The University of Nottingham
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Collision of two communities: Developing higher education student teachers' creativity in design through a social networking collaboration with professional designers

by

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Abstract

This study examines the activity of an online community in developing design creativity. This involved undergraduate Malaysian university students and their tutor from the School of Education, and professional designers in a private online community using the social network site - Facebook - to improve interface design (websites or interactive courseware). Two research processes adapted from different communities - the creative industries and the higher education communities - were applied in the collaboration. Each community embraces distinctive methods, objectives, instruments, rules and roles in producing design. Contradictions and tensions resulting from incorporating these two communities were analysed. In addition, the effect of social interactions on students' performance, awareness, and perspectives were also investigated.

A qualitative approach was utilized and data consisted of online semi-structured questionnaires, face-to-face interviews, field documentation on Facebook, and Facebook chat. The process of analysis is divided into two parts: initial analysis and substantive analysis of four case studies. Thematic (Braun and Clarke, 2006) and comprehensive data treatment (Silverman, 2010) approaches were used to analyse the initial data. Activity systems analysis (Engeström, 1999) was employed in the substantive analysis to explore the contradictions within the collaboration.

The results indicate that contradictions occurred due to the new practice introduced by the community of practitioners (the designers). The collision of new practice positioned students in a disequilibrium stage but managed to also improve students' design outcomes and promote awareness of the importance of producing purposeful design. However it also revealed the importance of both cognitive and emotional support during the process as the harsh nature of the feedback from designers could potentially hinder creativity.

The findings of this study contribute to our understanding that the social-cultural process of creativity can be nurtured within higher education through the use of social network sites such as Facebook. It concludes that more research exploring online social interactions between a learning community and a community of practitioners is required in order to better understand the benefits it has to offer for creativity development.

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List of Abbreviations

CASA4SBL	Cognitive apprenticeship and social apprenticeship for studio-based learning
CoP	Community of practice
LPP	Legitimate peripheral participation
MKO(s)	More knowledgeable other(s)
ZPD	Zone of proximal development

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Chapter One: Introduction

(1.0) Chapter overview

In this introductory chapter I discuss the influential aspects that have motivated me to conduct this exploration into the development of students' design creativity through social interaction. I initially describe my background and its influence on my study. I also clarify the need for an educational multimedia design curriculum within initial teacher education in Malaysia and the challenges around developing student creativity within the courseware and web-based design courses within this curriculum.

(1.1) My background and its influence on this study

I entered Malaysian higher education in 2004 as a tutor with experience in different fields. I had previously worked as a graphic designer in Malaysian advertising agencies for several years before joining the School of Education. I had a bachelor's degree in art and design (graphic advertising major) and a master's degree in design (visual communications major). The reason for my shift in profession was mainly because I had to move from the capital city of Kuala Lumpur to a region in the south of Malaysia, Johor Bahru. There was only a relatively small number of advertising agencies to be found in Johor Bahru and as the opportunity for employment was very limited, I decided to apply for a job at one of Malaysia's established universities: Universiti Teknologi Malaysia (UTM) as a tutor. I was fortunate that the Department of Educational Multimedia in the university's School of Education was hiring staff with a background in industry. There are staff members with a range of different experience and skills backgrounds in the department, such as IT programmers, graphic designers and broadcasters. The department requires the involvement of those with areas of expertise other than just education to help develop their postgraduate and undergraduate programmes in educational multimedia. The programmes cover the theory and practice of learning and teaching using tools that allow the integration of multimedia components, e.g., text, audio, video, graphics and animation.

Mohamad Bilal Ali (2008), the head of the Educational Multimedia Department, verified that every semester approximately 300 students from the following programmes register for the educational multimedia courses:

- Bachelor of Science and Computer with Education (Chemistry);
- Bachelor of Science and Computer with Education (Mathematics);
- Bachelor of Science and Computer with Education (Physics);
- Bachelor of Science with Education (Sport Science);
- Bachelor of Science with Education (TESL);
- Bachelor of Science with Education (Islamic Study);
- Bachelor of Science with Education (Science).

These students are from different states in Malaysia and from diverse educational backgrounds. Similar groups of students can be found in other faculties of education in different universities in Malaysia who also take the same educational multimedia courses (see Appendix A). Students in each programme are expected to attend a total of 123 credit hours of lectures in classroom and computer labs; achieve minimum cumulative grade point average score (CGPA) of 2.00; pass teaching practice conducted at schools (equivalent to 8 credit hours/at least 12 weeks) at Year 3; and complete the undergraduate project at Year 4. All final year students at Year 4 have to conduct a project either in the form of research, software development or technological design.

Among the educational multimedia courses offered to these students are information technology in education; teaching methods in software development; audio and video technology; courseware and web based multimedia design; and programming languages. The educational multimedia courses were introduced with the aim to produce teachers who are able to integrate technology into education as well as to take part and advise in the development of future software for use in schools. The intention was to overcome the problems associated with overreliance on third parties (private developers) to produce educational multimedia applications, e.g., video, website and courseware: detail explanations on this are given in section 1.2 and 1.2.1.

I was assigned to teach the courseware and web-based multimedia design course to undergraduate teachers from the following programmes described earlier. Students undertaking this course are expected to use their creativity to develop multimedia applications for teaching and learning in the form of a website or courseware. I was, however, concerned about the students' lack of enthusiasm towards learning to develop such educational multimedia applications, particularly in organising screen design, e.g., coordinating colour, text and graphics. I sought to change the students' perceptions of the importance of screen design and this is how I began my journey as a researcher. As part of the process of adapting to the practice of education, I wondered what the outcome would be if these education students were to experience feedback on their designs from practitioners in the creative industries. I decided to explore this approach and it became the context for my doctoral research.

(1.2) The importance of the educational multimedia programme for Malaysia's teacher education

The Government of Malaysia has been proactive in integrating the use of information and communication technology (ICT) within the educational system (Foong-Mae, 2002). The Ministry of Education in Malaysia (MOE, 2008) sees ICT as a tool to improve learning, enrich courses, develop pedagogy and learners' self-reliance. Tinio (2003) defines ICT as an umbrella term that includes all communication and application technologies such as computers, the internet, radio, television and the telephone. Of course, computers and the internet have received the most attention over the last twenty years compared to any other technologies in the development of teaching and learning (Tinio, 2003). Koller et al. (2008) use the terminology of technology-based learning to signify the use of computer and internet technologies in learning.

> *Technology-based learning* (TBL) constitutes learning via electronic technology, including the Internet, intranets, satellite broadcasts, audio and video conferencing, bulletin boards, chat rooms, webcasts, and CD-ROM. TBL also encompasses related terms, such as *online learning* and *web-based learning* that only include learning that occurs via the Internet, and *computer-based learning* that is restricted to learning through the use of computers. *E-learning* is synonymous with TBL and has largely replaced it in scholarship and industry as the term of choice. (Koller, et al., 2008, p. iii)

In meeting the expectations of the Malaysian Government, technology-based learning with multimedia components specifically interactive courseware and websites has been used as tools in classrooms to support teaching and learning; however, most of the technology-based learning applications have not achieved expected levels of success. Kamaruddin (2010) states that the Malaysia Ministry of Education identified a low uptake of technology-based learning in schools. According to researchers (Kamariah, 2006; Kamaruddin, 2010; MDC, 2005; MOE, 2004; Neo, 2005) this moderate level of success was caused by poor interfaces design. In addition, technology-based learning developers in Malaysia currently do not have enough experts specialised in both pedagogy and design. In attempting to solve the problem, they have either tried to make their team members multitask, or outsourced the work to third parties. Kamaruddin (2010) also notes that there were miscommunications between courseware developers and content experts. Content experts (usually teachers) mistakenly assume that interface designers in the development team already know the fundamental pedagogical concepts involved in producing technology-based learning applications. These conflicts resulted in the development of teacher-centred instructional software based on printed textbooks and content delivery approaches in schools (Muda and Mohamed, 2006).

Aware of these constraints, the Ministry of Higher Education in Malaysia introduced educational multimedia curriculum programmes that aim to produce teachers who are able to develop technology-based learning applications and integrate technology into education. These technology-literate teachers are recognised as 'teacher-developers' (CEMCA, 2003). Student teachers are trained to apply cognitive learning theory, motivation, colour principles, communication, usability, multimedia learning principles and instructional design to technology-based learning applications. As of 2011, nine out of twenty public universities in Malaysia offer educational multimedia programmes for student teachers. A list of these universities can be found in Appendix A.

(1.2.1) The problem with developing technology-based learning applications in the educational multimedia programme

Technology-based learning has the potential to provide a highly positive learning experience. Nonetheless, it also has the potential to achieve exactly the opposite. Kreijns and Kirschner (2001) explain that the difference between these two extremes relies partly on the quality of the instructional design. Instructional design refers to the production of highly effective, efficient and engaging instruction for learning experiences. According to Kreijns and Kirschner (2001), the challenge of developing effective technology-based learning involves design choices, e.g., layout, quality of information, images and colour, and it needs to address actual user needs. In addition, the development of technology-based learning certainly depends on many subtle interface cues, both psychological and physiological. This is why the production of technology-based learning in creative industries is mostly managed by a team of people with different roles and expertise (Lara and Pérez-Luque, 1996); for instance graphic designers, user-interaction designers, programmers, web developers and information architects. The Department for Culture, Media and Sport

(DCMS, 1998, p. 3) in the United Kingdom defines creative industries as '...those industries which have their origin in individual creativity, skill and talent which have a potential for job and wealth creation through the generation and exploitation of intellectual property.'

Based on my experience as a tutor, it was not an easy task to train student teachers to design effective technology-based learning applications due to the reasons described above; designing a technology-based learning application requires skills ranging from design to implementation. Thus, different kinds of understanding (from pedagogy to user interface) need to be applied in this field. Student teachers taking educational multimedia programmes are trained to master these skills; however they find it difficult to shift their thinking particularly into developing a screen design. The term 'screen design' is often used interchangeably with Graphical User Interface (GUI) design (Zhang, 1996), or interface design (Chang et al., 2001). According to Haag and Snetsigner (1993), screen design plays a crucial role in the delivery of information to the learner. It functions as a bridge connecting the interface appearance to learners' experience (Wilding, 1998). In other words, learners are guided on how to interact and navigate, and what to expect from a technology-based learning application through its screen design. Screen design acts as an overview or a table of contents. Researchers (Milheim and Lavix, 1992; Sponder and Hilgenfeld, 1994) state that screen design has the potential to hold learners' attention, promotes engagement and facilitates deep processing of important information.

