 1 model for online designing for distributed groups of students.*

The analysis considered the emerging pattern of asynchronous communication over the duration of the study and compared it to the adapted conversational framework model (illustrated in Figure 14 above). The numbers in the diagram relate to the sequential nature of Asimov's model. The analysis revealed evidence for a recursive and cyclical series of modifying communicative activity. At each cycle of activity, indicated by peaks in asynchronous postings, a decision-making cycle of synthesis and evaluation can be identified that relates to one of the four stages of the design process (see Figure 15 below).

In the latter stages, these cyclical decision cycles seem to furnish design development. This could be interpreted as supporting Asimow's modelling of two cyclical iterative cycles in the design process (Asimow, 1962). Asimow's sequential design process model involves a similar phasing of linear design activity enhanced by an iterative decision making cycle incorporating synthesis, evaluation and communication that is common to all phases (see Chapter 2).

synthesis – evaluation – design decisions

Number of messages



task clarification – concept generation – design development – concept testing
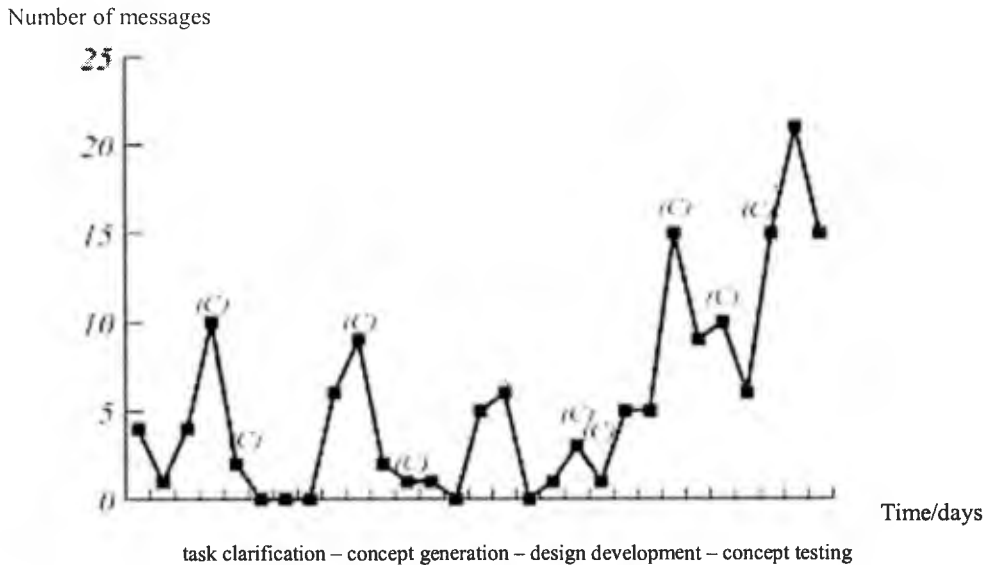
*Figure 15 Study 2 asynchronous communications over the duration of the project. © indicates the occurrence of synchronous online meetings. The occurrence of a decision-making cycle (above the graph) can be loosely associated with the sequential design process (indicated below the graph).*

## 6.3 Study 2: Student-instructor online practice

### 6.3.1 Introduction

The 2nd Study concerns instructor involvement in group design development and addresses the question of how instructors use the facilities of online learning to interact privately and publicly with students and each other. The study focuses on the dynamics of student and instructor online participation and the differing pedagogical attitudes of instructors to student group practice online.

| Phase 2 | Study 2 | Participant Locations | Platform | Group type and size |
|---------|---------|----------------------|----------|---------------------|
| Project 1 | Jan/ February 2002 | UK – R<br>UK – UM<br>US – IUPU<br>US – MC<br>UK – SIH | Blackboard | Participant Instructor Involvement<br>N =5 |

*Table 18 Study 2 instructor involvements*

96

The study involves the 5 instructors who participated and facilitated in the first project of Phase 2 of DesignLink. The instructors came from 5 universities in the US and the UK. 45 students from the 5 universities formed 15 distributed design groups. Each phase of DesignLink was promoted as an opportunity for students to work collaboratively on a student–centred, real life, and international design project. The project was introduced as

> an opportunity for students to collaborate with students in other universities on a four week design project – DesignLink is also a research project exploring the benefits and problems to do with using computer-mediated communication for design collaboration.

Instructors were given access to the site and invited to suggest improvements to the interface or changes to the design brief. They were also invited to collaborate in the research and asked to gain approval from their home institutions. The instructors were enthusiastic to have their students' involved and adopted roles as facilitators of the collaborative project. They incorporated the project to differing extents into the content of their courses. Instructors were also encouraged to take an active part in and to contribute ideas for the structuring of the environment.



*Figure 16 Study 2 Screen shot of instructors page.*

One outcome was a public area where photographs and brief biographies of participating instructors were posted (Figure 16 above). Other outcomes included the redesign of various pages for course documents, project description and search resources.

The idea for developing a public design critique area as a showcase of ongoing work was also initiated in this phase. The discussion boards included a public discussion area, a private instructor discussion area and 15 group-working areas accessible to instructors (see table 19 below).

| PUBLIC AREA DISCUSSION THREADS | INSTRUCTOR AREA DISCUSSION THREADS | AUTONOMOUS GROUP AREA DISCUSSIONS |
|---|---|---|
| PLEASE TAKE NOTICE<br>*21 messages* | THE BRIEF AND SPECIFICATIONS<br>*10 messages* | *15 AUTONOMOUS GROUP AREAS* |
| CALLING ALL INSTRUCTORS AND STUDENTS<br>*86 messages* | DEVELOPING IDENTITY<br>*15 messages* | *726 messages in total*<br><br>*Table 21 indicates number of messages in each group area* |
| DESIGN SHOWCASE – WORK IN PROGRESS<br>*232 messages* | FINAL PRODUCT OR SPECIFICATION<br>*6 messages* | *Discussion threads were created autonomously by each group* |
| | AUTONOMOUS COLLABORATIVE GROUPS V ONLINE INSTRUCTIONAL LEARNING<br>*8 messages* | |

*Table 19 Study 2 numbers of messages and threaded discussion titles in the discussion board areas.*

Primary data relating to this study was collected from the online dialogue of instructors and students in the discussion board areas over the 4 weeks of the project.

### 6.3.2 Public student-instructor interaction

The public discussion area contained 3 threaded discussions. The first threaded discussion was entitled 'please take notice' and contained 21 messages. This thread was used for instructions, advice about the brief and technical guidance by instructors to the groups and was active in the early stages of the project. The second threaded discussion 'calling all instructors and students' was a public forum where all 50 participants introduced themselves to each other. All of the students and instructors sent messages to this thread and it was locked from use in the second week of the project in order to

concentrate communication in the group areas. At this point, it contained 86 messages. These two forums proved very successful in building up a sense of community, in the first case, among the instructors and, in the second case, among all the participants. This happened despite the fact that no specific instructions had been given about posting a minimum number of messages to any particular forum. Although having experienced other, less successful, collaborations it is probably advisable to set a required minimum level of collaborative activity. Any further public and inter group communication took place in the third threaded section called 'Design Showcase – work in progress' and this gathered 232 messages and graphic file attachments by the end of the project.

Students developed their artwork using file exchange in their group areas and were encouraged to submit their work in progress for review to the 'design showcase' area. 15 threads were set up as group exhibition spaces to accommodate the 15 groups in the 'design showcase' area. All participants were encouraged to involve themselves in constructive comment and group critiques of the work of the other groups. Table 20 below indicates there were 47 critiques and artwork attachments in group 2's exhibition area. 13 messages were sent by the instructor from university A; 1 by the instructor from university B: and 1 from the instructor from university C; 2 members of group 2 who came from university B and E were responsible for uploading the work. The group member from university B was responsible for 27 uploads of artwork or comments on the artwork and the group member from university E was responsible for 1 upload. 2 students from university A and 1 from university B, who came from groups 1, 10 and 15 respectively, sent 4 messages commenting on the work. All 15 groups presented work in progress. 8 groups received external critiques from either instructors or other students or both (refer to Table 20).

| GROUP | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| TOTAL CRITIQUES | 6 | 47 | 1 | 1 | 2 | 8 | 1 | 30 | 17 | 22 | 10 | 7 | 6 | 1 | 73 |
| INSTRUCTOR CRITIQUES | A1 B1 C2 | A13 B1 C1 | B1 | B1 | B1 | A1 B1 D2 | B1 | A8 B1 D1 | B1 C1 | A4 B1 D1 | A1 B1 | A1 B1 | A1 B1 | B1 | A15 B1 C2 D2 |
| ARTWORK POSTED BY | B2 | B27 E1 | | | E1 | A1 B1 | | A2 B12 | E2 | A2 E3 | A6 | E4 | A4 | | A14 B26 |
| EXTERNAL CRITIQUES | | A2,10 A1,15 B1,1 | | | | A1,12 B1,1 | | A4,15 A1,12 B1,1 | A1,15 | A3,15 A1,12 B7,1 | A1,15 B1,15 | A1,15 | | | A3,10 A3,12 A1,6 B1,1 B1,9 D1,8 E3,2 |

*Table 20 Study 2 instructor and student involvement in the public discussion area Design Showcase.*

- ROW 2: the total number of critiques received in each group exhibition space
- ROW 3: the critiques received by each group from instructors. The instructors are identified by their university (A, B. C, D, and E) e.g. C2 indicates two critiques from an instructor from C
- ROW 4: the number of students from each group who posted artwork or discussed it e.g. B2 indicates that a student from B was involved twice in posting artwork and/or discussing it
- ROW 5: identifies students who made the effort to comment on the work of other groups. For example, A3, 15 identifies a student from university A belonging to group 15 and sent three critiques.

The introduction of a public exhibition space area for showing and critiquing artwork proved to be highly successful as shown by its use and student comments. Group members were aware of the developing artwork of other groups.

> *'If you guys haven't checked out the design showcase board yet, check it out – there's some good stuff happening there.'*

> *'I've copied a message I posted on the new discussion board (design showcase – work in progress). It explains my rationale for my logo. If you could read it before we talk in the virtual classroom that would be great. Also, if you want to see responses to it, go to the design showcase discussion board.'*

In the final week of the project, approximately 30 % of all of one group's postings were concerned with the placing of the groups design solutions on to the public design showcase and their reaction to other group's responses through critiques and evaluations.

### 6.3.3 Instructor communicative interaction

Communication between the instructors took place in a private discussion board set up on the Blackboard site. Additionally the instructors could communicate by e-mail and this was initially used for individual logistical and managerial purposes. All 5 instructors were able to introduce threads into the instructor discussion area and 4 threads were created (refer to Table 19, p. 98).



*Figure 17 Study 2 Screen shot of instructors discussion board.*

In the first week of the project, 'the brief and specifications' thread received 10 messages and involved 3 instructors. The focus was preparation for the project and the issues raised were to do with tight or loose specifications for the design brief and individual instructor's pedagogical approach. In the first 3 weeks of the project the 'developing identity' thread received 15 messages involving 4 instructors. This thread concentrated on interface themes including: the designing of the questionnaires; group size; the numbers and names and identities of students and their passwords; the possibility of using web cameras; and other logistical and technical matters. A third thread in the final week of the project concerned the final product or presentation and received 6 messages. Instructors and students contributed ideas with regard to what students should present, to

whom and whether online or in class. As discussed in the previous study some instructors had asked for additional material from their own students, such as a reflective journal, and this caused a little tension in some of the groups. Questions were raised in this thread about student extant and domain experience and the roles of the students in their groups. This led to some discussion regarding different pedagogical approaches and instructors reluctance or desires to become involved in the private group areas as the project developed.

All 5 instructors could observe and post messages in the private group areas. As lead facilitator, I posted one initial message in each of the 15 areas giving general guidance and instruction and 1 other message in the middle of the project if there seemed to be a specific problem with group activity. I would follow this up with a message to the appropriate instructor in the instructor area. Generally, this seemed an effective strategy. All other instructions and notices to students were posted in the public pages of the DesignLink interface as described above. The private group areas were coded for reference to instructor involvement and the number recorded as illustrated in table 21 below. Only one other instructor posted a number of messages in the group areas. A third instructor posted one message and the other two instructors did not post at all in the private group areas.

| Group | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Messages | 55 | 92 | 39 | 7 | 27 | 21 | 9 | 186 | 17 | 23 | 16 | 8 | 44 | 25 | 157 |
| Instructor involvement | A1 B1 | A2 B1 | A3 B2 | A1 B2 | A3 B1 | A3 B2 | A1 B1 | A2 B2 | A4 B1 C1 | B2 | A2 | B3 | A3 B2 | A3 B3 | A1 B3 |

Table 21 Study 2 instructor and student involvement in the private group areas.
A2 – indicates that instructor A has left two messages in a particular group's discussion area

One instructor intervention in the private group area suggested that:

> 'Hey, if you'd like to see some of (the work of one of the students in the group) work, check this url out It's an article I wrote last semester about some student projects.'

The response was a cryptic message from one of the students in this group.

> *'We would like to see some of (the same students) work on this project*
> *While its great getting help from T. I think we will be better of if we can get on*
> *with this project on our own.'*

This response was typical of the attitude of most students taking part in DesignLink. Although they were very keen on critiquing and being critiqued in the public arena, the students preferred a sense of autonomy and self control in their design activity. One group referred to the subject of instructor involvement in the group areas with the following message:

> *'Then there's T (a instructor) from your school – kind of a third group member.*
> *T always agrees with your opinion, presents your work from other projects but*
> *disagrees with almost everything else. Not just in this group. Today we had a*
> *discussion in my class and the other NI students think in a similar way and are*
> *not very happy with T's way of criticism.'*

These issues led to the setting up of a fourth thread that discussed whether the collaborative groups should be kept autonomous or whether instructors should access the group areas and provide on-line instructional learning. All 5 instructors involved themselves in this debate. The 8 messages in the threaded discussion were added to by a vigorous e-mail debate. The discussion concerned 2 pedagogical approaches each having different implications for the design instructor's role in online learning environments. This issue highlighted the conflict in pedagogical values that is central to issues of professionalism. An approach supported by one of the instructors suggested the need for ongoing and active involvement by the instructor in the group design process arguing that each group's work should be instructor led.

> *'this has been far from satisfying for my students, and I guess I now understand*
> *that the reasoning behind this experiment is to see what people do in this*
> *situation, and not to see what can be done to actually make this a rewarding*
> *experience for them.'*

This teacher-led approach required instructors to involve themselves in instructional supervision within group areas.

> *'But in terms of teaching, if I can do nothing to affect the outcomes of this*
> *project (presumably in a positive way), then I feel like I'm not doing my job. My*

*students look to me for guidance; when they tell me of a problem or have an idea about improving the process, they expect me to be able to do something in response.'*

The alternative constructivist approach supported by all but one of the instructors advocated group autonomy in student design work.

*'The big question is how much do we get involved in the group collaboration. On the one hand we could have a mentoring role in the group areas by assigning ourselves to groups and working with them. On the other hand, we could allow the group dynamic to resolve itself. In other words allow the collaboration to go according to the members and the processes, procedures and behaviours they decide to adopt in the light of their different experiences. I feel the latter way sits better with the point of the research, provided that we make this clear to the students.'*

Another instructor supported this pedagogical approach.

*'My silence within the student discussion board has been through choice. My understanding of the project was to encourage the students to develop strategies of communication within their groups while working on a common problem.'*

One instructor was more cautious.

*'Shouldn't a project of this nature have the flexibility for students and instructors to interact in different ways. By its very nature there is not one way to teach design and I am sure that there will not be one way to teach design via distance learning.'*

Moreover, suggested that the debate had been forced by our reliance on computer-mediated communication in some respect. Again there was a move to blame the technology.

*'I think that we are finding that we are a victim of the DL process virtual communication blur. Perhaps a little bit of traditional communication would resolve any debate?'*

The perspectives described in this study illustrate the differing pedagogical approaches of instructor directed design work and the facilitating of student centred online collaborative projects in a constructivist environment. In some ways it

demonstrates that the original brief for the project could not fully be adhered to in practice and that is something that collaborating instructors should be aware of.

## 6.4 Study 3: Group dynamics and partnership

### 6.4.1 Introduction

The 3rd Study is concerned with how design students from MC and ISU in the US and LS in Singapore countered a lack of participation and involvement from other students during an online project. They achieved this by either renegotiating their design group placement or by dropping out of the project. The study is drawn from Phase 3 of DesignLink in the spring of 2004 and focuses on the theme of group dynamics and the negotiation of partnership. The study questions how students handle group dynamics and partnership in online collaborative group work



*Figure 18 Study 3 Screen shot of group compositions.*

### 6.4.2 Initial communication

10 distributed groups of students were involved in the project and the groups communicated principally through WebCT. The study focuses on how students go about dealing with breakdowns of group communication by negotiating positions with other design groups in an online learning environment and the impact this has on group activity and cohesiveness. In the initial stages of the collaboration only one group had all three of its group members actively involved in collaboration. Ironically, this group failed to complete the project. Initial communication went well in planning timelines for meeting and suggesting ideas for the project. However, for reasons to do with using different modes of communication and the pressure of other work involvement, the group failed to get together online and eventually the most active participant e-mailed to say she was joining another group.

> *'Hello, this is X. I am in group 10. Both of my group members have contacted me at some point, and they say they will meet me or correspond, and they never do. I have waited in the synchronous chat, and they didn't come when they said. Both of them have done nothing to contribute to this project. I am becoming frustrated. I really want to get going on this project, and we are very far behind. I know you said we could change groups, so I am e-mailing you to let you know that I am changing to group three. If there is any more information you need from me, or this is not OK to do, please let me know. Thank you.'*

In the other 9 groups, 1 member in each group was completely inactive. A general e-mail was sent out to all the participants:

> *'It's the start of the second week and only 3 MC and 4 LS students have been in touch with their groups and one student can't raise anyone in his group.'*

The primary reason for this high level of inactivity may well have been that both MC and LS instructors inadvertently set up the project as a voluntary rather than a graded project. MC set up the project as:

> *'DesignLink is an 'add on' project and sometimes that works and other times it does not. My entire class has been up for two nights getting ready for a project that is due in 4 minutes so they are a bit on edge to say the least I will give them a nudge this morning if they can keep their eyes open!'*

While LS students were described as:

*'My students also have another project going on and students that are not active also show a slow progression on their degree project. I found this formula: students that are behind in school + coming deadline in short time = not active in DesignLink.'*

Given the pressure on students to complete deadlines for a number of simultaneous projects in their other courses it was no surprise therefore that the students did not allocate enough time to a voluntary online project, particularly as the project required a significant amount of time, dedication and determination to complete successfully. The ISU students however were doing the project in place of two assignments in their online class and subsequently all 10 of these students completed their projects.

Of the 30 students taking part, in this project in phase 3 of DesignLink, only 3 LS students and none of the MC students completed the project. 13 students in total completed the collaborative assignment making up 2 co-located and 3 distributed groups. This was a very high drop out rate and happened despite one of the participating universities having already successfully taken part in a previous project. All thirty students initially described themselves to be keen and eager to get involved in what they were anticipating to be an exciting and different challenge. Streaming video clips of the students introducing themselves and their ideas for the project were recorded. This appeared to encourage group cohesion and community building from some students.

Due to the lack of involvement of so many students in the first week of the project, it was decided, in consultation with the other instructors, to allow students to move out of the groups they had been randomly assigned. They were given access to all 10 group-discussion boards so they were able to observe initial communications within each group. They could then decide whether to stick with their original groups or negotiate to join whichever group seemed most appropriate for them. The instructors agreed that the requirement that students from the same university should not be in the same groups would be dropped. Given that the ISU students were doing this project as part of an online design course and that the 3 LS students, who completed the project,

remained in different groups, this did not in fact undermine the distributed nature of the research.

### 6.4.3 *Group dynamics and negotiation of partnership*

This study focused on how the students negotiated their places in groups and completed the project. The data collection consisted of observations of group activity and the group discussion boards. Instructor communications related to initial participation in the project, individual student movements and group restructuring were also observed and recorded. A number of reasons emerged for students wishing to change groups. The main reason was a lack of initial communication between some of the original group members. This proved frustrating for students who were motivated and keen to begin the collaborative project. These students then looked around and asked to join other groups that appeared to be more active.

> *'I'm in the process of seeing if I can join group 7. I've not had much luck in contacting and setting up times to meet. I'm very interested in working with people across the internet in other countries. I've kept up in reading most of the groups discussion notes and I've noticed that there is someone in group 7 who is willing and wants to work with someone else. This is why I wanted to do this project in the first place!'*

| Phase 3 | Study 3 | Participant Locations | Platform | Group composition | Group type and size |
|---|---|---|---|---|---|
| Project 2 | March/ April 2004 | US - **(ISU)**<br><br>US - **(M)**<br><br>Singapore **(LS)** | WebCT | **Initially** each group consisted of one student from each of the participating universities<br><br>**Finally**<br>1 co-located **ISU** group of 2 students<br>1 co-located **ISU** group of 3 students<br>2 distributed groups of 2 **ISU** and 1 **LS** students<br>1 distributed groups of 3 **ISU** and one **LS** students | **Initially**<br>10 distributed groups of three students<br><br>**Finally**<br>3 distributed groups of 2 and 2 and 4 students<br><br>2 co-located groups of 2 and 3 students |

*Table 22 Study 3 the initial and final composition of groupings.*

Sometimes students moved from groups where there was some level of initial communication when they spotted another group where they felt more interesting work was going on or where the ideas flowing aligned more appropriately with their own.

> *'I am in group 8 for the design link and have been trying to contact members and talk for a while now. Me and the guy from Missouri were in contact but he hasn't responded for a long time now so I told them I was joining another group because want (sic) to get started on this. Y joined group 7 and said I should too but I don't want there to be too many people or have them annoyed for joining in too late.'*

A third reason was students inviting another to join their group:

> *'Hai Y... my name is Z and am from LS in Singapore. I see that there are some people who haven't been actively participating in this project,,, we all are busy.. but since ur enthusiastic just as we ( me and P grp 1) are was wondering if u wud be interested to join us...we have done some brainstorming and have confirmed the airlines...we are planning to work on japan airlines and American airlines...so if interested, u can post a note here or in grp 1 page ..or u can also e-mail me at ...regards M*
> *P. S. three heads might be better than two...'*

Some of the 5 ISU students who changed groups negotiated a move to more than one group before finalizing their move.

> *'I'm sorry but I've already been accepted into group 7 with B. Thank you for the offer. Good luck with the project!'*

| Group number | Group members | | | |
|---|---|---|---|---|
| *One* | **ISU1** | **LS1** | | |
| *Two* | **ISU2** | *ISU4* | *ISU5* | |
| *Three* | **ISU3** | *ISU10* | | |
| *7* | **ISU7** | **LS7** | *ISU6* | *ISU8* |
| *9* | **ISU9** | **LS9** | | |

*Table 23 Study 3 final group compositions.*

Table 23 illustrates the final composition of the groups once the participating students had negotiated their group location.
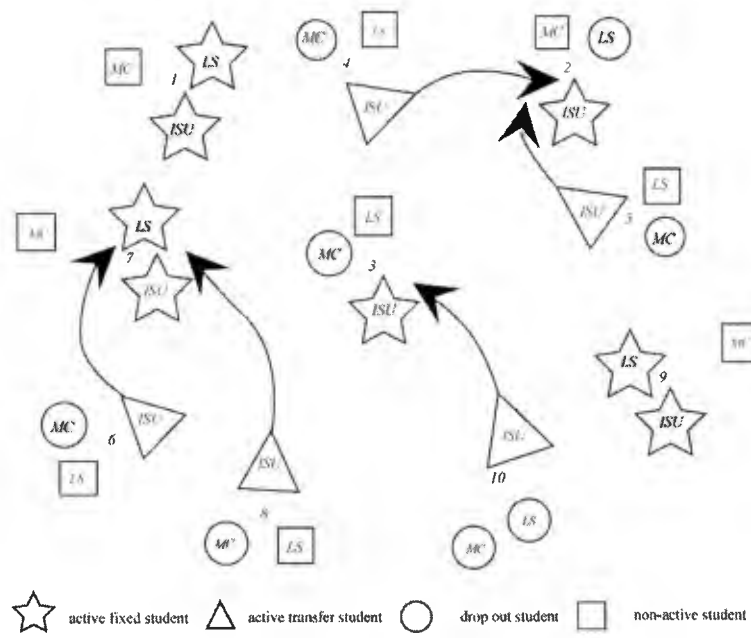
*Figure 19 Study 3 student movements leading to final group composition.*

Group members who remained in their initial groups are highlighted in bold. Students who negotiated a change of group are in italic. As table 23 shows 8 of the 13 students, including all 3 LS students decided to remain in their original groups.

An analysis of the groups identified certain patterns emerging (refer to Figure 19 above). Groups 1, 2, 7 and 9 were all made up of two of their original 3 members. The MC student in each study was non-active while the ISU and LS students remained active. Group 1 and 9 ended up like this while the LS student in Group 2 then dropped out. Group 2 and 7 were then joined by a further 2 ISU transfer students. Groups 4, 5 6 and 8 were all made up of 2 of their original 3 members. The LS student in each study was non-active while the ISU and MC students remained active. In each group, the MC student then dropped out of contact and the ISU student then transferred to another group. In Group 10, all of the students were initially active. When the LS and M students became inactive, the ISU student transferred to Group 3. These patterns and movements are illustrated in Figure 19 above. An examination of the composition of the final

groupings shows that 2 of the 5 surviving groups were composed of original members and that 3 of the 5 groups retained members from more than one institution. This might suggest that a certain bonding or loyalty is generated when original members of a group are from different institutions. An analysis of student movements suggest that when an online collaborative project is a graded component of an institutional course then the students involved will make every attempt to successfully complete the project by negotiating group transfer if necessary.