Designing for the interface involves problem-solving and creativity. Researchers (Cross, 1997; Gero, 2000; Hsiao and Chou, 2004) recognise design as a creative activity because the exploration of design solutions requires creative skills. A number of design studies have emphasised the importance of developing and advancing creativity in collaboration (Detienne, 2006; Resnick et al., 2005; Warr and O'Neill, 2005). Hence, the collaborative approach has been widely used in encouraging learners to work collectively in the design process. Smith and MacGregor (1992) provide an explanation of collaborative learning:

> Collaborative learning covers a broad territory of approaches with wide variability in the amount of in-class or out-of-class time built around group work. Collaborative activities can range from classroom discussions interspersed with short lectures, through entire class periods, to study on research teams that last a whole term or year. The goals and processes of collaborative activities also vary widely. Some faculty members design small group work around specific sequential steps, or tightly structured tasks. Others prefer a more spontaneous agenda developing out of student interests or questions. In some collaborative learning settings, the students' task is to create a clearly delineated product; in others, the task is not to produce a product, but rather to participate in a process, an exercise of responding to each other's work or engaging in analysis and meaning-making. (Smith and MacGregor, 1992, p. 5)

There is no doubt that collaborative activities present opportunities for reflection and interpretation, but these activities certainly do not guarantee design competence or the development of creativity for that matter. I feel sympathetic to the student teachers' predicament in developing screen designs. The course on courseware and web-based multimedia design (UTM, 2008) in the Universiti Teknologi Malaysia (UTM) is structured for students to attend lectures, engage in group work, discussions and lab sessions. The delivery during lectures and lab sessions is mainly formal and teacher-led. Students listen to the tutor and take notes. Students then have to work in a group to develop technology-based learning applications and engage in group discussion outside of class time. The university's e-learning tool is used to facilitate students' enquiry, and to distribute lecture notes and class schedules. During my personal teaching experience conducting the course, I had difficulties in delivering regular feedback to a large class of more than 60 students. It was difficult to identify students who required more support. A similar problem was also faced by other tutors who conducted the same course. Students eventually had no choice but to discuss issues among themselves when developing the interface design.

Sas (2006) proposes that design teaching should involve good coaching, reflection on experience, access to communities of practice and efficient communication. The dynamic teaching described by Sas (2006) is well established in cognitive apprenticeship (Collins et al., 1989): a trade apprenticeship that has been successfully applied in developing higher order thinking skills, shaping effective learning interactions and enhancing teaching (Cash et al., 1996; Glazer, 2004; Jarvela, 1995; Snyder et al., 2000). Cognitive apprenticeship as described by Collins et al. (1989) evokes the traditional apprenticeship model but with an integration of elements of schooling such as courses and curriculum. Dennen (2004) explains how, in cognitive apprenticeships, novices learn to solve problems and handle complex tasks with help from the expert. The expert provides assistance through a process of modelling (showing), coaching (explaining), scaffolding (supporting) and fading (slowly removing scaffolding as students develop competence). Students are also encouraged to engage with authentic activities in a context of 'communities of practice' (Lave and Wenger, 1991; Wenger, 1998). Communities of practice (CoP) according to Wenger (1998) represent a group of people who are active practitioners sharing a common interest in a particular domain area.

It is important to note that this study attempts to highlight two communities: (1) a community of practitioners from the creative industries involving designers who place a major focus on sharing experiences and insights in the context of professional practice (Lave and Wenger, 1991; McConnell, 2006), while (2) a learning community from the higher education/learning institutions refers to learners and tutors who share ownership in defining and addressing learning problems together (Rogoff et al., 1996; Wells et al., 1990).

Kirk and Kennedy (2001) recognise three critical roles of graphic designers in the design and development of educational multimedia. They aim to help students develop: (i) a visual concept, i.e., a well-organised screen design that can stimulate and attract the specific target audience; (ii) effective visual communication, i.e., layout design with clear text composition and immediately recognisable visual representation; and (iii) conceptual ideas, i.e., practical ideas that help solve design problems. Learning collaboratively to develop interface design with the designers is considered an important skill for student teachers to acquire, but it remains under-promoted.

The incorporation of cognitive apprenticeships and a community of practitioners in design learning may offer effective methods to promote expert problem solving and reasoning activities. This study explores how these powerful instructional methodologies have the potential to facilitate the enhancement of students' creativity in interface design. I touch on this in more depth in Chapters Two and Three of the thesis.

(1.3) The purpose of the study

I am interested in exploring the ways the learning of design can be improved through an approach that provides feedback from practitioners in the creative industries. My concern is not to place students in the workplace environment but instead incorporate workplace experiences into the students' learning environment. I also search for an understanding of how notions of design can be affected and the issues that are related to the application of this approach. It is hoped that this can put educational multimedia teachers/researchers in a better position to work more effectively with learners' difficulties and challenges. It is also hoped that appropriate learning instruction or programmes which truly relate to learners' needs can be developed which support individuals from specific educational backgrounds such as student teachers.

In seeking answers, I refer further to apprenticeship theories which specifically focus on social interactions. Such socially-situated learning allows students to interact with one another by verbally sharing skills and knowledge. I decided to investigate whether the positive gains produced through social interactions between two communities (a learning community and a community of practitioners) could help develop design creativity.

Little research has been conducted in the Malaysian context to investigate the use of apprenticeship theories such as cognitive apprenticeship on the development of Malaysian student teachers' design learning comprehension. Studies incorporating Malaysian student teachers' design learning using collaborative technology settings are even fewer. There are a number of studies from other countries on the incorporation of cognitive apprenticeships for design learning; however, very few studies were explicitly carried out using collaborative technologies (Dickey, 2008), and none to date have initiated collaboration between student teachers and practitioners from the creative industries. I will discuss this further in section 3.2.3.

Theoretically, I intend to focus primarily on two key areas: (a) apprenticeship theories; and (b) the process of critical reflection. The first key area sketches the importance of various apprenticeship models, encompassing traditional, cognitive and social apprenticeships. The second key area elucidates the process of critical reflection used by the community of designers; and the learning community in the architecture and design schools.

Methodologically, a qualitative case study is used to gain greater understanding of and more comprehensive insights into the issues. The research design involves the combination of recorded interactions, interviews and interface design outcomes. Chapter Four details these. Three main methods of analysis - thematic, comprehensive data treatment, and activity system analysis - are applied to make sense of the data (see Chapter Five for a detailed account of the data analysis methods.)

Philosophically, the study adopts constructivist and social constructivist perspectives that regard design learning as a dynamic process of construction. Learners are active participants who learn to create meanings and solve design problems by retrieving previous knowledge and experiencing social interactions with others. Vygotsky's (1978) notions of mediation and zone of proximal development (ZPD) are central to social constructivist theories and are applied in this study to help students develop as independent yet collaborative learners. Piaget's (1964) concept of equilibrium and disequilibrium is also referred to, to explain learners' adaptation process to new practice. To sum up, students are exposed to the social construction of thinking influenced by social situations. This provides a different perspective than that of conventional design instruction in Malaysian higher education and it is hoped that this study can focus attention on the integration of social learning into routine design instruction in Malaysia.

(1.4) An overview of the chapters included in this thesis

This thesis has seven chapters. The first has briefly described the influences that prompted the research into exploring more effective approaches to support the teaching of interface design for Malaysian student teachers. Chapter Two is a literature review that explores the literature underpinning the context of this study: design and creativity. Here I describe the nature of design practice in creative industries and the pedagogical approach of studio-based learning, a well-known reflective approach that has been successfully used to teach design courses. I also discuss in depth the importance of involving professional designers in the design learning process. Chapter Three explores theoretical conceptions of apprenticeship learning, from traditional apprenticeships to cognitive and social apprenticeships. With reference to apprenticeship learning (cognitive and social) and the studio-based approach, I propose a pedagogical model called 'cognitive apprenticeship and social apprenticeship for studio-based learning' (CASA4SBL) for this study that uses the social network site - Facebook as a tool for collaboration. In addition, I introduce Activity Theory as a framework for analysis to help identify contradictions and holistically examine students' learning experiences. Chapter Four refines the research questions and provides an outline of the methodology. I present the data analysis in Chapter Five by incorporating two sections: initial analysis (thematic and comprehensive data treatment) and substantive analysis of four case studies (activity system). The initial and substantive analyses assist to answer the research questions posed in this study which are:

(1) What is the nature of the learning experience and how does this promote understanding of the creative design of websites or courseware?
(2) What are the contradictions caused by this new pedagogic approach?
    (2.1) How did the students respond to the contradictions?
    (2.2) How were the contradictions reconciled, if at all?

(3) What are the factors within the learning experience that contributed to the development of design creativity?

(3.1) How did the factors support students to develop an understanding of effective website or courseware design?

In Chapter Six, I discuss the results of the analysis, focusing on the relationship between contradictions and the development of design creativity; I also examine the utility of Activity Theory as a tool for analysis within the research and Facebook's potential as a collaborative medium connecting two different communities: a learning community (tutor and students) and a community of practitioners (designers). The conclusion is presented in Chapter Seven, where I restate my research questions, and highlight the key findings, contributions and implications of this research. Recommendations and suggestions for future research are also made in this final chapter.

Chapter Two: Literature on design learning

(2.0) Chapter Overview

I begin Chapter Two by considering the link between design and creativity. I discuss the requirements of producing a creative outcome (interface design) which involves creative individuals, process and product. I also discuss the nature of design practice in the creative industries and the ways designers use critical reflection as part of routine interactions. The link between designers' reflective practice and the approach used in studio-based learning is made. The pedagogical approach of studio-based learning is described, and I examine its implications for students' learning. Four related studies that have implemented studio-based learning are discussed to understand its potential in developing design creativity.

(2.1) Introduction of design

Design is a sector classified as coming under the creative industries (O'Connor, 2010). The Department for Culture, Media and Sport (DCMS) in the United Kingdom defines creative industries as '...those industries which have their origin in individual creativity, skill and talent which have a potential for job and wealth creation through the generation and exploitation of intellectual property' (1998, p. 3).

Creative individuals (trained in the arts) in the design sector are responsible for 'making things better for people' (Seymour, 2008). They have to deal with ill-structured and open-ended problems in order to produce novel and practical designs (Hoadley and Cox, 2009). In terms of methodology, Eder

(1999) describes design as the process of producing a simple or more complex product (an artefact) for an intended purpose. The production of a design as an artefact or product requires thinking processes which comprise various design activities across many professional fields (Lawson and Dorst, 2009).

Humans are surrounded by designed artefacts; for instance, the book that we read, the car that we drive, the clothes that we wear, the piece of furniture on which we are sitting and the building that surrounds us. These artefacts have been designed to fulfil the requirements of humans as users themselves. Design is indeed a discipline that explores the conversation between products, people and contexts (UPA, 2005).

Design is therefore defined as the translation of ideas into something functional and precise for individuals within a certain context. In this thesis, I focus on the design of a product for teaching and learning, or, to be more specific, the production of the interface design of an educational website or courseware.

(2.1.1) Interface design in education

Interface design is the part of the computer or electronic device that can be seen and interacted with (Hackos and Redish, 1998; Stone et al., 2005). It functions as a bridge connecting the interface's appearance to users' experience (Wilding, 1998). According to Mayer (2003), a well-designed interface of an educational website or courseware can enhance learning experiences. It adds to the satisfaction of the students and increases motivation and engagement. Figure 2.1 depicts an example of the interface design of a website (on the right) and human interaction with the computer interface (on the left).

Figure 2.1: Interface design (DavisDesignPartners, 1999; Smith, 2009)

The development of an interface design is distinguished at two levels: the conceptual and the physical. Garrett (2003) defines conceptual design as the usability of a design solution, referring to making a product such as a website easier to access or use. He also explains that physical design is a more refined level that defines the aesthetic or visual appearance of a product. Both levels, conceptual and physical, are key determinants of the success or failure of the product.