### 6.4.4 Group dynamics and communicative interaction

The chronological ordering of the postings in the discussion board for Group 7 was analysed and a timeline prepared for the 4 weeks of the project. Table 24 below illustrates how the frequency of messages increased in the second half of the project. This might also be seen as supporting the possibility that distributed groups found online collaboration of greater use in the final solution focusing stages of the design process. However, the timing also coincides with the negotiations of the two ISU transfer students to enter the group and with the scaffolding of 4 threaded discussions into each group's discussion area. The 4 threads introduced were entitled: Airline choice; Brainstorming for logo development; Design development of logo; and Creation of Logo identity. Analysis of message content related to message frequency seems to indicate that the group impetus was bolstered by the arrival of the 2 newcomers.

| Timeline | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| LS | | &#124; &#124; | &#124; | &#124;&#124; &#124;&#124;&#124; | &#124;&#124; &#124;&#124;&#124; &#124;&#124;&#124;&#124;&#124; |
| ISU | &#124; | &#124; | | &#124; &#124; | &#124;&#124;&#124;&#124; &#124; &#124; |
| ISU2 | | | | &#124; &#124;&#124;&#124; | &#124;&#124;&#124;&#124; &#124;&#124;&#124;&#124;&#124;&#124; &#124;&#124;&#124;&#124; |
| ISU3 | | | | &#124;&#124;&#124;&#124;&#124; | &#124;&#124;&#124; &#124; &#124; |
| Instructor | | | &#124;&#124;&#124;&#124; | &#124; | &#124;&#124; &#124; |

*Table 24 Message timeline Group 7 source and frequency of posted messages over time.*

Full use was then made of the new discussion threads in ongoing communications between group members. One further important observation was the pivotal role of synchronous online meetings to this group's collaboration. 6 online synchronous meetings were arranged and proved extremely productive and were attended by all participating members of the group.

An analysis of the 5 surviving group's message frequency indicates that message productivity increased substantially when students negotiated transfer to other groups. Group 1 and 9 retained original membership and averaged approximately 12 messages per member. Group 2 and 7 each recruited 2 new members and had an increase in message productivity of 50 %. Group 3, which comprised 1 original and 1 new member, increased message productivity by almost 300 % and did not fit this pattern. Some of the increased message productivity in the 3 reformed groups appeared to be connected to membership negotiation and bonding, although it was also partly attributable to the scaffolding of discussion threads and also to a renewed enthusiasm for the design collaboration.

### 6.4.5 Group productivity and communicative interaction

An analysis of group communication frequency might suggest some relationship between the number of messages that accumulated in each group studio space and student movement and which groups went on to successfully complete the project. However, the connection was not so clear with regard to group size. The mean number of messages was 18 per person for the 5 groups who successfully completed the project. Table 25 lists the groups in order of the actual number of messages sent, the number that would have accumulated if each person had sent the mean amount, the final group size at the end of the project and the grade awarded for the final online presentation of the artwork. Those groups that failed to complete the project are listed with a final group size of zero.

| Group | Actual number of messages | Predicted number based on average number of messages | Final group size | Grade |
|---|---|---|---|---|
| 7 | 66 | 72 | 4 | A |
| 3 | 66 | 36 | 2 | A- |
| 2 | 55 | 54 | 3 | B- |
| 1 | 27 | 36 | 2 | B- |
| 9 | 23 | 36 | 2 | B+ |
| 10 | 23 | 0 | 0 | |
| 6 | 19 | 0 | 0 | |
| 4 | 13 | 0 | 0 | |
| 5 | 12 | 0 | 0 | |
| 8 | 11 | 0 | 0 | |

*Table 25 Study 3 numbers of messages related to final group size and project grade.*

There appears to be no obvious relationship in Table 25 between message quantity and group productivity. However, if we only consider groups who reformed group membership and thus discount Group 1 and 9, then, it might be possible to establish a correlation between messages posted and output. If this was established, then it would contrast with some research findings that suggest that the number of messages that any group posts does not necessarily reflect on the quality of the participation and collaboration or on the knowledge, building that is taking place (Kleiman et al, 2000). However, no correlation is evident between the number of messages communicated in any one group and the quality of the final artwork. Figure 20 shows the artwork of one of the groups that completed the project.

*Figure 20 Study 3 group performances, Screen shot of final artwork.*

If we relate the number of messages a particular group communicates with group size and the notion of negotiation of meaning then it might be possible to consider the productivity of the group in relation to the final assessment grade and quantity of messages sent. See Appendix 10 for the assessment criteria for the project. Grades are based on quality of output and evidence of productive collaboration. I investigated whether a productivity (effective communication performance) weighting might impact the relationship between message quantity and quality of outcome.

| Group | Actual number of messages | Predicted number based on grade | Group productivity | Grade |
|-------|---------------------------|----------------------------------|--------------------|-------|
| 7 | 66 | 79 | Highly productive | A |
| 3 | 66 | 66 | Productive | A- |
| 9 | 23 | 53 | Very highly productive | B+ |
| 2 | 55 | 40 | Under productive | B- |
| 1 | 27 | 27 | Productive | B- |

*Table 26 Study 3 Ranking group communication by grade.*

Taking up this notion Table 26 designates a productivity category to each group by relating the grade they achieved for their collaborative artwork to the number of messages that might flow within each group if determined by the grade awarded. More of the final artwork from this project can be found in Appendix 11. The number of

messages posted by Group 7 is very close to the mean and achieves an A grade. Group 9 with well below the mean number of messages (aprox.66 %) achieved a B+. Group 3 sent almost twice as many messages as the mean in achieving an A-. If the concept of a strong or a weakly communicating group is introduced there appears to be some connection between the number of messages a group creates and the final grade. Using productivity as a criterion might suggest that Group 9 could be categorized as a highly performing group, needing fewer or more succinct communication to negotiate meaning and arrive at a satisfactory design solution. Conversely, Group 2 could be considered as an underperforming group. However, the relationship between product and productivity as a group and/or communication is not straightforward. If any one area of good teamwork alone was enough to guarantee success then there are many teams who would be more successful than they actually are. Many other factors are involved and this might be considered a fruitful area for further research.

### 6.5 Summary

The three research questions addressed in these studies relate to the features of online communities as characterised by Wenger et al (2002). The 1st Study examines a group of students with shared domain experience using substantive online discourse while mutually engaged in a design task. The 2nd Study highlights instructors and students negotiating a shared experience while involved in authentic online activities, while the 3rd Study focuses on students' ownership of a shared experience while negotiating group cohesion.

In the 1st Study, a conversational framework for design activity is used to model the communicative interaction that is taking place between members of a distributed design group. 155 group messages were sent over the 4 weeks of the project with almost 50 % being sent in the final week. 2 of the group adopted creative design roles and were responsible for almost 90 % of the communication. The other member took on an appraisal and marketing role. 60 % of all group postings concentrated on design development issues.

Approximately 10 % of messages related to public group critiques in the design showcase and the external showcase website. An analysis was made of the 227 postings identified within the group messages. Each posting was coded as belonging to one of 4 design process levels. The postings were then assigned to a modifier: synthesis, evaluation or design decision. The data was matched against a model for online designing for distributed groups of students derived from the adapted conversational framework model. The analysis resulted in identification of 75 task clarification postings, 37 concept generation postings, 80 design development postings and 35 concept-testing postings. The first week of the project was almost fully concerned with task clarification and concept generation. Task clarification dominant in the first weeks recurred occasionally throughout the duration of the project. Design development began to appear in the third week gradually becoming increasingly the dominant process along with concept testing in the final week.

An examination of patterns of postings in the group discussion board provided evidence for linear design development, while cyclical patterns of synthesis and evaluation occur as public and private critiques at each stage of the design process. The linear pattern supported student observations about the formal constraints imposed on the groups design development when working in an online environment. The cyclical pattern of synchronous and asynchronous interaction, coincident with specific design development stages, occurring over the period of the project lends support to the 'geneplore' model of cyclical broadening and narrowing of the solution space of the design problem (Finke et al, 1992). The findings indicate that a balance between dynamic synchronous and reflective asynchronous engagement is critical in establishing successful online collaborative design environments, particularly those in international contexts.

The 2nd Study focused on instructor involvement in online learning environments. Although the students were very keen on critiquing and being critiqued in the public arena the students preferred to be autonomous and in control of their design activity. Most instructors were prepared to allow student groups' autonomy and ownership of the design problem within their private group areas and confined their feedback either to the public

areas or to face-to-face critiques in their own institutions. As lead facilitator, I posted 34 messages in the private group area. Another instructor posted 21 messages and a third posted 1 message. Various instructors posted all other instructions and notices to students in the public pages of the DesignLink interface. In the public critique area a total of 72 messages were posted by 4 of the 5 instructors.

The introduction of an area for presenting, viewing and critiquing group work in progress proved to be highly successful as illustrated by the number of messages posted, the number of active participants and the communication between students in their private group areas. In the 2nd Study, a decision was made by the participating instructors to follow a constructivist approach by being prepared to allow student groups' autonomy and ownership of the design problem. The students gained feedback on the developing artwork from both instructors and their peers in the design showcase, while appreciating the trust and security engendered in their private group areas. This is an important issue and is something that needs to be taken into consideration when contemplating initiating online design collaboration. The study demonstrates that there are different perspectives on the issue amongst instructors and this too needs to be resolved from the outset. Other outcomes from this study included the benefit of a public showcase area as a form of open design critique space plus the use of public space for building student motivation, involvement and a sense of community and place. Group partnerships and cohesion proved problematic and this led to the design of the 3rd Study, which concentrated on the negotiation of group placement.

The 3rd Study questioned how students handle group dynamics and partnership in online collaborative group work. It was found that bonding and loyalty can be generated when the original members of a group are from different institutions. Yet, when online collaborative projects were graded then students might attempt to successfully complete the project by negotiating group transfer, thus disrupting other members of their group. Three reasons were identified to explain students wish to change groups: a lack of initial communication, more interesting work going on in

another group and being invited to join another group. The frequency of messages increased when a student negotiated transfer to another group but the connection is not clear because this coincided with the introduction of threaded discussions into the groups' area. There was no obvious relationship between the number of messages communicated in any one group and the group size and group productivity. The relationship between quality of solutions and productivity of group communication was not straightforward. The outcomes lend support to the notion that if students adopt autonomy in decision-making, collaboration, and participation this should encourage social learning (Jonassen et al, 1999, Sorensen, & Takle, 2003).

The next chapter explores the potential of online learning environments for design education by analysing the outcomes from these three studies to provide insight for design educators using online collaborative design practice. As well as addressing the research questions, issues to do with the nature of conversational frameworks in online design practice, the use of scaffolding for developing cognitive design skills and the role of the design critique in decision-making will be analysed.

*Chapter 7*

*Conclusions and future implications*

## *7.1 Introduction*

Computer-mediated communication has become a common part of higher education and of designers' professional practice in the twenty-first century. An online collaborative design initiative called DesignLink provides the pedagogical context for a grounded practitioner enquiry into the potential of incorporating online collaborative learning environments in university design courses and the implications this might have for design educators. This practitioner research investigates student-centred group enquiry-driven learning in a distributed environment. The aim is to examine how students and instructors interact in online learning environments in the conduct of online collaborative design work in international educational settings, and thus provide the basis for the identification of some of the factors that contribute to successful online collaborative work in design education. Through the study of three examples of online collaborative design work the research examines how a distributed group of students use text based synchronous and asynchronous interaction when seeking collaborative solutions to a design problem, how participants in an online collaborative environment interact privately and publicly with each other and how group dynamics impact on online collaborative group work. Analysis suggests that in the hands of a committed design teacher technology can support innovations that will improve student performance (sections 6.2.2 and 6.2.4), help students to develop cognitive design skills (section 6.2.5) and introduce a real-world design context for student learning (section 4.1). The analysis of data in section 6.2 indicates that a balance between dynamic synchronous and reflective asynchronous engagement is critical in establishing successful online collaborative design environments. The importance of privacy issues in the space used by design students, examined in section 6.3, can inform restructuring of collaborative interfaces for future design education. Despite limitations in the scope of the work it is hoped that this

grounded research into the online activities of a small number of participants highlights issues about the use of online collaborative work for design education that can be pursued in further research. In this chapter the importance of the scaffolding of the social interaction between design students is identified as a key factor for successful online collaboration (sections 7.2, 7.3 and 7.4). Strategies for implementing online design collaboration are explored (sections 7.5 and 7.6) and guidelines proposed for design educators hoping to exploit the potential of online learning environments in the design classroom (sections 7.7 and 7.8). Finally the implications for future research are discussed (section 7.9).

## 7.2 A conversational framework for collaborative design work

The 'geneplore' model describes designing as an iterative process of widening of a problem solution space through idea generation followed by a narrowing of the space though synthesis and evaluation (Finke et al, 1992, Stempfle & Badke-Schaub, 2002). This can help to keep the solution space to a manageable complexity. Analysis of data from Study 1 indicates how the online environment might support specific phases of this model (section 6.2.4). Online collaborative group work involves both synchronous communications using virtual chat and asynchronous communication using discussion boards. The analysis indicates that while discussion boards allow students to log on and post thoughtful and reflective responses at any time, synchronous meetings, being immediate, are especially useful in facilitating brainstorming and shared whiteboard sessions (section 6.2.4). This would appear to contradict some research that argues that the chat facility does not allow for productive discussion or participation and frequently disintegrates into simple one-line contributions of minimal length (Palloff & Pratt, 1999).

The emerging pattern of synchronous and asynchronous communication over the duration of a design project is examined (sections 6.2.2, 6.2.3, 6.2.4 and 6.2.5). Figure 21 below illustrates the recursive and cyclical series of asynchronous decision making overlapping with coincident synchronous online meetings. The peaks, representing

increases in asynchronous postings, can be matched to ongoing interim evaluation and linked with the practical production of artwork (sections 6.2.4 and 6.2.5). This could be interpreted as a representation of Asimow's cyclical design process model (Asimow, 1962). Divergence takes place through asynchronous discussion board communication and a narrowing or synthesis of ideas then follows using synchronous chat. This suggests a need to balance dynamic and immediate synchronous engagement and reflective and considered asynchronous engagement between students for successful online collaboration to take place. In order to achieve this participating design groups might set up times and dates for regular synchronous meetings using virtual chat to 'sit down' and exchange ideas at pre-arranged times throughout the project.
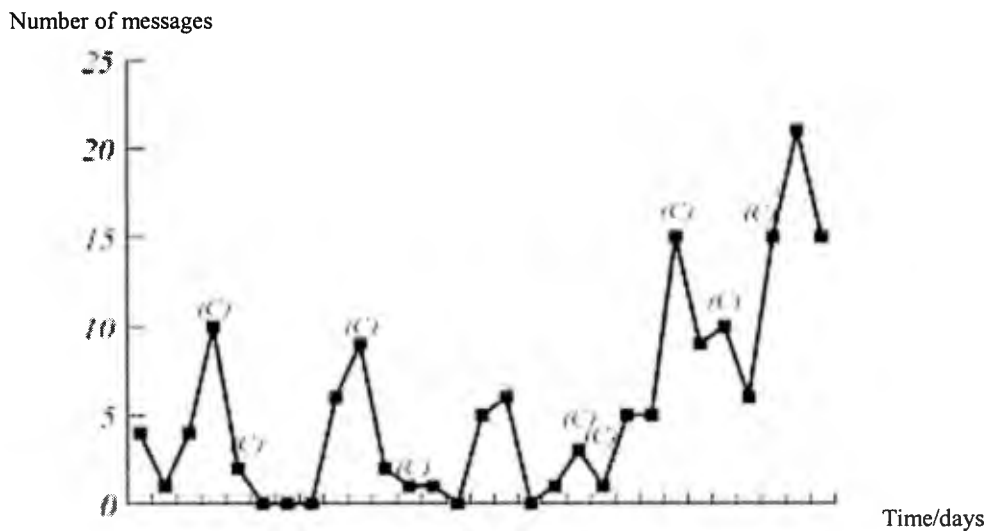
Number of messages



*Figure 21 Number of asynchronous messages produced by the group over time. (c) indicates the occurrence of synchronous online meetings*

Another key issue for effective group interaction and design activity relates to the creation of private and public spaces. The research findings support the importance of scaffolding the online environment to encourage both private and public interaction between students for learning. The students gain feedback on their developing artwork from both instructors and their peers in the design showcase, while appreciating the trust and security engendered in their private group areas. The students were enthusiastic about

critiquing other groups and being critiqued by their peers and tutors. However, they prefer this to take place in the public arena. They value the autonomy of their private space for developing work and were unhappy with tutors taking part in and critiquing group activities while they were in their group area (sections 6.3.1 and 6.3.2). This is supported by educational research on knowledge building in constructivist learning environments, which suggests that if students are given autonomy this can encourage more social-learning (Jonassen, 2000). This is an important issue and is something that needs to be taken into consideration when contemplating initiating online design collaboration. The importance of privacy issues in what might be called the practice spaces has implications for the design of the interface. While initial introductions and bonding in public space generally facilitates student awareness of the project and can motivate students and encourage group bonding, the need for 'off-task' public discussion space later in the project appears not to be so necessary, and, in fact, most students confined their 'off-task' communication to their private group areas (section 6.3.2). This has implications for what might be considered appropriate scaffolding of public and private, and 'off-task' and 'on-task' spaces and this is discussed in the next section.

### 7.3 Scaffolding in online learning environments

Scaffolding, as defined for the purposes of this research, is the technological and pedagogical structuring of a solution focussing online problem solving environment. The aim of this scaffolding is to provide clear directions, deliver efficiency and create momentum, clarify context and expectations, and encourage procedural design methods. Scaffolding is structured to assist design activity in the same way as scaffolding is erected around a building to assist the building process. Study 1 examines the influence of collaborative activity on learning and cognition through a cognitive analysis of peer interactions in a small group (section 6.2). Designing involves conjectural reasoning and higher order thinking from flexibility of idea generation through brainstorming to evaluation and decision-making. Study 1 focuses on the conversational frameworks of

working practice and examines the cyclical and recursive nature of a group's online discourse (sections 6.2.2 and 6.2.4). To create a supportive environment for nurturing cognitive skills, scaffolding was introduced to encourage self-reflection and stimulate discussion and decision-making in line with other research (McLoughlin, 1998). The analysis in section 6.2.6 shows how the structural aspects of a problem-solving process help to determine the outcome of the design work. Introducing topics into the threaded discussion boards stimulates discussion, which could enable students to articulate and elaborate their views. In Study 2 careful scaffolding of specific private workspace and public critiquing space assist the design group to take ownership of the problem and encourage a dynamic interaction in the design activity (section 6.3.3). Such autonomy is cited by other research as being crucial to community building (Jonassen, 2000). Scaffolding can also alleviate fears on the part of the instructor that students might be left to flounder and sink and the notion that the instructor must intervene immediately and directly support the work of the group (Tobins & Tippins, 1993). Scaffolding of the online environment could be a key factor in helping to promote an effective community of design practice and this is in line with other research (Stempfle & Badke-Schaub, 2002). At the same time it is important to keep online discourse economically productive while allowing space for ideas to be generated and developed. Other studies have agreed with this emphasis, arguing that scaffolding will promote awareness and understanding of the problem space and encourage meta-cognition and self-direction in the students (McLoughlin, 1998, Duffy & Cunningham, 1996, Winnips et al, 2000). It is important that scaffolding, while not being intrusive or instructional, establishes shared objectives and encourages procedural methods. The dynamics of group interaction can lead to higher levels of task-related interaction and behaviour through a combination of individual and group effort (Johnston et al, 1986). Collaborative learning environments can lead to higher self–efficacy and achievement in participating students (Moriarty et al, 1995). Design education involves teaching students to think and solve problems for themselves, while

online design activity requires negotiation of meaning and decision-making that may encourage exploration and experiential learning (Cross, 2001).

The problem space paradigm adopts a solution focusing strategy for solving complex poorly structured real life problems. This approach emphasises cognitive processes in explaining creative problem solving behaviour. An examination of the online group discourse in Study 1 suggests that distributed online activity gives students experience of coping with a certain amount of uncertainty and working with incomplete information about the problem space, two of the cognitive behaviours identified as necessary behaviours for successful design practice in earlier studies (Cross, Christiaans & Dorst, 1994). Complex problem solving requires student self-regulation. Constructivist environments allow students to take responsibility for the processes and ownership of the problem while exploring a variety of solution seeking strategies. The findings, attitudinal in the Pilot Study (sections, 5.3 and 5.4) and evaluative in Study 1 (section 6.2.4), support other research that has found that student experience of online collaboration helps to develop awareness of the cognitive design process (Goodfellow & Kukulska-Hulme, 1996, Jonassen, 2000). Overall the findings suggest that working collaboratively online can develop reflective and critical responses that are indicative of the higher order thinking necessary for designing (Seels & Glasgow, 1998). Scaffolding of the online environment is established through these studies as a key factor in helping to promote an effective community of design practice and this is supported by other research (Stempfle & Badke-Schaub, 2002).

### 7.4 The pattern of synchronous and asynchronous communication

The initial wave of asynchronous activity in Study 1 occurs during a period of introductions and community bonding. This period is followed by three successively smaller waves of asynchronous activity, each indicating an increase in postings related to idea generation and design development. A four-fold increase in the number of threaded asynchronous messages occurs in the final week. Again, more messages were sent earlier

in the week than over the weekends apart from the final weekend when approximately one third of the total of messages were sent. References to synchronous meetings and the continuing exchange of artwork files were dominant themes in the asynchronous messages. Almost 30 % of postings in Study 1 refer to or contain a record of synchronous meetings.

In Study 1 the group found the reflective nature of the asynchronous discussion board very useful in developing their ideas for the project (section 6.2.4). Not feeling pressured to come up with immediate answers to design problems meant they were able to work at their own pace at a time when it was convenient for them.

> *'I like the freedom of working alone and using asynchronous communication to keep in touch with my group members rather than having to schedule a specific time and location to meet.'*

Asynchronous meetings also allow the members of the group to accommodate different work schedules and then come back together and have meaningful synchronous discussions. Although the asynchronous nature of the discussion might occasionally provoke misunderstandings, these disputes seem to cement community bonding as the group members commit themselves to resolving the issues.

> *'I guess there has been a lot of misunderstanding between us, which is understandable due to the arrangement of our collaboration.'*

The misunderstandings help to illustrate how stress in a group can easily arise in an asynchronous medium and these need immediate resolution if the collaboration is to succeed (section 6.2.4). The internal disputes tend to coincide with final deadlines indicating, as might be expected, that increasing pressure to complete the work increased the likelihood of disputes. Disputes also seem to coincide with students experiencing technical difficulties with the synchronous chat facility or while exchanging artwork.

The design of asynchronous private discussion boards appears to be a crucial issue. In Study 1 instructing groups to post asynchronously a minimum number of times each week and to post at least one message to all structured threads encourages a coherent and rigorous approach to problem solving activity. Information processing theory describes a

problem space made up of knowledge states. In Study 1 when discussion boards are set up with leading propositional statements, each one representing different knowledge states, this encourages the production of a range of possible solutions to the design problem. This scaffolding also encourages students to tolerate a certain amount of uncertainty while working with incomplete information towards autonomous decision making. One of the key implications arising from the studies is the importance of appropriate scaffolding balancing synchronous and asynchronous communication (sections 6.2.2 and 6.2.6).

The emerging pattern of synchronous and asynchronous communication developing over the 4 weeks of the project indicates support for the 'geneplore' model. In this model, the peaks in asynchronous communication illustrate cognitive operators expanding the solution space. The synchronous meetings, although having less room for elaboration and clarification than traditional face-to-face meetings, allow immediate exchange of ideas and evaluation of the designs being exchanged through file exchange (section 6.2.4).

> *'synchronous communication is very important for our group project... to brainstorm ideas and make preliminary decisions within a relatively short time frame.'*

At, or around, each peak of communicative activity, a synchronous meeting allows for an immediate and intuitive decision-making to occur. This involves comparison and selection of the generated ideas and encourages a narrowing of the solution space. By formalising the modes of communication and negotiation, synchronous and asynchronous computer-mediated communication keep the problem space in an ongoing state of widening and narrowing as suggested by the 'geneplore' model described in Chapter 2 (Stempfle & Badke-Schaub, 2002). The analysis of Study 1 suggests that balancing dynamic, immediate and intuitive synchronous engagement and reflective, evaluative and considered asynchronous engagement is critical in establishing a successful online collaborative design environment.

## 7.5 *Student-instructor participation in online collaboration*

Study 2 concerns the extent of instructor involvement in online group discussions. The case focuses on the dynamics of student and instructor online participation and highlights differing perspectives about instructor involvement in design development during this type of project. Instructors were encouraged to take an active part in and to contribute ideas to the structuring of the online environment. They were given access to the site and invited to suggest improvements to the interface or changes to the design brief. Instructor communication focuses on preparation for the project, interface issues, specifications for the design brief and individual instructor's contributions to the pedagogical approach. The instructor debate also addresses the designing of the questionnaires, group size, the possibility of using web cameras and other logistical and technical matters. One issue that could be resolved early on is a clear pedagogical approach to integrating the project into the content of the different courses as this causes some tension for students during some of the projects. It is also probably advisable to set a required minimum level of collaborative activity.