Interface design has a commercial value and is judged by what it does, how it works, what it looks like, who it is for and how it fits together (Barlex, 2007). Designing an interface, particularly for teaching and learning, requires implementation of pedagogical approaches (Guralnick, 2006; Precel et al., 2009). Laurillard (2002) emphasises three aspects that must be considered when developing technology-based learning applications. These are: the user interface, the design of learning activities, and assessment of whether learning objectives have been met. This means that designers will have to seek suitable learning principles, apply the principles in the interface and investigate their effectiveness.

Greenberg (1996) suggests that it is necessary for users to be involved in the process of developing interface design (see figure 2.2). In doing this, designers are able to gain a richer understanding of user requirements. It is proposed that this process should be highly iterative in order to gain users' feedback and approval. In this way, as stated by Hoadley and Cox (2009), users are involved as co-constructors of the design process.

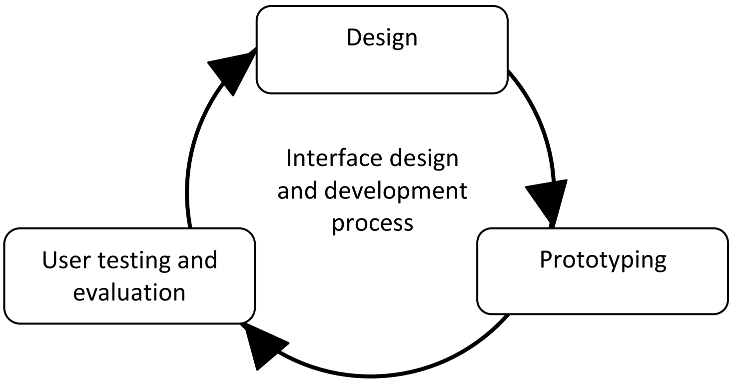


Figure 2.2: The iterative process of user interface design (adapted from Greenberg, 1996)

Users' active participation in the design process helps achieve the goals of producing an interface design that is useful and usable (O'Neill, 2000). The difficulties of implementing this method however involve identifying and recruiting appropriate users (Kyng, 1994; Norris and Wilson, 1999). Users' involvement in the design process can also be expensive. I discuss the process of design further in section 2.2.2

(2.2) Design as a mix of creative individuals, processes and products

The literature reveals that creativity may be usefully looked at in three ways: the person, the process and the product (Gardner, 1983; Tardif and Sternberg, 1988).

(2.2.1) Creative individuals: the individual and the social

A creative person is normally defined as someone who comes up with a novel and useful idea. He or she considers many ideas and different kinds of ideas, and can even change or transform ideas. According to Torrance (1988), a creative person possesses skills of fluency, flexibility, elaboration and originality (see table 2.1).

Table 2.1: Torrance's creativity skills (adapted from Torrance, 1988)

Fluency (Quantity of ideas)	How many ideas can you come up with?
Flexibility (Variety of ideas)	How many different ideas can you come up with?
Elaborateness	Can you explain or detail your ideas?
Originality (Uniqueness)	Can you come up with an idea that no one else has?

Jackson and Shaw (2006) add the following features in describing a creative individual: being imaginative; generating new ideas; thinking differently by looking beyond the obvious; exploring, experimenting and taking risks; and possessing skills in critical thinking and synthesis. All of the creativity traits in an individual can be categorised into three key components as proposed by Amabile (1998), which comprise creative-thinking skills, expertise, and motivation (see figure 2.3).

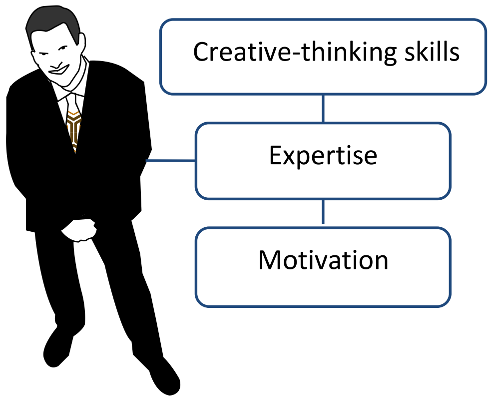


Figure 2.3: The three components of creativity (Amabile, 1998; researcher's own illustration)

Amabile (1998) describes the creative individual as a person who can think creatively (see Jackson and Shaw, 2006; Torrance, 1988). They are experts in a certain domain of work and trained with specific knowledge and technical abilities. It is generally acknowledged that individuals are creative within particular domains (Csikszentmihalyi, 1988; Feldman, 1974; Feldman, 1994; Gardner, 1983; Sawyer et al., 2003). For instance, someone may be creative in the arts, but they may lack creativity in biology (Gardner, 1983). John-Steiner (1985) explains that creativity requires fluency in language, symbols and the tools of a domain. Without fluency, creativity is hard to achieve. The creative individual is also motivated by their interests, passions and determination. Researchers (Amabile, 1996; Hennessey, 1995) claim that intrinsic motivation has a strong link with creative achievements. Intrinsic motivation is the tendency to engage in tasks because the individual finds them interesting, challenging, involving and satisfying. Extrinsic motivation, on the other hand, is the tendency to engage in tasks because of task-unrelated factors such as the promise of rewards and punishments, directives from superiors, surveillance and competition with peers (Deci and Ryan, 1995). Csikszentmihalyi (1990) describes intrinsic motivation as an advantageous experience or 'flow'. Flow is the mental state of operation in which individuals are fully immersed in what they are doing (Csikszentmihalyi, 1990).

Although many researchers have focused on intrinsic motivation in enhancing creativity (Amabile, 1996; Csikszentmihalyi, 1990; Hennessey, 1995), having both intrinsic and extrinsic motivation can sometimes be useful. Extrinsic rewards can increase the chance that individuals will be motivated in accomplishing their goals (Paulus and Nijstad, 2003). For instance, a person will work harder to seek creative solutions when offered rewards. Researchers (Eisenberger et al., 1999; Eisenberger and Rhoades, 2001) have found evidence that extrinsic rewards increase creativity and trigger an individual's self-determination.

Aside from rewards, pressure can be another effective extrinsic motivator to some people when it is properly harnessed. It drives people to do things that they otherwise would not do. In order to avoid shame and guilt, pressure in some instances can motivate a person to make a greater effort (Kandel and Lazear, 1992). Pressure is a type of motivation known as introjected regulation (Deci and Ryan, 1995). Deci and Ryan (2000) describe introjected regulation as motivation with an element of control over people. People feel motivated to perform in order to avoid guilt or anxiety, or to maintain ego. Deci and Ryan continue by explaining that introjected regulation can shift into integrated regulation where a person can become fully engaged with his or her beliefs and work. According to

Brophy and Wentzel (2004), integrated regulation is not the same as intrinsic motivation; a person performs a task because of self-determination instead of enjoyment or interest. Brophy and Wentzel (2004, p. 206) acknowledge that Deci and Ryan have disclosed 'the key to understanding motivational dynamics is not an intrinsic vs. extrinsic motivation dichotomy, but the degree to which the person perceives rewards or other extrinsic features of the situation as informational versus controlling'. Informational rewards refers to individuals finding the task as challenging and interesting, while controlling rewards demote individuals perceiving the task as pressuring or forcing (Brophy, 2010). This also means that extrinsic features of motivation can either enhance or hinder creativity depending on an individual's acceptance (Parnell et al., 2007).

An individual with creative thinking, expertise and motivation can certainly contribute to the production of creative outcomes. Nevertheless, designers in the creative industries generally work in teams. Team work is important in coping with time constraints (deadlines) and high-level requirements from customers (Badke-Schaub and Frankenberger, 1999). The multiple perspectives and alternatives offered by group members lead to more innovative (De Dreu and West, 2001) and higher quality outcomes (Nemeth et al., 2001). Furthermore designing a complex and quality interface requires many different design skills (Shank, 2005). Shank (2005, p. 11) lists the skills involved in interface design:

> We needed instructional design skills to determine the goal of instruction and select instructional strategies and multimedia elements, writing skills to write content, information architecture skills to structure the content so it was easily to follow and access,

> graphic design skills to develop clear and attractive navigation and explanatory graphics, multimedia skills to work with instructional designers to create interactive elements, usability research skills to make sure that the whole worked well and wouldn't hopelessly frustrate learners, and infrastructure skills to make sure it would work on the client's systems. Not all projects require one or more people for each of these functions, but most require some elements of all of them.

In relation to design skills, many creativity researchers have now recognised the importance of social interactions, mentoring and collaboration in creative work (Amabile, 1983; Candy and Edmonds, 2002; Csikzentmihalyi, 1999; Fischer, 2000; Klemmer et al., 2002). Warr and O'Neill (2005) see design as a social activity. Design is a socially-generated creative outcome (Watson, 2007) and can be productively achieved through a process of social construction (Detienne, 2006). Even if a design is produced by a single individual that does not mean its essence is individual. The individual designer would still have to deal with a number of other people such as clients, users, legislators, consultants, suppliers and manufacturers in the design's production (Lawson, 2004).

Warr and O'Neill (2005) propose that creativity in design should be understood as social creativity. Social creativity is defined as a socio-cultural process (Csíkszentmihályi, 1996) in which novel and appropriate products are developed (NACCCE, 1999). It is perceived as a generic skill that can be fostered through interactions between people and in interactions with tools and artefacts (Bereiter, 2002). An objective of social creativity is to create, accumulate, share knowledge and enable innovation (Fischer, 2005). Social creativity is not a luxury but a necessity to address design problems (Fischer, 2004). Fischer (2004) suggests that design problems are better addressed, framed and solved by communities rather than individuals. Creativity in design is not perceived as a personal judgement but is judged by social groups (Csikszentmihalyi and Wolfe, 2000).

The study of social creativity was extensively promoted in Vygotsky's work. Moran and John-Steiner (2003) identify that Vygotsky produced a number of papers related to creativity studies which were not published during his lifetime: for instance, 'The Psychology of Art' (Vygotsky, 1925/1971); 'On the Problem of the Psychology of the Actor's Creative Work' (Vygotsky, 1932); 'Imagination and Creativity in Childhood' (Vygotsky, 1933/2004); 'Imagination and Creativity in the Adolescent' (Vygotsky, 1931/1998); and 'Imagination and Its Development in Childhood' (Vygotsky, 1932/1987). Vygotsky was more interested in the origins and interrelationship of functions, in contrast to researchers who conceived of creativity as a set of traits of specific individuals that could be measured in tests and cross-sectional experiments (Guilford, 1970; Runco, 1999; Torrance, 1988). Arguably, Vygotsky did not emphasise separation but rather connection. Vygotsky recognised the individual's experience and transformation, and also acknowledged the critical role of social interactions in the development of creativity (Gibbons and Grey, 2004; Vygotsky, 1978; Wertsch, 1985). Through Vygotsky's lens, creative individuals are those who manage to utilise higher mental functions in getting others to acknowledge their creative ideas (Moran and John-Steiner, 2003). Diaz et al. (1990) describe higher mental function as a complex thinking process derived from social interactions. Within the thinking process, individuals internalise social interactions and continually develop their understanding (Moran and John-Steiner, 2003) towards producing creative outcomes that can gain recognition from others. This also means that individuals have to adapt to reality if they wish to develop creativity (Rieber and Carton, 1988). As a result the involvement of the social community in nurturing creativity should be taken seriously, particularly in the domain of design: a domain that requires making things functional and precise for individuals within a certain context.