A focus of debate between instructors concerns two different pedagogical approaches. One approach advocates group autonomy in student design work and the other argues for the need for ongoing and active involvement by the instructor in the group design process. Instructors, by assigning themselves to groups and working with them, could take a mentoring role in the group areas. Alternatively, instructors could allow the group dynamic to resolve itself and allow the collaboration to go according to group members wishes and the processes and procedures they decided to adopt. The constructivist approach allowing group autonomy was adopted for this research (section 3.7). Instructor involvement in working group areas generally proved to be effective when dealing with specific problems with group activity. This was best followed up with a message to the appropriate instructor in the instructor area. All other student instructor communications were best kept to the public spaces. The group discussion areas were coded for reference to instructor involvement (section 6.3.2). The analysis reveals that

students were very keen on critiquing others and being critiqued by the instructors in public spaces rather than in the group areas. Synthesis and evaluation help to set patterns of understanding and procedure within group activity at all stages of the design process (refer to Asimow's design process model in section 2.6). The design critique is represented in the group dialogue by those messages that are to do with critical selection or decision-making (section 6.2.6). Design students develop attitudes, learn about technique and acquire critical skills through participation in these dialogues. Approximately 60 % of the postings in the asynchronous discussion threads involve critiquing ideas and possible design solutions. These peer critiques are important for student interaction and their interpretative processes and strategies in dealing with online collaboration. The students also develop their designs through frequent synchronous online meetings and exchange of artwork in file exchange.

Group members, being aware of the developing artwork of other groups, use the public 'design showcase' area for displaying group work and canvassing other opinion. The introduction of a public critiquing space proves to be highly successful (section 6.3.2). It is used increasingly for presenting, viewing and critical analysis of group work in progress. The introduction of forums also works very well in providing an initial impetus to the project by giving everyone a sense of the project's size and range. At the same time, a sense of anticipation and excitement was generated which was stimulating and beneficial to the success of the project. The public forums also allow the students to feed on the initiative of others, for instance, in suggesting going off into group discussions, meeting up in the virtual classroom for synchronous discussion or answering other people's problems. The success of the public forums was indicated by the fact that the vast majority of participants visited and posted to these forums repeatedly during the project (section 6.3.1). However spaces set up to be used by the whole class for social rather than project orientated chat were again underused. This might question the need, cited by some researchers, for this type of space (Pallof & Pratt, 1999, Tobins & Tippins, 1993). The analysis of Study 2 suggests that setting up appropriate access privileges to private group

areas, public engagement areas and appropriate opportunity for peer and group critiques can help to ensure a dynamic and productive collaborative online learning environment.

The design process can be considered as a method for resolving ill-defined problems by adopting solution-focusing strategies and abductive styles of thinking. The process is context driven with ideas emerging over time and interaction is an important element as the design group arrives at solutions. Prompt feedback and direction, when requested, is helpful. Yet, there is a fine line between instructors' involvement in online learning and students' constructing their own knowledge by learning from one another. If the instructor is willing to give up control of the learning process and give feedback only at fixed times, this might allow student groups to take ownership of the problem and facilitate successful collaboration. Indeed some educational research supports this proposition (Jonassen, 2000, Sorensen & Takle, 2003). Other research argues that the best thing instructors can do is to adhere to their best instructional practice and then get out of the way (Palloff & Pratt, 1999). However, while some students might well take control others may not. Instead, they might withdraw from the collaboration. Meaningful learning requires ownership of the problem to be solved. In order to provide support for continuing student learning, the research suggests that instructors ensure that the students undertake sufficient preparation for their online collaboration and are aware of the significance of the online and collaborative context of the project. This will give the students some control over and ownership of the experience and is in broad agreement with the findings from other studies (Land & Green, 2000). These design decisions will have inevitable implications for the role of the instructor in collaborative projects and consequently for professional practice.

### 7.6 Group dynamics and partnership in collaborative group work

Study 3 examines a situation where, after an unsuccessful start to a collaborative project, design students were allowed to form themselves into new groups rather than remaining in their allocated groups. Substantial drop out had initially occurred in this

project but this was more than likely to have been the result of two of the collaborating universities setting the DesignLink project as a voluntary rather than a graded part of their course (section 6.4.2). An issue that arose from this study is the need for a clear understanding by the students of where the collaboration sits in the context of the course curriculum. This supports other research that suggests that the context for the collaboration and the way it is set up are extremely important to the success of collaborative activity (Hoyles et al, 1994). Similar results came from other research into co-located group activity, where it was found students' expectations, their sense of the activity and their individual roles will play a strong influence on outcomes (Mercer & Fisher, 1992). Analysis of Study 3 suggests that the introduction of the project should clearly underline aims, objectives, and assessment criteria and clarify individual and group responsibilities for the project. (section 6.4). It should also stress the level of commitment required from the students. Study 3 indicates some potential for not prescribing group composition but allowing time at the start of the project for a general forum to allow students to make up their own groups. Students could then introduce themselves and begin to align themselves with chosen peers (section 6.4.3). This might allow groups to take ownership of the project and help to forge bonds within cohesive groups having shared ownership of the problem (section 6.4.4).

Analysis of the data from all three studies indicates the importance of a number of factors to do with group dynamics and partnership; the group clearly defining their purpose (section 6.2.1), the creation of private and secure meeting places (section 6.3.2), effective leadership developed along with specific roles and responsibilities for individual members within each group (section 6.2.4). These factors might help to establish norms and a clear code of conduct that might assist members in resolving their own disputes. Conflict, rather than proving destructive, can contribute to group cohesion and to the quality of the learning outcome (section 6.2.5). The analysis of group activity indicates that self-selected groups might establish a sense of community more quickly than pre-determined groups (section 6.4.4).

Online collaborative projects are more suitable for students who have extant knowledge of design, confidence in their prior experience as designers and are committed to allocating time and effort to the project despite any conflicting deadlines from other coursework. The project can be introduced in part as an exploration of and reflection on design processes and procedures. The aims of the project would then be as much about reflective practice and design theory as about the collaborative experience of online designing. In this case online collaborative projects, such as DesignLink, might be more suitable for senior students and introduced as vocational studies projects. Student groups could either, consist solely of design students, or, be inter-disciplinary in nature. Multi disciplinary teams might make it possible to reflect real life situations with participants taking on a variety of roles. On the other hand, design students could form productive creative groups and gain experience in collaborating as designers online. A longer time allocation for online projects might allow time for the cementing of community and the gradual build up of a community of practice to work on real life 'dirty' design problems. Clear assessment criteria and instructions, required number and frequency of synchronous meetings and asynchronous communication, fixed deadlines, set times to be allotted to online communication and offline visual research and preparation should all help to ensure a successful collaborative experience. Introducing basic study skills in time management, goal setting and self-evaluation might help to ameliorate any logistical and organisational problems that may occur.

## 7.7 Design of the collaborative interface

In addition to addressing the research questions, it became clear over the period of the research that it was necessary to evaluate issues arising from the design of the Blackboard and WebCT interfaces and how the student-computer interfaces affected the nature of group collaborative activity. The design of the online interface is critical to establishing an appropriate environment for design collaboration. Effective scaffolding included forums for threaded asynchronous discussions, functional synchronous meeting

places, autonomous group workspaces as well as accessible public forums and the facility to display images and video clips on site. This supports other research that has been done into collaborative online learning (Seels & Glasgow, 1998, Jonassen et al, 1999, Schwartz et al, 1999, Oliver et al, 2001).

Online learning environments for design can facilitate active thinking and autonomy in decision-making by encouraging these cognitive skills through constructive scaffolding of the site. The collaborative interface will require clear navigational aid and well-designed structure. Strong graphic design of colour, symbols, signage and style is essential for intuitive navigation and functioning of the environment. The design of the content of the site is also essential to productive online learning environments. Clear deadlines, a well written brief, comprehensible online instructions and threaded discussions are ways of scaffolding learning in the online environment. Most important is the need to embed precise and succinct instructions within an intuitive navigational interface to scaffold participant interventions.

The development and exchange of artwork is critical to the success of these collaborative group projects since the developing artwork externalises the internal processes of negotiation of meaning and knowledge building. The students develop their artwork using the graphic applications: Illustrator, QuarkXpress or Photoshop. If picture file exchange was problematic, it could ruin the project and worse, perhaps, turn the instructors and students off the idea of using technology as a collaborative tool. Creating small graphics files is the key to distributing images on the Internet as web servers can store and transmit images more efficiently, and viewers can download images more quickly. The students were instructed to keep the physical size of the files to below 10 centimetres and the digital size to around 1 megabyte. They were also told to use either the Graphics Interchange Format (GIF) or the Joint Photographic Experts Group (JPEG) graphic file format when developing their artwork. In general, continuous-tone images such as photographs were to be compressed as JPEG files and illustrations with flat colour

or sharp edges and crisp detail, such as type, were to be compressed as GIF. The groups transferred their work using the File Exchange facility as either GIF or JPEG files.

## 7.8 *Reflections*

In order to maximize the pedagogical potential of online collaborative projects, experience reminds us that some basic preparations are necessary and certain guidelines can be established. Jonassen identifies three integrated components of constructivist learning environments, problem context, problem representation or simulation and a problem manipulation space (Jonassen, 2000). The DesignLink interface was designed to support learning by scaffolding student experience for each of these components. The problem context is international design collaboration. The environment is designed as a virtual design studio and the problem manipulation space, by involving multiple perspectives, supports the complexity of the knowledge domain (Jonassen, 1994). The aim is for this focus on learning supports to help to promote a successful online collaborative design environment (Oliver et al, 2001).

My experience of developing the DesignLink projects suggests that basic preparation and guidelines for incorporating online collaborative environments into the design studio might include:

- Involving the instructors in preliminary planning and design of the online environment.
- Giving the instructors time to introduce the subject matter of the project.
- Allowing time for the students to become familiar with the site and the requirements of the project.
- Setting up a login and password for instructors prior to commencement to allow them to access the site, to observe what is going on and to become familiar with the project prior to its commencement.

- Clearly identifying each stage of the project and the deadlines for completing aspects of the project.
- Creating a database of useful web links on site.

Although some students had indicated their approval of some form of audio-visual link, the setting up of such links can prove problematic. However, with the rapid improvements in and accessibility of instant messaging systems on the Web, it might be advisable to include an audio-visual link. Cable high bandwidth connectivity is growing exponentially. A number of Internet-based software applications are being developed that enable communication and collaboration in real time and use tools that are separate applications relying on users to invoke them individually while using a net conferencing system. These include JETS (Shirmohammadi et al, 1998), REDISE (Jopke & Luther, 1999) and RC developed at the University of California (Blake, 2000). Systems based on the metaphor of shared workspaces are also appropriate. One such system Helpmate, developed at the University of Ulster, includes interactive tools such as video/audio and shared whiteboards (Curran, 2002).

In future collaborations I would research the availability of multi-media, Internet based collaborative applications with technological features that might include:

- Sharing remote documents and making real-time amendments.
- Using instant messaging to develop design ideas.
- Using a chat room for student-instructor question and answer sessions.
- Allowing access to design work on remote computers.
- Communicating via web cam and audio.
- And using whiteboards for interactive sketching.

Learning activity management systems could also be considered for future collaborations. SaKai, a leading open source Collaboration and Learning Environment, and LAMS an open source Learning Design system together could provide an intuitive visual

collaborative authoring environment to support and develop online pedagogy (LAMS, 2005).

In each of the three studies in this research participating students enjoyed the distributed group activity and this enthusiasm supports earlier studies suggesting that most students find collaborative learning to be a pleasurable and satisfying experience (Fry & Coe, 1980). Student motivation has also been cited as a principal factor benefiting collaborative learning environments with the inherent reward systems in co-operative environments providing a positive motivation for participants (Slavin, 1990). Overall the three studies support other research in arguing for the pedagogic benefits of using collaborative online projects in design education at the university level (Scrivener & Vernon, 1998). However, a caveat ought to be introduced. Teachers will need to be enthusiastic and motivated if the collaborative work is to be successful. Problems of logistics, time differences, the place of the project in the curriculum of each college, assessment criteria, aims and goals, all of these issues need to be addressed early on in the collaboration. A great deal of time and effort will need to be spent in setting up the context for the collaboration in order to manage logistics and organization. Similarly, it is important that advice and support are sought from those departments responsible for technical provision and resources in the institution at an early stage in the design of the collaboration. For the projects to work successfully a network of like-minded instructors is needed who are keen to explore the potential of this type of activity and its place in the design curriculum. Access to online learning applications, graphic design applications and a network connecting these and the Internet are primary requirements. An ongoing relationship with other design instructors will allow the projects to be introduced each semester utilising the same infrastructure. Collaborative online projects are not to be undertaken lightly. The amount of preparation and setting up required, the design and development of the online learning environment, the amount of organization and overseeing, all of this represents a tremendous amount of work for instructors

contemplating incorporating online collaborative activities into their design course. The potential benefits for design educators, however, can make all this effort worthwhile.

### 7.9 Implications for future research

A design culture has been identified which inhabits a cross cultural space and which values teamwork and collaboration across borders and allows for the sharing of intercultural perspectives in a globalised age. Online learning environments hold the potential to make international collaboration in joint design projects more feasible by allowing students from universities in different parts of the world to meet, share ideas and work together. Future research might explore the impact of multiculturalism on computer supported collaborative work and the need for cross-cultural support systems in multi-user interdisciplinary online environments.