Although researchers (Amabile, 1983; Candy and Edmonds, 2002; Csikzentmihalyi, 1999; Klemmer, et al., 2002) have recognised the importance of social interactions, mentoring and collaboration in creative work, there is also another important aspect to look at in developing creativity in a social context: group development. Paulus and Nijstad (2003) states that for social collaboration to have effects on creativity, careful attention to the development of the group is required because the experience of being in a group with members who have different backgrounds and perspectives can often be difficult. A clearer understanding of group interaction needs to be developed (Hand et al., 1997) to reduce the potential sense of insecurity, embarrassment and conflict: these are seen as some of the negative psychological effects that can occur when a group is not carefully managed (Turner and Horvitz, 2001).

I further discuss the benefits and disadvantages of conflicts and disagreement in section 2.4. Next, the process of creativity is examined.

(2.2.2) Creative process: design as problem solving

Creativity may be considered as the process of getting ideas, testing them and communicating the results. Design of any type is mostly seen as a problem-solving process that leads to the transformation of a product or service (Heskett, 2002). Lawson and Dorst (2009) explain that designers have to formulate solutions through analysing a design problem. From many solutions, designers will have to decide on the one that is most appropriate. This model of solving design problems is commonly used by every designer, and is illustrated in figure 2.4.

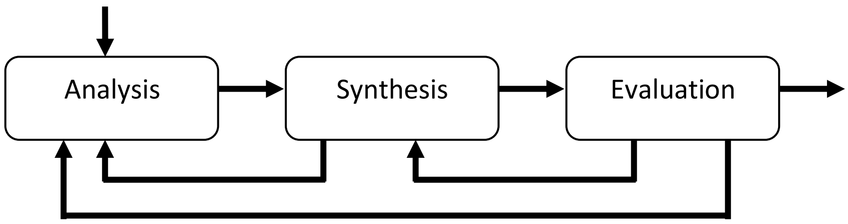


Figure 2.4: Model of the design process (Lawson and Dorst, 2009, p.33)

The process of design is nonetheless not as simple in reality as it is portrayed in figure 2.4. The evaluation process involving practitioner critical review is not mentioned explicitly in the model (Lawson and Dorst, 2009). Practitioner critical review is the part of the practice used to frame the problem as described by Schön (1983). A reflective practitioner is someone who does something and is automatically reflective (Schön, 1983). They constantly learn, evaluate and refine their practice, even after years of experience. Schön (1983, 1991) introduced the idea of reflection-in-action (thinking while dealing with a problem), and reflection-on-action (looking back at what has already taken place) to describe the way practitioners work in practice. Killion and Todnem (1991) extended Schön's notions of reflection-on-action and reflection-in-action to include reflection-for-action (planning ahead for future actions). Schön recognised reflection-for-action but he did not consider it as a new reflective event, instead as imaginative perspectives. Reflection-for-action is an important mechanism that stimulates thinking and cognitive growth (Killion and Todnem, 1991) thus it is no less important than the other two types of reflection (on, and in action).

Practitioners in general reflect on their practice during and after engaging in action in order to creatively adapt their practice to new situations. They interpret and frame problems by referring to past experiences, knowledge, theories and practices. This is because their work constantly deals with complex situations. For example, as described by Stolterman (2008, p. 59) designers have to create 'something with a specific purpose, for a specific situation, for a specific client and user, with specific functions and characteristics, and done within a limited time and with limited resources'. Roller (2009) explains that, in dealing with complex design situations, designers utilise design thinking: an analytical and contextual thinking intended to create great products and experiences for their customers (see Garrett, 2003; Roller, 2009). Analytical thinking relates to a step-by-step thinking process involving planning and developing a design (Roller, 2009). This is where designers focus on the functionality and appearance of a product or design. Contextual thinking conversely refers to capturing the users' experience of using a product or design (Roller, 2009). Designers have to make sure the experience of a product or design meets their customers' or users' expectations. They have to deal with customers from varying backgrounds; from sophisticated professionals to those with no design experience. Other than utilising analytical and contextual thinking, Sternberg and Lubart (1999) emphasise the importance of synthetic thinking in producing creative ideas or outcome. Synthetic thinking require designers to 'see problems in new ways and to escape the bounds of conventional thinking' (Sternberg, 2009, p. 28). Synthetic thinking can be linked to what Lawson and Dorst (2009) refer to as situation-based and strategy-based thinking - I discuss this next.

Lawson and Dorst (2009) describe in more detail the way designers think when solving design problems. They identify three different approaches to design thinking strategies: convention-based, situation-based and strategy-based (see figure 2.5). These approaches can be employed separately or simultaneously depending on the design problem and the expertise of those involved in the design process.

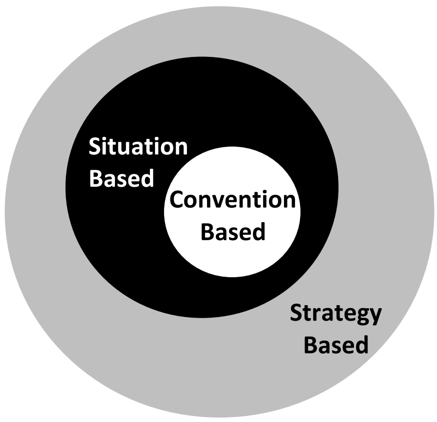


Figure 2.5: Design thinking strategies (Lawson and Dorst, 2009, p.69)

Convention-based design thinking relies on standard rules of design such as rules of proportions. Rules of proportions refer to a framework for organising content, images and other graphical elements in a design layout. An over-reliance on this type of thinking can lead to the production of ordinary design ideas. It is normally used as a first step in becoming literate in design work. It is all about following the 'rules of the game'. In contrast to experts, novices usually consider convention-based design thinking as they follow strict rules to deal with design problems.

Situation-based design thinking solves design problems by considering the most suitable and appropriate solution. Designers refer to the 'rules of the game' only as guidelines and they begin to improvise and explore their creativity further. For instance, instead of designing a building by following a rule-based structure, the designer applies unique characteristics to the building design, an example given by Lawson and Dorst (2009) is the Sydney Opera House; or instead of designing a website with a generic layout design, the designer applies appealing features such as page flipping, for example www.datafisher.com and www.blackcoffeeproject.com.

In strategy-based design thinking, designers formulate a solution by imposing a 'style' on the design problem which has added value for customers and society. For example, designers may implement environmental awareness in their design after reflecting on climate change, for example eco-friendly buildings and furniture made from recycled materials, or designers may produce a website with user-friendly facilities for users with vision or hearing impairments.

According to Lawson and Dorst (2009), these three modes of thinking lie behind the problem solving and decision making that takes place through design activities. The mode of thinking plays a crucial role in determining the quality of design products.

(2.2.3) Creative product: novelty and appropriateness

Creativity may also be seen as a product. It is the ability to bring something into existence. Looking back at earlier research on defining creativity, the term 'creativity' often focuses on producing novel or original works. Boden (1998b) offers two explanations for novelty: psychological (P-creativity) and historical (H-creativity). P-creativity represents an idea which has been used by others but is new to the person who produces it, whereas H-creativity is an idea which has never been thought of in the history of mankind. Boden admits H-creativity is very hard to distinguish as most creative ideas are rather mundane. Boden (1998a) adds that creative products need to be not only novel but also valuable. Parallel to Boden, Sternberg (2007, p. 34) recognises the creative product as 'relatively novel, high in quality, and appropriate for the task at hand'. Sternberg emphasises the dynamic interplay between the novelty and the usefulness of an idea or product. While 'novel' refers to any new idea or product, creativity is a subset of novelty, covering ideas that are both novel and appropriate to the cultural context (Amabile, 1983; Csikszentmihalyi and Wolfe, 2000; Warr and O'Neill, 2005). Appropriateness is determined by some form of public recognition, and varies from one domain to another (Warr and O'Neill, 2005). Whether an idea or product is creative or not does not depend only on its own qualities, but on the effect it has on others who are exposed to it. This led to a discussion concerning the interrelationships between innovation and renovation to emphasise the importance of public or users' recognition in the production of creative ideas or product. Dillon (2000, p. 3) defines innovation as 'change through the introduction of new ideas, methods and processes' while renovation is 'change through the renewal and updating of methods and processes'. In another words, while innovation relates to production of new ideas, renovation focuses on the ongoing process of restoring or upgrading the existing ideas. Innovation allows for creative ideas or product to be recognised for its potential within a certain domain or field (Amabile et al., 1996). Renovation on the other hand ensures that the resulting ideas can fulfil users' or customers' constantly changing needs. Innovation and renovation work as a value adding process leading to commercialisation of creativity; this should be emphasised especially in the production of ideas or product that require recognition from the public or users, e.g., interface design.

Regardless of the person, the process and the product, literature on creativity suggests that the definitions of the term vary considerably depending on the contexts in which the topic is discussed (EUA, 2007). In short, creativity has to be defined in its own context, and something can only be recognised as creative when it is accepted by a certain community (Sawyer, 2003) or by a suitable group of observers (Martin, 2008). Suitable observers are those familiar with the domain in which the product is created or the response articulated (Amabile, 1982; Amabile, 1996; George and Zhou, 2002; Oldham and Cummings, 1996). Suitable observers for design creativity can be either the targeted end-users in a society or the community of practitioners who are experts in the domain of design. An expert in design is defined as a progressive problem solver who sees the source of the problem in more depth than others, who possesses an abundance of knowledge and who takes pleasure in solving problems (Bereiter, 2002; Chamorro-Koc et al., 2009). An expert possesses enormous background experience in the relevant area which has been recognised publicly (Nonaka and Takeuchi, 1995). I discuss the work of experts in the design practice further in the next section to justify the importance of their role in evaluating the creativeness of a design or product.

(2.3) The design practice: designers in action

As design production depends heavily upon an individual's knowledge and experience (Lawson, 2004), feedback from experts has been recognised as an important source to stimulate creativity (Amabile, 1996; Pringle, 2008; Wiley, 1998). However, the interaction techniques used by domain experts to stimulate creativity have received limited research attention (Kilgour and Koslow, 2009). It is essential to understand the nature of experts' interactions because the use of language within interactions is recognised as a powerful tool in fostering creativity (Rieber, 1998; Vygotsky, 1978). Through language, improvisation and innovation can be achieved (Barrett, 1999). These findings from the literature triggered further enquiry into the ways experts (designers) interact and function in developing design creativity.

Designers commonly perform critical reflection on their work in studio-based environments, a meeting place where they initiate idea generation, production and critique (Heckman and Snyder, 2008). Critical reflection involves the activity of questioning and not taking things for granted (Thompson and Thompson, 2008). Wlodarsky and Walters (2006) explicate that during critical reflection an idea or experience is reconsidered, revised and evaluated. Designers perform a critique (or 'crit') session, to help them think reflectively. The crit session is a common practice where designers defend and justify their designs. During the crit session designers engage in a range of discourse from casual comment to formal critique (Oak, 2000). The designer is a critic, and critique is used as part of the analysis process in solving design problems (Friedman, 2000). As remarked by Christenson (2001, p. 37), 'Any society that values creativity also needs to enable criticism. If we cannot question the way we are doing things and thinking about things at present, it will not occur to us that they could be thought of or done differently'.

Designers reflect on their work through analytical, creative and critical thinking. They discuss their agreement and disagreement with each others' ideas by recalling previous experiences, recognising the current situation, and adapting or putting together recent ideas (Finkelstein and Fishbach, 2010). Lawson (1997) finds that designers routinely adopt character roles while discussing design ideas: roles of leader, clown, lawyer and dunce.

Lawson further explains the characteristics of each role: leaders appear to initiate; clowns criticise with humour; lawyers criticise more negatively; and dunces constantly demand further explanation. Lawson describes designers' conversations as a powerful creative force between different people with the same goal. The role of a lawyer, also known as the devil's advocate (Nemeth, et al., 2001; Nemeth et al., 2003), helps eliminate bias, makes designers question their own judgement more critically, discovers and explores alternative ideas and reframes design problems (Louro et al., 2007).

Designers' ideas are also provoked during the crit session. Provocation is an important lateral thinking technique that is concerned with the generation of new ideas (Sloane, 2006). It works by moving individuals' thinking out of the established patterns that they use to solve problems (De Bono, 1970). Lateral thinking is used to move from one known idea to the creation of new ideas. Provocation and critique have become part of design practice (Kuhn, 2001). Such interactions help designers to contextualise their work and make improvements (Kasof et al., 2007; Nemeth, et al., 2003).

Critique is commonly accepted in service-related industries (Dormann and Zapf, 2004). It is used for group advancement and for achieving quality results (Katzenbach and Smith, 2005; Montoya and Vandehey, 2002). For example, complaints, which are similar to critiques, are forms of feedback that can help organisations rapidly and inexpensively improve their services and products in terms of meeting the needs of customers.

Chen, Lam and Zhong (2007) state that individuals who accept negative feedback are found to perform better in their work than those who are prone to accept only positive feedback. Successful organisations view negative feedback such as complaints or critiques as a marketing strategy rather than as a nuisance or a cost (Barlow and Møller, 2008). In the commercial world, critiques and complaints can help employees understand which areas of work they need to address and correct and, thus, how to perform more effectively (Ashford et al., 2003; Podsakoff and Farh, 1989).

It is important to emphasise here that the systems approach in relation to defining positive and negative feedback within commercial and non-commercial organisations may differ. I have discussed the benefits of negative feedback (critical, complaint, critique) in this section within the design practice/commercial world. However, the same negative feedback may or may not have positive effects when applied in educational settings. Dillon (2008) stressed that the engagement between individuals and their context influences their acceptance of certain practice. For instance, educationalists opposed to the use of negative feedback in schools recommend the use of positive feedback which is seen as constructive, kind and helpful (Edmondson, 1999; Flowerdew, 1998; Montuori and Purser, 1999; Schein, 1993; Wiley, 1998). I however do not view the definition of feedback from the perspective of education; that highly emphasise the role of positive feedback in promoting change and growth. I argued that depending on the situations, positive and negative feedback when applied strategically can be effective in strengthening a desired behaviour. Therefore, different terms of feedback are used for this study to accentuate the complexity of feedback, e.g., confrontation to replace negative feedback (see Knight, 1966). I discuss this further in section 5.1.1.1 (sub-theme 1.2) and section 6.2.

(2.4) Applying studio-based learning in the development of interface design

The design process requires a considerable amount of tacit knowledge (Ashton, 2007). Giroux and Taylor (2002) consider tacit knowledge or embodied knowledge to be knowledge that remains in specific situations and actions. Nonaka and Takeuchi (1995) propose that tacit knowledge can be acquired through experience and reflection. They explain that tacit knowledge can be created and expanded through social interaction. For instance, people who do not possess tacit knowledge can learn from those who do. Hoadley and Cox (2009) recommend for students to work with a community of designers in order for design knowledge to be passed on and for students to initiate and develop their design skills.

This proposition is closely related to the apprenticeship form of learning which leans towards the studio-based approach (the theory of apprenticeship will be discussed in Chapter Three). The studio-based learning approach has been successfully used to teach skills in art, design and architecture education for over a hundred years (Agrawal and Hundhausen, 2008). The pedagogy underlying the studio approach has its theoretical origins in social constructivism and is based on the Bauhaus School of Design's model for teaching and learning.

> The Bauhaus incorporated a variety of pedagogical philosophies such as (1) interdisciplinary teamwork (different individuals working together), (2) the artifacts that were created are common objects with direct meaning to society, (3) supervision using the Socratic dialogue that allows students to get in contact with different professionals/researchers in the field. (Thomassen and Ozcan, 2010, p. 851)

studio-based learning offers a model of professional practice which fundamentally emphasises critical reflection and evaluation to enhance students' creative and critical thinking (Cobb, 2000). Students have to deal with design projects within studio-based learning in order to gain marks in the same way that professional designers are rewarded with payment for their work (Lawson and Dorst, 2009).

According to Cox et al. (2009), the studio is perceived as more of a project room than a classroom. The studio environment is physically designed to encourage social interaction. Students work in close proximity with each other, allowing them to intensively discuss and exchange ideas. There are four fundamental steps in the traditional studio-based learning process, as described by Kvan (2001) in figure 2.6.

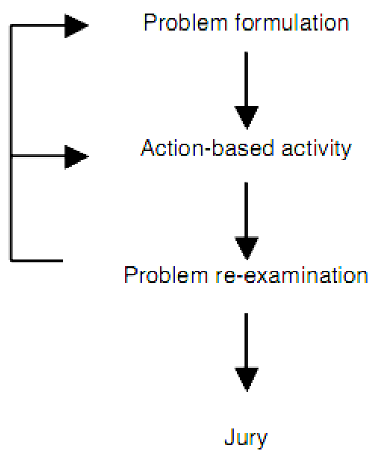


Figure 2.6: Kvan's studio teaching cycle (Ellmers, 2006, p. 3)

First, students are given a design problem and they are expected to analyse this. Then, action-based activity (learning by doing) is applied for the exploration of solutions. Solutions identified are re-examined. Students have to rotate through these steps before proceeding to the final step of examination by jury.

Design schools often hire design practitioners as part-time tutors (Blackwell, 2007). Researchers (Lawson and Dorst, 2009; Watkins, 2003) identify that design practitioners are able to facilitate learning by sparking students' curiosity, increasing their disposition to learn, offering new directions for approaching design and helping to develop students' ideas beyond the project requirements. Kvan (2001) reports that designers from the creative industries are also invited to participate in studio-based learning as visiting experts or juries who act as clients. Their involvement is valuable due to their extensive and varied experience in producing commercial designs. Their profession requires them to understand the physiological, psychological and emotional aspects of society as end users (Seitamaa-Hakkarainen et al., 2004), and to keep up with changes and current demands (Kaptelinin and Nardi, 2006). Involving designers in studio-based learning helps increase 'up-to-date experiences instead of out-of-date documentation' (Sutton and Kelley, 1997, p. 85).

Critique is the main pedagogical method used in studio-based learning. Students are exposed to formal and informal reviews through crit sessions (similar to designers' workplace practice). Once a task has been given to students and the students begin to draft their ideas, the critique simultaneously begins (Burroughs et al., 2009). Kuhn (2001) explains that critique in studio-based learning generally involves tutors, students' peers and visiting experts. The idea is that students have to display their design work. The tutor and visiting experts will sit around and formally or informally critique the design work in a public forum with other students listening (Parnell, et al., 2007). Figure 2.7 depicts a crit session taking place in the studio environment of a design school.

Figure 2.7: Crit session (flicker, 2010)

Parnell et al. (2007) describe how students need to be prepared to deal with confrontational situations within the crit session. The crit session, according to Dannels (2005), is known to be the most controversial aspect of the studio model. It can be problematic as students can be affected by ‘vicious critiques’ (Cox, et al., 2009, p. 150) with ‘sadistic overtones’ (Stead, 2003, p. 10) directed at their work. Visiting experts or tutors who teach part-time and are also in practice can unconsciously treat the students in the same way that they treat their junior staff in the design office. This can distract them from recognising the learning needs of, and the support required by the students.

Vicious critique can have unconstructive impacts, such as losing face (Smith and Berg, 1997), discouraging creativity (Pajares and Graham, 1998), harming self-esteem (Bernichon et al., 2003) and causing interpersonal and organisational conflict (Baron, 1984; Pruitt and Rubin, 1986). Such critiques are often referred to as negative feedback (Stahl, 2006), the type of feedback given by a person to another to inform the recipient(s) that they are not performing in an adequate or appropriate manner (Baron, 1988; Baron, 1990; Graen and Scandura, 1987). Research in educational psychology indicates such feedback to be harsh in nature and likely to violate several basic principles of effective feedback (Ilgen et al., 1979). The accepted practice of feedback in higher education is that it should always be constructive, kind and helpful (Edmondson, 1999; Flowerdew, 1998; Montuori and Purser, 1999; Schein, 1993; Wiley, 1998). Krogh et al.(2000) recommend that attention should be given to the way people treat each other to encourage creativity. They clarify that the concept of care has a positive impact on the creation of knowledge.

Cox et al. (2009), in their study of learning technology design, however, argue that the wrecking strategy used in a crit session is meant to grab students’ attention and get them interested in interpreting the purpose of design. Cox and his fellow researchers support their arguments by associating the wrecking strategy with Gagne (1965) and Keller’s (1983) views on learning, which highlight the importance of capturing the student's attention. Cox and his colleagues further describe how the crit session benefits technological design, in particular the design of software:

> This involved the identification of poor design (and providing justification for such an evaluation), introducing discourse and an ontology of design practices, practicing rapid communication of intent as part of a dialog with others, user testing, iteration, and reflection on the accomplished process in order to inform the next performance. (2009, p. 162).

In addition, several other researchers have identified negative feedback that is actually useful for enhancing creativity (Anderson and Rodin, 1989; Campion and Lord, 1982; Podsakoff and Farh, 1989). Negative feedback derived from critique can potentially bring about a cognitive conflict which enhances learning; cognitive conflict here refers to the production of arguments that put individuals at the centre of conflict that structures intellectual awareness (Collins, 2002).

The issue of cognitive conflict can be linked to Piaget’s concept of cognitive disequilibrium. According to Piaget (1964), a learner may face disequilibrium when their new experience conflicts with previous experience. In reaching equilibrium (ideal state) and adapting to the new experience, a learner will have to achieve a balance between assimilation and accommodation. Assimilation is the process of digesting information, while accommodation refers to the process of shifting existing knowledge or mental structures to accommodate the new information (Benson and Haith, 2009). Wlodarsky and Walters (2006) associate disequilibrium with dissatisfaction with one's own performance. An individual's mind has to process information that does not appear consistent with what he or she already knows (Johnson and Johnson, 2007). The learner learns to deal with their state of disequilibrium by seeking equilibrium through reconciliation (Sugarman, 1987). For example, students may face disequilibrium when their understanding of design, e.g., from reading a book contradicts with the tutor's view. In dealing with the contradiction, students seek equilibrium and as a result a new understanding is achieved.