Online collaboration comes with a great deal of autonomy. Students need to use both initiative and self-discipline in taking on responsibility to organise and complete their design work. Much collaborative activity online has been pursued at the postgraduate level where students can be expected to have acquired these skills but by introducing online collaborative at the undergraduate level there may be a danger of high attrition and drop out (Kearsley, 2000). Involvement in online projects may work best with senior students as group outcomes may prove to be more successful when skill levels, prior experience, motivation and commitment are higher. Studies on face-to-face collaboration have indicated the need for leadership from a competent peer or facilitator (Vygotsky, 1978, Hoyles et al, 1992). In this situation the more capable student may dominate the group while the less able student might adopt a spectator role so it is important that all the participants should have some say in negotiating the ground rules for group interactions (Mercer, 1996). This could be another interesting area for further research into online collaboration.

Another issue that might hold some potential for research is the relationship between design processes, the design critique, discourse types and postings. The pivotal role of the

critique in design education might suggest research attention could be paid to what is happening between design students during synchronous online meetings. Records of synchronous chat could be examined to see how much design talk interaction takes place in these forums and the impact this has on group decision-making. This might lead to the identification of improved ways of scaffolding online design collaboration. Another fruitful avenue for further research might lie in issues to do with the adoption of roles within groups and the nature and composition of student design groups.

Research into using online collaboration for developing students' cognitive design skills holds potential. What would be exciting would be to develop this work further by interrogation of a larger population of design groups to identify a range of higher order thinking occurrences and how these occur and might be encouraged in online environments. The research could be designed around collaborating groups' involvement with various forms of scaffolding and the online collaborative student dialogue might then be coded for incidences of higher order thinking such as problem solving, flexibility of idea formulation, information handling or decision-making.

The professional boundaries of design educators are being challenged by rapid developments in technology, by the alternative sources of expertise these developments introduce and by the consequent changes in the culture of the design classroom. Incorporating collaborative projects into the design curriculum can help to provide a critical design education for a modern society (Thistlewood, 1990, Oliver, 2001). In the hands of committed teachers, online environments can engage and motivate students, support innovations that will improve student performance, enable students to develop cognitive design skills and can be used as the springboard to a real-world context for student learning. The use of online collaborative work can be of particular benefit for design education in facilitating the forms of international and inter-disciplinary collaboration that lie at the heart of the contemporary professional design practice. My grounded practitioner research, by focusing on designing as a social process, has implemented and examined strategies for developing online learning environments for

design collaboration in the design classroom. I hope that the study will contribute to design teachers developing online environments for developing design skills and stratagems and that the findings outlined in this thesis will provide some insight and help for them in using communication technology for collaborative design projects.

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*DESIGNLINK: PARTICIPATING INSTITUTIONS AND FACILITATORS*

| | phase 1 | | phase 2 | | | phase 3 | phase 4 |
|---|---|---|---|---|---|---|---|
| Spring 2001 | Spring 2001 | Jan/Feb 2002 | Mar/Apr 2002 | Nov/Dec 2003 | Mar/Apr 2004 | June/July 2004 |
| Richmond University<br><br>University of Nebraska | Richmond University<br><br>University of Nebraska | University of Ulster-Magee<br><br>University of Missouri – Columbia<br><br>Richmond University<br><br>Indiana-Purdue University<br><br>Southampton Institute of Higher Education | University of Nebraska<br><br>Richmond University<br><br>University of Denver<br><br>Universad Icesi Cali-Colombia<br><br>York University Toronto | Iowa State University,<br><br>Central St. Martins The London Institute<br><br>Richmond University | Iowa State University<br><br>LaSalle Singapore<br><br>University of Missouri – Columbia | Iowa State University |
| 7 * 2 co-located<br>2 * 2 distributed | 8 * 2 distributed | 15 * 3 distributed | 9 * 3 distributed<br>1*2 co-located | 10 * 3 distributed | 2 ' 2 co-located<br>1 * 2 distributed<br>1 * 3 co-located<br>1 * 4 distributed | 2 * 3 distributed |
| 18 students | 16 students | 45 students | 29 students | 30 students | 13 students | 6 students |

Table 27 Participants in DesignLink, 2001 – 2004.

Alan Baines, Senior Lecturer, Central St Martins, University of the Arts, London, UK; Maya Drodz, Visiting Assistant Professor of Visual Communication, Indiana University-Purdue University-Indianapolis, US;
Cinthea Fiss, Assistant Professor eMAD, University of Denver, US;
Paul Hodgeson, Assistant Professor of Design, Richmond American International University in London;
Deborah Huelsbergen, Associate Professor Undergraduate of Graphic Design, University of Missouri-Columbia, US;
Wojtek E. Janczak, Associate Professor of Design, York University, Toronto, Canada; Philip Long, Senior Lecturer in Visual Communication, Southampton Institute of Higher Education, UK;
Justin Magee, Lecturer in Product/3D/Multimedia, University of Ulster, Northern Ireland;
Yulius McGd, Assistant Professor of Design, LaSalle College of the Arts, Singapore; Juan M. Salamanca, Professor of Design, Universidad Icesi, Cali-Colombia, Colombia; Richard Schuessler, Associate Professor of Graphic Design, University of Nebraska at Kearney.
IT Staff who gave assistance and support in developing the DesignLink websites at Iowa State University, US and Richmond American International University, UK.

APPENDIX 2

*A FRAMEWORK FOR ANALYSING EDUCATIONAL MEDIA*

*Teacher's Conception* ← *1 Theory, ideas* → *Student's Conception*
*2 Conceptions*
*3 Re-description* →
← *4 Re-description*

5 Adaptation of task goal in light of S's Description

12 Reflection on learner's actions to modify descriptions

10 Adaptation of actions in light of theory, goal, and feedback

11 Reflection on concept in light of experience

*Teacher's Constructed Environment* ← *6 T sets goals* → *Student's Actions*
*7 S's action*
*8 Feedback* →
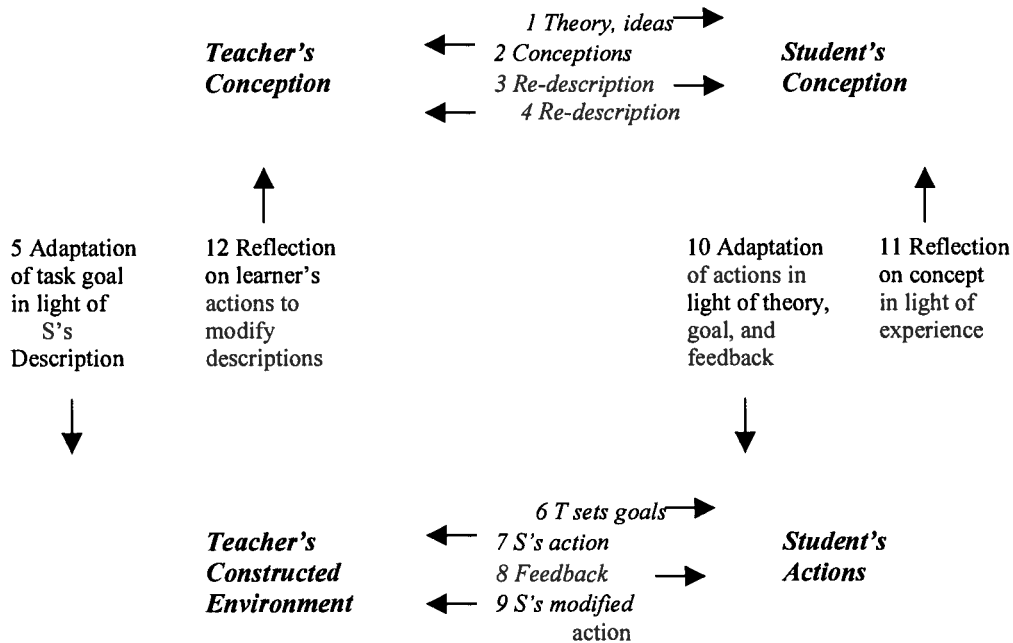← *9 S's modified action*

Figure 22 *The Conversational Framework*

Figure 11.1 The Conversational Framework identifying the activities necessary to complete the learning process (p87).
Laurillard, D. (2002) Rethinking University Teaching A Conversational Framework for the effective use of Learning Technologies, (2$^{nd}$ Edition), London: Routledge Falmer.

*APPENDIX 3*

*INITIAL QUESTIONNAIRE*

♦ Answer the following questions by either underlining one response or typing in your answer.

♦ Please return this completed questionnaire to your instructor by saving it to your hard disc, completing it and then dropping it into the digital dropbox in the Tools section of Blackboard.

1. Your Name     _____

2. Your Group     _____

3. Your University     _____

4. Your Major/Degree Subject     _____

5. Year of Study:     _____

**6.** How do you rate your computer skills?

Good      Adequate      Non existent

7. Have you ever used the following computer software?:

| | | |
|---|---|---|
| PhotoShop | Yes | No |
| QuarkXpress | Yes | No |
| Illustrator | Yes | No |
| Word | Yes | No |
| Blackboard | Yes | No |

8.  How difficult do you think it will be to work with people in other countries on the same project using a virtual environment?

Very    Somewhat    Not at all

9.  What do you hope to gain from this experience both personally and professionally

_____
_____
_____

10. In your opinion how useful will BLACKBOARD be at each stage of the design process?

   a) in the early stages when trying to come up with ideas.

   Very useful          Adequate          Useless

   b) in the middle stages when trying to develop ideas.

   Very useful          Adequate          Useless

   c) in the later stages when trying to finish off artwork.

   Very useful          Adequate          Useless

12. Do you think being able to use a webcam facility will

   ◆      be essential for communications
   ◆
   ◆      not add anything to communications

11. Do you think using BLACKBOARD for collaborative design work will be

   ◆      Frightening?      Very    Somewhat    Not at all

   ◆      Exciting?         Very    Somewhat    Not at all

   ◆      Waste of time?    Very    Somewhat    Not at all

   ◆      Easy to learn?    Very    Somewhat    Not at all

Please give reasons for your answers above

thank you for your co-operation.

*APPENDIX 4*

*FINAL QUESTIONNAIRE*

♦ Answer the following questions by underlining one response and typing in your answers.

♦ Please return this completed questionnaire to your instructor by saving it to your hard disc, completing it and then dropping it into the digital dropbox in the Tools section of Blackboard.

1. Your Name                _____

2. Your Group               _____

3. How difficult do you think it was to work with people in other countries on the same project using a virtual environment?

     a. Very     Somewhat     Not at all
     b. Please give reasons for your answer
     c. _____
        _____
        _____

4. What do you felt you gained from this experience both personally and professionally

     a. _____
        _____
        _____

5. In your opinion how useful was BLACKBOARD for making decisions and arriving at solutions at each stage of the design process?
     a. Please give reasons for your answers
     b. in the early stages when trying to come up with ideas.

Very useful           Adequate           Useless

_____
_____
_____

    c.  in the middle stages when trying to develop ideas.

Very useful          Adequate          Useless

    d.  _____
_____
_____

6.  in the later stages when trying to finish off artwork.

Very useful          Adequate          Useless

    a.  _____
_____
_____

7.  Do you think being able to use a webcam facility would have helped communications or would not have helped communications

    a.  _____
_____
_____
_____

**8.**  Do you think using BLACKBOARD for collaborative design work was

| | | | |
|---|---|---|---|
| Frightening? | Very | Somewhat | Not at all |
| Exciting? | Very | Somewhat | Not at all |
| Waste of time? | Very | Somewhat | Not at all |

9.  Do you think using BLACKBOARD for this project:

has helped you to develop your ideas with your partners more easily?

Yes definitely          Yes somewhat          No, not at all
Please give reasons for your answer

helped you to communicate your ideas to your partners more easily?

Yes definitely          Yes somewhat          No, not at all
Please give reasons for your answer

_____
_____
_____

10. In your opinion, which of the following were the disadvantages of using BLACKBOARD for this collaborative design project?

I was not face to face with my partner

Yes definitely          Yes somewhat          No, not important to me
_____ Please give reasons for your answer

_____
_____
_____

I did not get immediate feedback to my thinking and ideas.

Yes definitely          Yes somewhat          No, not important to me
_____ Please give reasons for your answer

_____
_____
_____

It was difficult only communicating electronically.

Yes definitely          Yes somewhat          No, not important to me
_____ Please give reasons for your answer

_____
_____
_____

11. In your opinion, which of the following were the advantages of using BLACKBOARD for this collaborative design work?

I could easily communicate with my partner whenever I want.

Yes definitely          Yes somewhat          No, not important to me

_____
_____

I could ask questions without embarrassment.