Conflict and disagreement are found to be essential in considering the distribution of resources, procedures, guidelines, and the interpretation of facts (DiPaola and Hoy, 2001; Jehn, 1995; Passos and Caetano, 2005). The process of argument and disagreement has been shown to help to produce better decisions, encourage knowledge construction (Kirschner and Van Bruggen, 2004) and promote change and development (Daniels, 2001, p. 45; Fischer, 2005; Paulus and Nijstad, 2003; Sins, 2010; West, 2002). Conflict due to diverse perspectives can prevent the production of common thinking (Paulus and Nijstad, 2003) through increased numbers of ideas, improved quality of ideas and originality of expression in solving a particular problem or carrying out a particular task (Bolen and Torrance, 1978; Gruber, 2006; Johnson and Johnson, 2007; Torrance, 1973; West, 2002). According to Johnson et al., (2000), who address conflict as controversy, conflict increases students' efforts in solving problems by reading more library materials, reviewing more classroom materials, more frequently watching optional movies and more frequently referring to others for information. Students who survive conflicts will become more critical and more prepared to accept failure, and will learn to think in new ways (Lawson and Dorst, 2009); these are the criteria needed for the development of creativity. Designers' critiques have proven valuable, and lacking the normal curriculum constraints within courses, designers can adopt creative and experimental pedagogical modes to support the learning process.

This, however, does not change the fact that designers' critiques as experts may also cause chaos due to power relations and the rejection of students' good ideas (Nakamura and Csikszentmihalyi, 2003). Their diversity can create high levels of conflict (Jehn et al., 1997) and low levels of cohesiveness (Jackson et al., 1991). Several studies in architectural education (Anthony, 1991; Parnell, et al., 2007) have identified that studio crit can cause many pedagogical problems. Anthony (1991) describes how critiques applied in studio learning seem to go against the educational theory that encourages commenting on students' work positively. Students directed to focus on their failure and negativity were found to exhibit high levels of stress, as a result of which learning became less efficient. Graham (2003) explains that the problem occurs because design instructors are not trained as educators, and this requires attention. To deal with the problem, designers are encouraged to work alongside academic staff in achieving more successful teaching and learning (Pringle, 2008). Parnell (2007) suggests that students should be given more control over their own learning. This helps resolve unequal power relations between students and experienced others, and helps students achieve equilibrium in thinking (Rogoff, 1990). Pringle (2008) proposes that to sustain creativity, learners need to retain responsibility and ownership as far as possible. They should also be encouraged to take risks. Bereiter (2002) explains that in acquiring imprecise knowledge such as design knowledge, students should be encouraged to make risky choices and learn from both their successes and failures. Graham (2003) recommends that students are properly introduced to studio-based learning, since the studio culture of learning is very different from many learning situations.

All these proposals are put forward in order to ensure students receive adequate support in addressing their cognitive conflicts and achieving equilibrium. As stated by Piaget (1962), equilibrium is an important stage encompassing the assimilation-accommodation process, i.e., the ability of individuals to adapt and adopt new understanding. Piaget's idea of attaining equilibrium goes hand-in-hand with Vygotsky's concept of mediation (Ayman-Nolley, 1999): mediation is required in achieving equilibrium.

(2.4.1) Emphasising mediation (meaning-making) in studio-based learning

Vygotsky focused on the relations between people and the socio-cultural context in which humans perform and work together in shared experiences (Crawford, 1996). Humans use tools that emerge from a culture to mediate their social environments. There are three main categories of tool: psychological tools (such as language and writing); material tools (such as computers and books); and other human beings (see Kozulin, 1990). Compared to the other two categories of tool, Vygotsky sees other human beings as carriers of signs, symbols and meanings, and he did not attempt to elaborate more than this (Kozulin and Presseisen, 1995). Psychological tools, on the other hand, also include 'various systems for counting; mnemonic techniques; algebraic symbol systems; works of art; writing; schemes, diagrams, maps, and technical drawings; all sorts of conventional signs, and so on' (Vygotsky, 1982, p.137, cited in Cole and Wertsch, 1996, p. 252). Vygotsky acknowledged all three categories of tool but described psychological tools, particularly language, as influential in mediating human thoughts, feelings and behaviour (Daniels, 2001). Language, as argued by Vygotsky, mediates higher thinking processes; individuals interact with others and their learning is influenced by direction and instruction/training (Daniels, 2001). Language within interactions functions as a bridge connecting individuals in order to understand the social environment (Wittgenstein, 2001). When associated with studio-based learning, language undoubtedly plays an important role in the production of creative outcomes. Students are encouraged to search for understanding, meaning or solutions, or to create an artefact or product of their learning through joint activity (Lee and Smagorinsky, 2000). Joint activity offers complex and unpredictable interactions (Sawyer, 1999). Interactions in the form of scaffolding enable students to achieve understanding beyond independent efforts. The term 'scaffolding' was coined by Bruner (1975), and his idea of scaffolding complements Vygotsky's concept of the zone of proximal development (ZPD). Researchers (Wood et al., 1976; Wood and Middleton, 1975) define scaffolding as pedagogical processes allowing more knowledgeable others (MKOs) to assist learners in performing tasks they would not have been able to do on their own. A MKO is anyone who has a higher/greater understanding or ability than the learner. The MKO could be teachers, peers, domain experts, family or even an artefact such as a computer or a book. Scaffolding is given by the MKO until students are able to realise their potential and perform independently (Collins, et al., 1989; Lajoie, 2005; Pea, 2004). Wood et al. (1976) describe how scaffolding helps to raise learners' interest, draw attention to critical aspects of the task, maintain learners' goal orientation, provide direction and reduce frustration. Students are found to develop higher-level thinking skills when scaffolding is given by experts or peers with higher capabilities (Stone, 1998).

Nonetheless, not all scaffolding has a positive effect on learning. Piaget (1928) believes that a student's learning can become hampered when paired with more experienced peers or experts who poses authority: 'Criticism is born of discussion and discussion is only possible amongst equals' (Piaget, 1932, p. 409). This is due to the issue of unequal power relations (see Parnell, et al., 2007; Pringle, 2008). Piaget's view is useful as a precaution, but for the purpose of developing design creativity in higher education, students are literally required to interact with people with different levels of design expertise in producing a creative outcome that is useful and appropriate. These people may or may not possess authority. In comprehending this situation, Vygotsky's notion of mediation with the assistance of more knowledgeable others (MKOs) is referred to.

Vygotsky's zone of proximal development (ZPD) incorporates what others have since termed scaffolding (Bruner, 1975), which emphasises social interactions. The ZPD is the distance between a student's ability to perform a task under the guidance of an MKO and the student's ability to solve the problem independently (figure 2.8). According to Vygotsky, learning occurs in this zone.

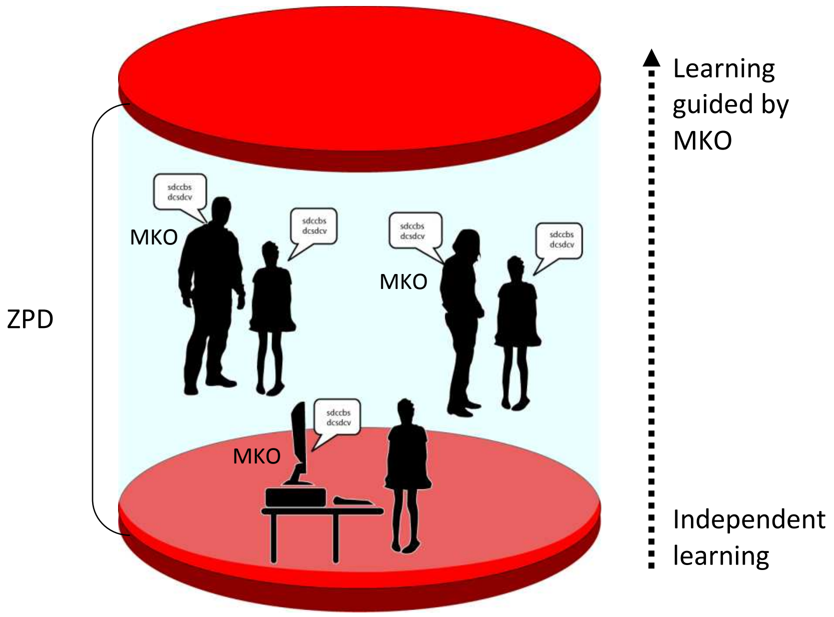


Figure 2.8: Process of mediation in the ZPD (researcher's own illustration)

Figure 2.8 depicts an individual's ability to solve problems independently and with the assistance of an MKO. Vygotsky described how the less capable individual learns better with the assistance of an MKO. Vygotsky offered a systematic view of the process of mediation by placing a learner in actual interactions within the ZPD. He placed more emphasis on the role of language in mediating relationships and this reminds us not to take any kind of interaction in learning for granted. For example, the informal interactions between tutors and students as described by researchers

(Clay, 2005; Smagorinsky, 2007) can actually offer many opportunities to facilitate the development of new ideas.

Vygotsky views social interactions as a necessary part of concept formation and this has many similarities with design practice (see section 2.3). Social interaction as noted by Cox et al. (2009) is the core of studio practice, which is based on apprenticeship learning (see section 3.1). Students are encouraged to immerse themselves in social interactions in order to develop an understanding of design requirements. This, however, can be challenging as the interactions not only focus on design learning but also on the social system, which can invite many tensions (Moran and John-Steiner, 2003).

(2.4.2) Related studies to studio-based learning

There is very limited research focusing on the interaction techniques used by design experts in assisting students with design learning (Kilgour and Koslow, 2009). This is because most of the curriculum for studio-based learning was designed to involve practitioners as visiting experts. Their participation is limited to only one session which normally takes place at the end of the course (Sas, 2006). There are, however, four significant studies (Baird, 2004; Craig and Zimring, 2000; Hertfield, 1992; West and Hannafin, 2010) that managed to obtain designers' participation throughout the design process, promoting negotiation of meaning and co-construction of design knowledge in collaborative ways. These studies will now be discussed.

The first study is one by Hertfield et al. (1992) exploring the result of designers' participation as mentors in a course on human-computer interaction. A team of professionally-recognised software and interface designers - four men and four women - acted as mentors in the students' interface design project. The study found their participation to be beneficial yet difficult to implement. The medium of the study was face-to-face interaction in which small group meetings between mentors and students were organised. The researchers found it difficult to acquire full participation from mentors due to issues of unpaid involvement and because their involvement competed with their professional schedules. In spite of this, the research revealed interesting differences between the roles played by each mentor. Some mentors pointed students to related materials that would be relevant to the students' design work, while other mentors referred students to other people who could offer a variety of support for the project. Students were able to benefit from the study by sharing experiences with others and through working in groups. They managed to work many more hours than usual to complete the project and they learned more than expected. Based on the researchers' observation, students' comments and reports by mentors, the study produced evidence that the process developed students' competence. The study however was not focused on the interactions taking place between students and mentors, and there was no detailed description of designers' interactions in facilitating students' learning. By detailed description, I refer to what actually happened during the experience-sharing process; for example, what form of feedback (praise, critique, comments) did the designers use that managed to contribute to the students' development? Which type of feedback works best? And which type of feedback was found to be less useful?

The second study is that by Baird (2004), involving building designers acting as mentors in transforming students' knowledge. The study applied the cognitive apprenticeship learning method (see section 3.2) within a classroom. The classroom replicated a typical design office where students had to deal with authentic projects and were addressed as designers instead of as students. The mentors introduced the students to the practice of the design office where they were given responsibility for their own learning. Students were also encouraged to use their own creative and innovative ways to solve design problems through discovery, self-evaluation and reflection. The success of this study relied on cognitive apprenticeship teaching methods along with four other elements:

1. the varied expertise of the mentors, who carried different perspectives and skills;
2. the learning environment, which was structured around one-to-one tutoring by designers as consultants, group interactions, the real atmosphere of a design office and afterhours access to the classroom facilities;
3. the learning activities, which were developed to encourage the expression of innovative design ideas through debates and defending design ideas, working collaboratively with peers using various tools, e.g., sketches, notes and forum, and the implementation of positive reinforcement; and

4. the learning task, which was authentic and gradually exposed students to the complexity of design work with sufficient challenges.

Baird advises that mentors should be voluntarily selected and that they should have at least basic teaching and mentoring experience in the industry or in a tertiary institution. This however seems easier said than done, as it would be a challenge to secure the participation of design experts who possess teaching experience. Baird provides useful guidelines in using the cognitive apprenticeship approach as a framework for design learning. Nonetheless, just like Hertfield et al. (1992) study, he did not explore the interactions taking place between the students and the designers.

The third study is that by Craig and Zimring (2000), exploring formative interactions between designers and students in the field of architectural design. The study was carried out in an asynchronous web-based online environment that supported text and images called CoOL Studio (Collaborative On-Line Studio). Six professional experts were asked to provide remote critiques on graduate students' designs (students were assigned to work in groups). They were invited to participate on three specific occasions. In addition to the designers, two instructors participated in leading the class and in helping the students to develop designs. Ten students created pages in CoOL Studio that contained images and text describing their project, and designer critics were asked to view the pages and add their comments wherever they seemed appropriate. There was an incident where a designer delivered a harsh critique to one student for overusing academic jargon. Designers expressed dissatisfaction when their critiques were not taken seriously by the students. As a result, the designers became more interested in seeing what the other critics had to say rather than interacting with the students. Several students, on the other hand, found some critiques to be helpful. This use of informal conversation in an online environment was one reason this collaboration between designers and students was valuable for my research study. This study found that the critiques were viewed by both students and designers as a one-way interaction. The students never directly responded to the designers' critiques. The researchers suggest that this had to do with the limited time that the students had to become familiar with the CoOL Studio environment, the technology constraints of asynchronous communication (designers added their comments whenever they seemed appropriate), ineffective navigation of the CoOL Studio environment, and a lack of trust between the students and the designers. The lack of trust, as stated by Percy (2004, p. 146), can be associated with the 'superiority and the legitimisation of social difference' between students and designers. Craig and Zimring (2000) suggest the need for further research to take place using different online environments in order to increase our understanding of how people of different ages and experience collaborate with each other. Since there was little interaction between the participants, it is hard to understand the exact influence designers' feedback had on the students. Nonetheless, the use of negative feedback or harsh critique in particular is identified in the study, and this was of interest to my research.

The fourth study is that by West and Hannafin (2010) promoting collaborative creativity using the framework of Communities of Innovation (COI). West and Hannafin explain that as opposed to communities of practice (see Wenger, 1998) COI refers to a community that shares innovation, rather than sharing practice. COI is a type of community that is not particularly linked with a specific domain of practice, structure or actions. They involve motivated individuals gathered to work towards a common goal; in the case of this research, the COI was a design community of graduate students. Instructors and graduate assistants involved only as consultants rather than as direct lecturers. Three case studies involving four design students were scrutinised and their characteristics were examined. Students in each case study were found to position themselves in the state of flow (losing consciousness of surroundings) when they began to work on their design task. Students were described as immersing themselves into their work without realising how much time had gone by and becoming unaware of their surroundings. They were also found to possess what West and Hannafin called the hacker ethic: the insertion of determination and motivation into an experience. The hacker ethic made them strive for quality rather than for grades. Students were also said to be in control of their own learning, and with this autonomy they were free to experiment with their ideas. The students however desired more collaboration and mentoring because peer critiques in the class were described to be less helpful at times. One of the students received help from another friend who was also a designer from outside the classroom. Based on their findings, West and Hannafin describe that both interactions from inside and outside the studio have an impact on students' learning, and wider collaboration can potentially enhance learning. Other methods that helped the students with their design development were prototyping activities (idea testing) and learning through critiquing others' designs. This study also identified that the involvement of COI mentors does not guarantee successful learning. This is because it was unclear whether students considered either the COI or outside design collaborators as their design community. Connections with expert networks are described as important in re-examining the designs produced by the COI; however again it is not clear precisely how they may benefit creative design. West and Hannafin recommended future studies analyse how 'distributed creative thinking emerges within a community and which community structures and constraints affect creative thinking' (p.19).

All the four studies described are relevant and useful in providing guidance for the development of an effective studio-based learning environment either face-to-face or online, with the participation of experienced communities. Nevertheless, the nature of interaction techniques used by design experts in assisting students with design learning remains unanswered.

(2.5) Summary

This chapter raises the importance of:

1. producing design that is new or outstanding and appropriate for the target society and recognised by domain experts;
2. studio-based learning approach and its limitations; and

3. social interactions in developing creativity, particularly critical reflection delivered by designers from the creative industries.

The literature however reveals that little is known about the nature of designers' feedback and its effect on higher education design courses. The next chapter explores the apprenticeship theory of learning; the type of theory that has predominantly used in design learning.

Chapter Three: A theoretical framework for the enquiry into design learning

(3.0) Chapter overview

This chapter focuses on the theoretical underpinnings that shaped and guided this research. I begin with a general discussion of the apprenticeship theory of learning, a type of theory that relates predominately to design education. I then investigate the use of cognitive apprenticeships (Collins, et al., 1989) and learners' legitimate peripheral participation (Lave and Wenger, 1991) within an educational technology design classroom, as well as that of social apprenticeship (Beaufort, 2000; Ding, 2008) in a web-based setting. The frameworks of cognitive and social apprenticeship are combined to build a pedagogical model called cognitive apprenticeship and social apprenticeship for studio-based learning (CASA4SBL). In addition, the studio-based approach is also introduced into the CASA4SBL model with the intention to make the learning process more interactive and fitting for the design interface.

This chapter also introduces the use of Activity Theory as an analytical tool to holistically examine students' learning experiences. I provide a framework to describe the compatibilities of Activity Theory and the CASA4SBL model. Within this framework, I emphasise the aspect of contradiction, as this study involves participation from two different communities, a learning community (tutor and students) and a community of practitioners (designers), within different settings, face-to-face and web-based. Based on related literature, the nature of this learning scenario is predicted to invite many contradictions.

(3.1) Apprenticeship in educational practice

My literature review revealed that research on design learning has predominantly used frameworks which have their roots in the notion of apprenticeship. Studio-based learning, as discussed in Chapter Two, reflects an apprenticeship model.

Since medieval times, the term 'apprenticeship' has been used to describe the master-apprentice relationship in which experts provide guidance to novices in becoming competent (Sims and Shreev, 2006). Apprenticeship is an old and well-established model for learning in many fields, from painting and sculpting to medicine and law (Brown et al., 1989). Before education became the responsibility of schools, it was learning through participation in apprenticeship experiences that served as the most common method of acquiring knowledge and skills (Lave, 1993; Lave and Wenger, 1991; Rogoff, 1990).

The apprenticeship method of learning is considered significant for all kinds of settings, age ranges and domains. It connects learning at work and learning in the classroom (Fuller and Unwin, 2008). It rejects the idea of separating practical skills and theoretical knowledge (Pattayanunt, 2009). Researchers (Collins, et al., 1989; Enkenberg, 2001) find this separation problematic because without sharing knowledge and expertise with a community of practitioners, learning is found to be less related when applied in concrete, real-working situations. The apprenticeship model is also useful in helping schools to rethink the teacher-student relationship. As argued by Hargreaves (2004), learning requires more than a linear transfer of knowledge. Hargreaves states that learning should emphasise mentoring and coaching, and should prepare individuals with marketable skills to benefit the future.

The apprenticeship system contains a situated learning element including thinking and reflecting on practices, reviewing and learning from experience, solving authentic problems and, most importantly, learning to learn (Raelin, 2000). These elements are valuable in promoting a smooth transition from school to work (Payne, 2002).

(3.1.1) The limitations of apprenticeship

Any type of learning approach has its strengths and limitations. In the implementation of apprenticeship learning, commitment from all parties is required, especially from the private sector such as creative agencies in the creative industries. However, many employers in the private sector find the apprenticeship procedure complicated and refuse to participate (Fuller and Unwin, 2008). To encourage participation, policy makers decided to compile a brief procedure of the learning objectives of apprenticeships in the hopes of reducing the employers' burden and providing them with more flexibility in their teaching (Steketee and Bower, 2007). This however has affected the quality of learning. Without proper regulation it is difficult to ensure apprentices receive appropriate and equal levels of training (Gospel, 2006).

Halpern (2009) states that the nature of apprenticeships (iterative, consists of plenty of practice and trial and error) can sometimes be painful and frustrating for learners. Halpern adds that it can be worse when a learner has no self-motivation, lacks discipline and receives no support from those concerned. Having an inexperienced or authoritative mentor can complicate the learning process even more (Halpern, 2009). Instead of being able to express and demonstrate their creativity, students may end up imitating previous work. As argued by Grubb and Lazerson (2007), learning may become a routine production rather than learning through production. In order to encourage the development of cognitive skills and expand apprenticeship learning beyond a single master-apprentice relationship, Collins et al. (1989) introduce the idea of cognitive apprenticeships.

(3.2) From traditional to cognitive apprenticeships

The notion of apprenticeship has developed and been updated to cognitive apprenticeship. The term cognitive apprenticeship was first coined and articulated by Collins, Brown and Newman (1989). It is defined as ‘an apprenticeship process that utilizes cognitive and meta-cognitive skills and processes to guide learning’ (Dennen and Burner, 2008, p. 426). Cognitive apprenticeship incorporates the theory of situated cognition, which posits that knowing is inseparable from doing (Brown, et al., 1989). It is also related to the Vygotskian zone of proximal development (ZPD) in which a more knowledgeable other (MKO) offers guidance to individuals in dealing with difficult tasks (Collins et al., 1991). Cognitive apprenticeship has become one of the recognised models to support learning and has gained respect and popularity throughout the 1990s and into the twenty-first century (Dennen, 2004).