Yes definitely          Yes somewhat          No, not important to me

_____

_____

I could easily exchange artwork as electronic files

Yes definitely          Yes somewhat          No, not important to me

_____

_____

I could research material on the Internet and pass it to my partner with ease

Yes definitely          Yes somewhat          No, not important to me

_____

_____

12. Would you consider using BLACKBOARD even if you were working on the same campus as your partner

    a. Very often      Sometimes      Not at all

13. Number these features in the order you liked using them in the order you used them most

    14. File Exchange

    15. E-mail

    16. Virtual Classroom

    17. Discussion Board

    18. Electric Blackboard

    19. Digital Drop Box

20. Do you think that using BLACKBOARD can improve your ability to design?

Very much      Somewhat      Not at all

*APPENDIX 5*

*QUESTIONNAIRE DATA*

| | | Co-located Group | Distributed Group |
|---|---|---|---|
| RATING | Computer skills | .66 | .5 |
| RATING | Previous experience | .33 | .66 |
| PROCESSES | Develop idea | 0 | .17 |
| PROCESSES | Communicate idea | .17 | .17 |
| PROCESSES | Not face 2 face | .5 | .66 |
| PROCESSES | Lack immediate feedback | .5 | .17 |
| DISADVAN. | Only digital comm. | .17 | .17 |
| DISADVAN | Communicate any time | .5 | -.17 |
| DISADVAN | Ask questions - embarrassment. | -.33 | -.5 |
| DISADVAN | Easy exchange artwork | .83 | .66 |
| ADVAN | WWW research & exchange | .66 | .33 |
| ADVAN | Getting idea | .33 | -.33 |
| ADVAN | Developing idea | .5 | .66 |
| STAGES | Executing idea | .17 | .5 |
| STAGES | Use Bb if co-located | .17 | -.33 |
| FEATURES | Order of use | EM/FE | EM-FE |
| FEATURES | Order of preference | EM-FE | EM/FE |
| FEATURES | Frightening | -.66 | -.5 |
| FEATURES | Exciting | .17 | 0 |
| FEATURES | Waste of time | -.66 | -.66 |
| FEATURES | Easy to use | .5 | .5 |
| FEATURES | Improves design skills | .17 | .5 |

*Averaged responses of the 6 distributed and the 6 co-located groups. N =24*
*(Values range from 1 indicating the most positive response to -1 the most negative response)*
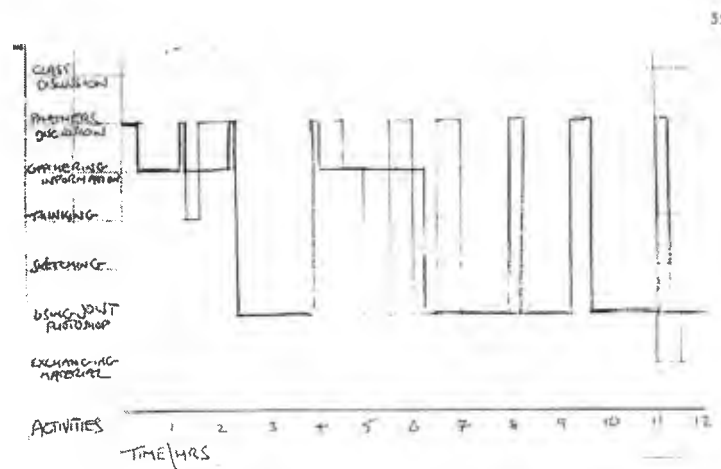
*ACTIVITY SHEET*



Diagram 3.        London – Nebraska Link:  Time Sheet of a Distributed Group.

note the regularity of movement between partner discussion and use of software
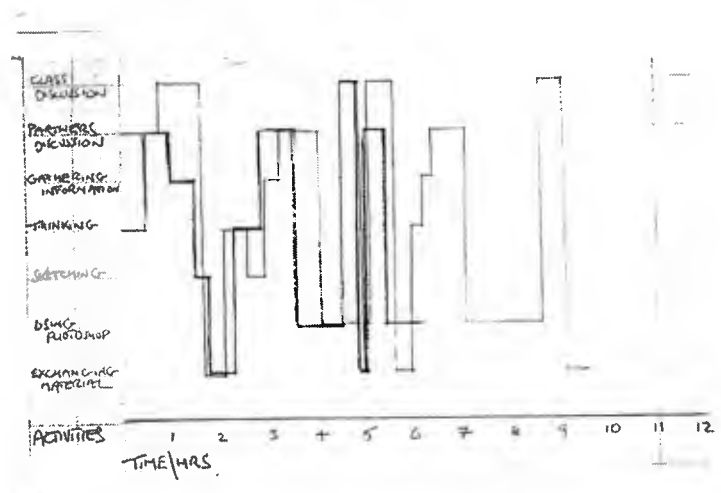


Diagram 4.        London – Nebraska Link:  Time Sheet of a Co-located Group.

note the irregularity of pattern between the group members.

Coded student activities:

Class discussion, Partners' discussion, Gathering information, Thinking, Sketching, Using Photoshop, Exchanging material.

*REFLECTIVE JOURNAL*

Categories were identified to code student activities including reflection, decision-making, general discussion, informal conversation, brain-storming, idea-generation, sketching and drawing and the students were asked to record their activities during the project (see the section on methods in chapter three).

# DesignLink reflective journal
# International Collaborative Project

**Week one/two/three/4**          **Date :**
**Year :2002**                    **Discipline of Degree/Major :**
**Group :**                       **Year of Study:**
**Name :**                        **University**

- Please return the completed journals to your instructor by saving it to your hard disc, completing it and then dropping it into the digital drop box in the Tools section of Blackboard.

- Please describe your design activities (distinguish between collaborative and individual work) each week as a reflective journal

| Day | Description of Work Completed | Total Hrs. |
|---|---|---|
| Mon | | |
| Tues | | |
| Wed | | |
| Thurs | | |
| Fri | | |
| Sat | | |
| Sun | | |
| Total Hrs. | | |

*APPENDIX 8*

*BLACKBOARD PROJECT ASSIGNMENT*

## International Corporate ID: Collaborative Design Project

This project is intended to allow you to work collaboratively as a team with two other design students. You should discuss and develop your ideas using the communication facilities available in your 'GROUP' area in Blackboard.

As a result of the terrorist activities of September 11 2001, there has been something of a crisis in the airline industry. Some national airline carriers have gone into liquidation (eg Sabena, Belgium) while others have been forced to make redundancies in their work force and re-organize their schedules.

Choose two national or international airlines as candidates for amalgamation and design an international corporate id for this new global airline.

Consider different national perspectives regarding the chosen airline companies and the 'other' country. Design teams should take into account each airlines current image and reputation and could also take into consideration the 'special relationship' between the two countries. Teams are encouraged to exchange opinions and ideas in their design development which might include possible variations more suited for national consumption.

Design a logo for the 'new' airline and incorporate this into promotional material marketing the new ID. You are free to choose the style and substance of this material from letterheads and business cards to livery design and fascias but bear in mind commercial constraints.

Your final presentation should include a sketch book illustrating the joint design development of your ideas as well as a plastic sleeved presentation folder containing a title page, the brief, the final proposal and the final artwork presented as a sequence of PhotoShop Jpeg or Gif files.

In addition you are expected to make an individual presentation of your work to class.

## Method
Each design group needs to begin to develop ideas as soon as possible. Do this by using the communication facilities available in the 'GROUP' area to set up regular times to 'sit down' with your team and exchange ideas.

Use the discussion board and virtual chat (or the web cam link if available) to communicate at pre-arranged times and e-mail and the discussion board for asynchronous communication.

It is very important that you keep a record of your activities, how much time you spend on each and the order in which you do them by completing a reflective journal. This will be used for analysis at the end of the project. You are also asked to keep a record of your exchanges.

In addition, you will complete a questionnaire both at the beginning and at the end of the project; and take part in a video interview discussing your experiences at the end of the project.

Both the reflective journal title sheets and the questionnaires can be downloaded to your desktop from the 'COURSE DOCUMENTS' area. When you have completed these use the 'DIGITAL DROPBOX' in the 'TOOLS' area to send them to your instructor.

Creating small graphics files is key to distributing images on the World Wide Web. With smaller files, Web servers can store and transmit images more efficiently, and viewers can download images more quickly.

Use either the GIF (Graphics Interchange Format) or the JPEG (Joint Photographic Experts Group) graphic file format when developing your artwork. In general, continuous-tone images such as photographs should be compressed as JPEG files. Illustrations with flat color or sharp edges and crisp detail, such as type, should be compressed as GIF.

When transferring your work - (using the File Exchange facility in your 'GROUP' area in Blackboard) - save for the web in Photoshop either as Gif or JPEG. Try to keep physical size to below 10cm if possible. You may work using any of the following graphic applications: Illustrator, QuarkXpress or Photoshop.

## Timetable and Deadlines
You should adhere to the following timetable for the project:

March 18 - 22 - Intro week
Student Orientation Week
Introduction to the project
Introduction to corporate id
Introduction to Blackboard
Introduction to partners

Completing initial questionnaire

March 25 - 29 week one
Initial design stage.
Use file exchange to submit initial questionnaire
Brainstorm, develop ideas, research content.
Using the discussion board, virtual classroom or e-mail or web cam link

April 1 - 5 week two
Use file exchange to submit first week's activities sheet
Use e-mail or discussion board to fix up meeting times
Use file exchange-to-exchange thumbnail sketches (72DPI, GIF/JPEG or PDF)
Research content (text & Images) using the discussion board or e-mail

April 8 - 12 week three
file exchange - 2nd week's activities sheet
produce a preliminary proposal
file exchange - design development (images and text as roughs, draft layouts,

April 15 - 19 week 4
open design critique - final design reviews - finalise proposal
file exchange - 3rd week's activities sheet file
file exchange - final artwork (CYMK mode, GIF/JPEG or PDF)
file exchange - final questionnaire
file exchange - 4th week's activities sheet file
Deadline for completion of Project - Monday April 22
Presentation of final work to class this week

Assessment.
This will be based on the following:
25 % Preliminary research, sketching and ideas.
25 % Design and creativity.
25 % Software Proficiency.
25 % Final Artwork.

**AS WELL AS COMPLETING THE BRIEF YOU ARE ASKED TO DESCRIBE YOUR WORK BY:**
- filling in an initial and a final questionnaire; sets of questions about your behaviour, attitude, approach and method while problem-solving.

- - completing a reflective journal - describe your activities such as reflection, decision making general discussion, informal conversation, brain-storming, idea-generation, sketching and drawing. You are asked to keep timed and coded observations logs of these various activities you engage in during the problem-solving process.

- taking part in a short video-taped interview - short semi-structured interviews will be conducted to assess your performance in the project and your views on how you negotiated meaning collaboratively through your actions and behaviours.

*DISTRIBUTED GROUP THREADED DISCUSSION BOARD*

An international online environment
**Discussion Messages: group 7 studio space**

| Subject | Author | Date |
|---|---|---|
| hello group 7 | Christopher Saldanha (saldanha) | April 1, 2004 7:55pm |
| 2nd hello from boon | Kian Lee Boon (w.kian) | April 4, 2004 10:41pm |
| Re:2nd hello from boon | Christopher Saldanha (saldanha) | April 5, 2004 11:59am |
| | | |
| meeting schedules | Kian Lee Boon (w.kian) | April 10, 2004 1:48am |
| need to get started | Christopher Saldanha (saldanha) | April 8, 2004 9:55am |
| meetings... | Kian Lee Boon (w.kian) | April 15, 2004 11:11am |
| Re Meetings: | Kian Lee Boon (w.kian) | April 19, 2004 9:13pm |
| | | |
| Airline Choice? | John Fraser (ARTIS301_2) | April 18, 2004 1:24pm |
| Re: Airline Choice? | Kian Lee Boon (w.kian) | April 19, 2004 9:08pm |
| | | |
| Brainstorming for Logo De... | John Fraser (ARTIS301_2) | April 18, 2004 1:30pm |
| Re: Brainstorming for Log... | Melissa Sheil (msheil) | April 26, 2004 6:21pm |
| Re: Brainstorming for Log... | Craig Oldakowski (coldakow) | April 26, 2004 6:26pm |
| Re: Brainstorming for Log... | Christopher Saldanha (saldanha) | April 26, 2004 7:29pm |
| Re: Brainstorming for Log... | Melissa Sheil (msheil) | April 26, 2004 7:53pm |
| Re: Brainstorming for Log... | Christopher Saldanha (saldanha) | April 26, 2004 8:13pm |
| Re: Brainstorming for Log... | Kian Lee Boon (w.kian) | April 26, 2004 8:31pm |
| Re: Brainstorming for Log... | Kian Lee Boon (w.kian) | April 26, 2004 8:42pm |
| Re: Brainstorming for Log... | Christopher Saldanha (saldanha) | April 26, 2004 8:45pm |
| Re: Brainstorming for Log... | Melissa Sheil (msheil) | April 26, 2004 8:47pm |
| Re: Brainstorming for Log... | Melissa Sheil (msheil) | April 26, 2004 8:48pm |
| | | |
| Actual Development of Log... | John Fraser (ARTIS301_2) | April 18, 2004 1:45pm |
| Re: Actual Development of... | Christopher Saldanha (saldanha) | April 26, 2004 8:58pm |
| Re: Actual Development of... | Craig Oldakowski (coldakow) | April 26, 2004 9:04pm |
| Re: Actual Development of... | Melissa Sheil (msheil) | April 26, 2004 9:08pm |
| Re: Actual Development of... | Melissa Sheil (msheil) | April 28, 2004 1:39pm |
| | | |
| Re: My letterhead system | Melissa Sheil (msheil) | April 28, 2004 3:32pm |
| Corporate system | Craig Oldakowski (coldakow) | April 28, 2004 5:07pm |
| Re: Corporate system | Christopher Saldanha (saldanha) | April 28, 2004 7:17pm |
| | | |
| Re: internet connection b... | Melissa Sheil (msheil) | April 28, 2004 7:53pm |

Re: internet connection b...    Craig Oldakowski (coldakow)        April 28, 2004 7:57pm

Creation of corporate id ...    John Fraser (ARTIS301_2)           April 18, 2004 1:56pm
Re: Creation of corporate...    Kian Lee Boon (w.kian)             April 28, 2004 7:56pm
Re: Creation of corporate...    Kian Lee Boon (w.kian)             April 28, 2004 8:10pm

Revised System                  Craig Oldakowski (coldakow)        April 28, 2004 8:18pm
Re: Revised System              Craig Oldakowski (coldakow)        April 28, 2004 8:28pm
Revised System by Boon Ki...    Kian Lee Boon (w.kian)             May 1, 2004 12:22pm
Boon Having Problems & Th...    Kian Lee Boon (w.kian)             May 1, 2004 12:30pm

Re: Boon Having Problems ...Craig Oldakowski (coldakow)            May 1, 2004 12:44pm
applications                    Melissa Sheil (msheil)             May 1, 2004 12:56pm
MMMMmmmm no one here... d...Kian Lee Boon (w.kian)                 May 1, 2004 12:44pm
Re: MMMmm no one here....    Christopher Saldanha (saldanha)May 1, 2004 1:27pm
Re: MMMmm no one here....    Craig Oldakowski (coldakow)  May 2, 2004 9:40am

Can I join your group?          Craig Oldakowski (coldakow)        April 21, 2004 2:17am
Re: Can I join your group...    Christopher Saldanha (saldanha)    April 21, 2004 10:11am

Got room for one more????...Melissa Sheil (msheil)                 April 23, 2004 1:07am
Got room for one more...        Kian Lee Boon (w.kian)             April 23, 2004 12:09pm

meeting 21st april on AIM...Kian Lee Boon (w.kian)                 April 21, 2004 9:15pm
great rcord of collaborat...    John Fraser (ARTIS301_2)           April 23, 2004 11:26am

meeting 23rd april on MSN...    Kian Lee Boon (w.kian)             April 23, 2004 12:11pm
next meeting --- mon wed ...Kian Lee Boon (w.kian)                 April 23, 2004 12:41pm
back in town                    Christopher Saldanha (saldanha)    April 25, 2004 3:49pm
Re: back in town                Melissa Sheil (msheil)        April 25, 2004 9:36pm
meeting... getting togeth...    Craig Oldakowski (coldakow)        April 26, 2004 7:50pm
April 26th meeting — whol...Craig Oldakowski (coldakow)            April 26, 2004 9:54pm

final artwork and final s...
April 28th meeting              Craig Oldakowski (coldakow)        April 28, 2004 8:47pm

Meeting Conclusion              Craig Oldakowski (coldakow)        April 28, 2004 8:55pm

PRESENTATIONS                   Kian Lee Boon (w.kian)        April 28, 2004 9:34pm
Re: PRESENTATIONS               John Fraser (ARTIS301_2) April 28, 2004 10:23pm

May 1st Meeting - Final m...Craig Oldakowski (coldakow)            May 1, 2004 1:11pm
Boon- Final Presentation        Craig Oldakowski (coldakow)        May 1, 2004 1:21pm

Its A Wrap!!!                   Kian Lee Boon (w.kian)        May 2, 2004 10:33am

Re: Its A Wrap!!!          Kian Lee Boon (w.kian)     May 2, 2004 9:50pm
Re: Its A Wrap!!!          Kian Lee Boon (w.kian)     May 3, 2004 12:46am
Re: Its A Wrap!!!          Melissa Sheil (msheil)     May 3, 2004 12:39pm

Final design critique from John  John Fraser (ARTIS301_2)      May 3, 2004 11:06am

*APPENDIX 10*

*DESIGNLINK PROJECT ASSESSMENT CRITERIA.*

The following assessment criteria applied to the collaborative DesignLink projects.

Grade A applies only to the exceptional piece of work that:

- exhibits effective decision-making and creative argument in its development;
- involves substantial use of computer-mediated communication involving group work and collaborative thinking;
- is well supported by strong evidence of teamwork in visual research and design development;
- demonstrates a high level of quality. Superior (A-)), or outstanding (A).
- Grade B applies to work that:
- goes beyond a basic use of computer-mediated communication to develop as more questioning and analytical approach to problem solving;
- has involved collaboration that has evidently aimed to get the most learning out of the project;
- goes beyond the most basic required collaboration in visual research and development. Good (B-), very good (B), or excellent quality (B+).

Grade C applies to work that:

- is basically competent in using computer-mediated communication to develop artwork;
- fulfills the requirements of the assignment at a foundation level;

demonstrates adequate teamwork in presenting the final artwork coherently. Just below average (C-), average (C), or showing signs of reaching above the average (C+).
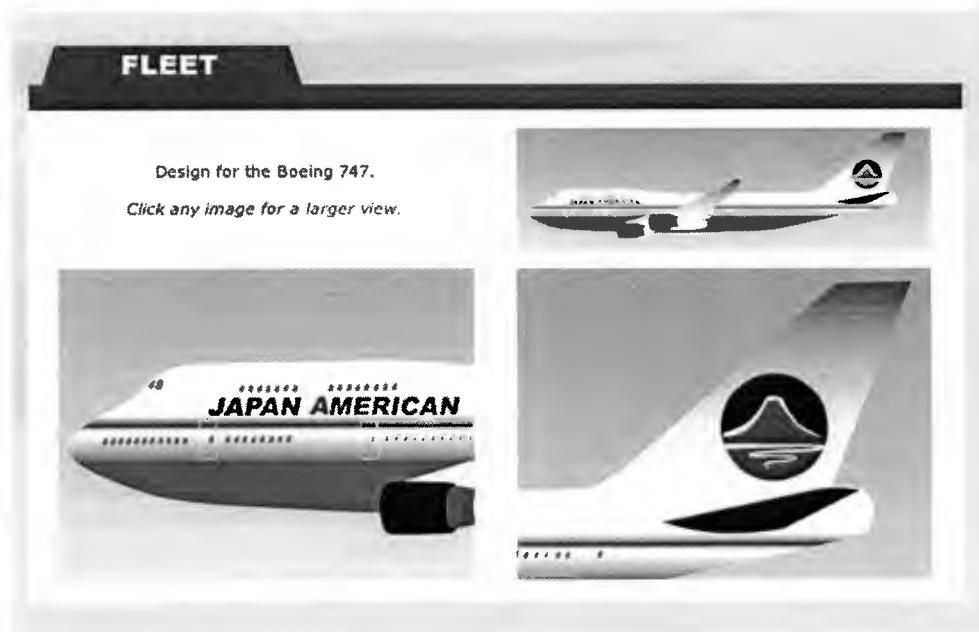Grade D applies to work that:
- has been done without proper understanding of the brief;
- is lacking in collaborative activity;
- exhibits little use of computer-mediated communication. Unsatisfactory work (D-), very poor work (D), and work that is weak (D+)
Grade F applies to:
- failure of the group to submit any work;
- late work after one extension has been given that is barely competent;
- work that may be competent but does not address the requirements of the assignment;
- has been created by others.

*STUDY 3: A PORTFOLIO OF ARTWORK*



FLEET

Design for the Boeing 747.

Click any image for a larger view.



UNIFORMS

Summer and winter flight attendant uniforms.

Click any image for a larger view.

**Quek Hong Shin**
LASALLE-SIA College of the Arts

**Brooke Weber**
Iowa State University

# JAPAN AMERICAN
## A I R L I N E S

### LOGO

The color red was chosen to represent Japan while blue represents the United States.

The mountain and stream image represents the idea that the airline flies "over mountains and seas."

*Click the image for a larger view.*

### STATIONERY

Letterhead, envelope, business card, and memo pad.

*Click on any piece for a larger view.*

American**Swiss**   ¤ About Us   ¤ Identity   ¤ Stationery   ¤ Applications   ¤ Advertising

The launch ad for American Swiss Air adopts an emotional approach with an emphasis on safety and the notion of returning home.

Click here to view a larger image.

American**Swiss**   ¤ About Us   ¤ Identity   ¤ Stationery   ¤ Applications   ¤ Advertising

AmericanAirlines

swiss skies

**Introducing American Swiss (AMSW)**

Due to the unabating wave of terrorists threats, as well as conflicts in many parts of the world (it seems conflicts in parts of world have become, sadly and surreal-ly, a 'norm')

American Airlines and Swiss Skies have come together to provide safe and speedy

expedition from hostile countries for Americans wounded, on military and/or on business and ambassdor-al duties.

American Airlines is one of America's top national airlines while Swiss Air is formerly an independent airline serving a similar purpose as AMSW.

Click here to go to American Airline's website or here to go to Swiss Skies.

170

# American**Swiss**

Logotype Full Colour Application. Red _____ of _Blue_ ___ ____

# American**Swiss**

Logotype Greyscale Application. _____ ___ Black _____ Black

The Logotype for American Swiss consists of the words **American and Swiss conjoined to form one word.**

**American is set in Red Helvetica Bold while Swiss is set in Blue Futura Bold.**

The Logotype appears in either full colour or in greyscale.

---

Futura

ABCDEFGHIJK _ ____PQRSTU____XYZ 1234567890~_,/.'[]\
abcdefghigjlmnokprstuvwxyz ___ !@#$%^&*[]_+[]{:"?><

Futura Bold

**ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890~_,/.'[]\**
**abcdefghigjlmnokqrstuvwxyz !@#$%^&*[]_+[]{:"?><**

Helvetica

ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890~_,/.'[]\
abcdefghigjlmnokqrstuvwxyz !@#$%^&*()_+[]{ '?><

Helvetica Bold

**ABCDEFGHIJKLMNOPQRSTUVWXYZ 1234567890~_,/.'[]\**
**abcdefghigjlmnokqrstuvwxyz !@#$%^&*()_+[]{:"?><**

Helvetica Italics

*ABCDEFGHIJKLMNOPQRSTUVWXYZ 12345678____ ,/;___*
*abcdefghigjmnokqrstuvwxyz !@#$%^&*()_+[]{ '?><*

The Corporate typeface for the airline Helvetica and Futura.

In the event that there is a for need for different typefaces for purpose of display and legibility, always choose a regular and a bold version of the type family to compliment each other.

Click here to view design developement.

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**AmericanSwiss**

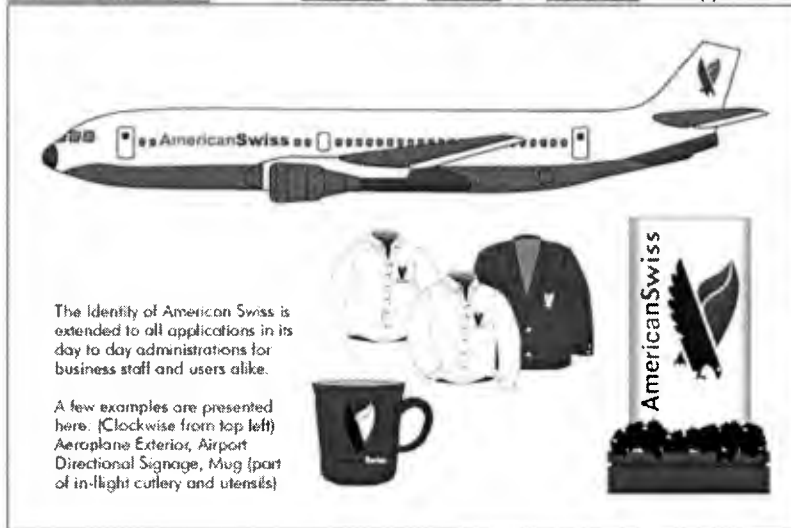White Background

**Swiss**

Red Background

**AmericanSwiss**

Black Background

When appearing on various colour backgrounds, the Logotype must always be distinguished by 2 different colours.

Wherever possible, the word American will always be in Red, Blue and then White in order of colour preference.



Continued from previous:
(Clockwise from top left) In-flight Safety Manual for passesngers, Shuttle Service Vehicle Transportation, In-flight Disposable Napkins, In-flight Barf Bag

The Identity of American Swiss is extended to all applications in its day to day administrations for business staff and users alike.

A few examples are presented here. (Clockwise from top left) Aeroplane Exterior, Airport Directional Signage, Mug (part of in-flight cutlery and utensils)

## Continental Arab Airlines
**designLink:** Ben Lumpkin & Heather Larson

**Project Intention:** Since 9/11, there have been mergers between airline companies just to stay alive. We wanted to show unity despite terrorism. So we chose two unlikely airline companies to team up. The US's Continental Airlines & Libyan Arab Airlines. We thought that if these two companies merged and were successful, then anything could happen.

### Application 1: Airplane branding



### Application 2: Boarding Pass



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