There are many similarities and differences between traditional and cognitive apprenticeships (Collins et al., 1989). Cave (2010) describes that the similarities between both models relate to learning arrangements. She explains that students are encouraged to deal with authentic tasks (tasks performed for example in an organisation or a workplace) and learn through observing others (a master or other peers) during task completion. Students have to fully engage in the activities with assistance from experts. They are also advised to continuously reflect on their work in order to make improvements (Cave, 2010). Collins et al. (1991), on the other hand, establish three important differences between traditional apprenticeships and cognitive apprenticeships. They state that the traditional model is more observable since students are engaged in physical activities, such as wood carving. Novices perform direct observation in carrying out tasks by replicating what the master does. Cognitive apprenticeship, however, requires students to learn knowledge and skills that are not necessarily obvious to the eye, for example a lesson is typically presented in text, video or online. Second, the traditional apprenticeship approach to learning is confined solely to the workplace. Learners manage to make direct associations between the task and the finished product. Conversely, learning in cognitive apprenticeships is modelled in real-world situations (Collins, 2006). Teachers have to design learning activities for use within the school curriculum in contexts that make sense to students. The problems and tasks that are assigned to learners in cognitive apprenticeships arise not from the demands of the workplace but out of pedagogical concerns (Collins, 2006). Third, learners in traditional apprenticeships require less transfer of skills, given that the skills to be learned are inherent in the task itself. In contrast, cognitive apprenticeships demand that students transfer what they learn through reasoning, diagnosing problems and explaining their thought processes. Table 3.1 summarises the differences between traditional apprenticeships and cognitive apprenticeships.

Table 3.1: Differences between traditional apprenticeships and cognitive apprenticeships (Ghefaili, 2003, pp. 8-9)

Traditional apprenticeship	**Cognitive apprenticeship**
Simple tasks	Complex tasks/problem-based
Physical skills and processes	Cognitive and meta-cognitive processes
One-on-one learning in the workplace	Learning with several students in the classroom and laboratory
Tasks performed by observation	Tasks and processes performed by reasoning
Learning by doing physical tasks	Learning by externalising thought processes in diagnosing problems
Learning from modelling, coaching and fading (slowly removing scaffolding as students develop competence)	Learning from modelling, coaching, scaffolding, articulation, reflection and exploration of ideas
Job determined by tasks	Learning determined by outcomes

The differences between these two types of apprenticeship can also be visualised as shown in figure 3.1.

Figure 3.1: The traditional and cognitive apprenticeship (Cardillo, 2008; thecarpentersunion.cas, 2009)

In order to translate the model of the traditional apprenticeship to the cognitive apprenticeship, Collins et al. (1989) suggest that teachers identify ways to transfer tacit processes into explicit processes, thus allowing students to observe, perform and practice with help from the teacher. They propose six characteristics of cognitive apprenticeships: modelling, coaching, scaffolding, reflection, articulation and exploration as guidance for teaching and learning. These characteristics help students to adapt and assimilate into authentic practices (Brown, et al., 1989). Within these authentic practices, students are exposed to the principles of legitimate peripheral participation (Lave and Wenger, 1991): also see section 3.2.1, and reciprocal teaching (Palincsar et al., 1989; 1984), in that students as novices collaboratively involve themselves in social interactions with MKOs to increase their understanding and become proficient. Figure 3.2 illustrates and summarises the model of cognitive apprenticeship adapted from Brill et al. (2001).

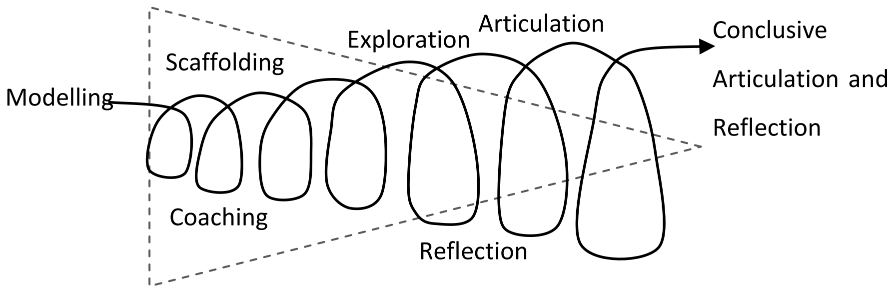


Figure 3.2: Cognitive apprenticeship characteristics (adapted from Brill, et al., 2001)

Figure 3.2 depicts the six characteristics of the process taking place when applying cognitive apprenticeship for teaching and learning. The triangle shape ( ) represents experts who gradually reduce the support provided to students through scaffolding and coaching methods. The spiral shape ( ) symbolises the stimulation of students' autonomy through exploration. Collins (2006) explains that the model of cognitive apprenticeship begins with modelling, followed by coaching, scaffolding, reflection, exploration and articulation. The model ends with conclusive articulation and reflection (Brill, et al., 2001). Collins (2006, pp. 50-51) provides further elaborations on the characteristics of cognitive apprenticeship as follows:

- Modelling involves an expert performing a task so that students can observe and build a conceptual model of the processes that are required.
- Coaching consists of observing students while they carry out a task and offering feedback, challenges and new tasks aimed at bringing their performance closer to expert performance. 'Coaching is the process of doing whatever it takes to assist learners in their learning, from start until finish' (Brill, et al., 2001).

- Scaffolding is categorised as a type of coaching and is most discussed in the literature. It refers closely to support provided by an expert to a learner. In contrast to coaching, support through scaffolding is gradually removed (faded); students have to be responsible for their own performance.
- Articulation includes any method of getting students to describe their mental process of problem solving or reasoning. This helps lead students to a better understanding of the processes involved.
- Reflection involves enabling students' own problem-solving process with other people's processes, including experts. This comparison can lead the student to new ideas or to reconsider an old idea in a new way.
- Exploration involves getting students to set their own goals for learning. The teacher can, at first, set goals for students and then encourage students to alter those goals according to what the student is interested in.

Collins (2006) explains that three of these features (modelling, coaching and scaffolding) are based on traditional apprenticeship. Students learn through observation and guidance from others. Students begin to take control of their own learning (problem solving) as they move towards the articulation, reflection and exploration stage. This model aims to encourage each student to think beyond replicating others' ideas or products (Hogan and Tudge, 1999) by promoting higher-order cognitive reasoning and thinking.

Despite its strengths, Ghefaili (2003, p. 23) also notes the challenges that teachers face when implementing a cognitive apprenticeship approach in their classrooms:

- Cognitive apprenticeship may require different roles for teachers, from that of a knowledge transmitter to a coach to a facilitator of students' understanding;
- Cognitive apprenticeship may provoke higher levels of student anxiety and frustration;
- Cognitive apprenticeship may require more time on task;
- Cognitive apprenticeship may require additional or more sophisticated resources;
- Cognitive apprenticeship may require a fundamental change in test traditions, focusing on the individual's cognitive progress and transfer of knowledge (testing the cognitive progress).

Ghefaili (2003, pp. 14-17) provides a summary table showing the six teaching method of cognitive apprenticeship and the mentors and students roles as well as the expected target skills the students should achieve (see table 3.2).

Table 3.2: A summary of roles of cognitive mentors and students and target outcomes for the six teaching methods of cognitive apprenticeship (Ghefaili, 2003, pp. 14-17)

Component	Mentors' Role	Students' Role	Target
Modelling	Show students how to do tasks; Build a conceptual model of the processes; Explain reasons why things	Observe Watch/ listen/ conceptualise.	

	happen that way; Provide rationale for processes.		Receptive meaningful learning (declarative and heuristic knowledge)
Coaching	Observe students attempting a task; Provide assistance as needed; Offer hints, feedback and guidance.	Perform a task; Engage in problem-solving activities.	
Scaffolding ('fading')	Offer minimal support, guidance and reminders; Assist students to manage complex task performance If necessary, complete those parts of the task that students have not yet mastered; Gradual removal of support (fading)	Perform a more complex task; Work independently; Engage in legitimate peripheral participation.	
Articulation	Require students to explain what they are doing; Encourage students to explicate their knowledge, reasoning and problem-solving strategies.	Explain their knowledge; Discuss their strategies; Think aloud.	Meta-cognition
Reflection	Encourage students to reflect on their tasks; Provoke students to compare their work with masters, other students and with an internal cognitive model of the relevant expertise.	Reflect on work they have already performed and analyse or deconstruct it; Compare what they know with what others know; Contrast their work with that of others.	
Exploration	Encourage students to solve new, but similar, tasks; Push students to be	Solve new, but similar, tasks; Frame and explore interesting questions;	Application/ transfer

	independent learners; Force students to engage in exploration.	Make independent discoveries; Identify personal interests and pursue personal goals.	

Table 3.2 can be useful for mentors who wish to use the cognitive apprenticeship model in their lessons. Every activity is structured to make learning more valuable and meaningful for the students.

(3.2.1) Legitimate peripheral participation in cognitive apprenticeship

Legitimate peripheral participation (LPP) is commonly discussed in the cognitive apprenticeship literature. Lave and Wenger (1991) claim that successful apprenticeship learning occurs through a process of LPP in a community of practice (CoP). They shift the idea of learning from single relations between master and apprentice to learning in a community, taking the influence of the social into consideration. LPP allows a learner to act as a member of a CoP. Wenger (1998) describes CoP as groups of people engaging in activities with shared objectives or interests expanding their knowledge through regular interaction; LPP, on the other hand, is described as the process of integrating novices or newcomers into a CoP.

> Legitimate peripheral participation provides a way to speak about the relations between newcomers and old-timers, and about activities, identities, artefacts, and communities of knowledge and practice. A person's intentions to learn are engaged and the meaning of learning is configured through the process of becoming a full participant in a socio-cultural practice. This social process includes, indeed it subsumes, the learning of knowledgeable skills. (Lave and Wenger, 1991, p. 29).

LPP emphasises ‘connecting issues of socio-cultural transformation with the changing relations between newcomers and old-timers in the context of a changing shared practice’ (Lave and Wenger, 1991, p. 49). This distinction appears to be of interest to my study in understanding the nature of learning scheduled between students and a community of practitioners in developing design creativity. The community of practitioners may provide peripheral experience to students through legitimate access. This also means that students will experience the process of enculturation: adopting the norms, behaviours, skills, beliefs, language and attitudes of the design community (Lave and Wenger, 1991; Rogoff, 1990).

According to Wenger (1998), every CoP has its own ways of engagement. Members perform detailed and complex activities which outsiders may not understand. For example, designers in the creative industries apply critical reflection as part of their practice (see section 2.3) which students may find unusual. The idea of learning through the process of LPP in a CoP, however, has received criticism related to the effects of ‘power relations, access, public knowledge and public accountability’ (Tennant, 1997, p. 79). Wenger (1998) responds to the critics by highlighting three critical dimensions explaining the reasons that sustain relationships and bring people together as a CoP: these are mutual engagement, joint enterprise, and shared repertoire.

- Mutual engagement: Wenger (1988) suggests that there should be a shared task or interest between members so as to reduce unequal power relations. Mutual engagement is reached when members acquire an awareness mechanism (Gutwin and Greenberg, 2002), and become aware of the contribution made by others and of the purpose of each other's role in the community. Members should also constantly discuss their shared objective(s) (Churchill et al., 2000).

- Joint enterprise: in achieving mutual accountability, Wenger explains that it takes more than a statement of objective. It involves the negotiation of that statement where members agree to a common set of community standards and expectations.
- Shared repertoire: over time, members of a CoP evolve a shared repertoire (common stories, style, ways of speaking, artefacts, tools, discourses, concepts, historical events). This differentiates them from others.

Wenger (1998) further elaborates on the type of membership of a CoP. Relationships between members can vary within these various trajectories:

- Peripheral (lurker): moderate and unstructured participation. They may not become insiders of the community but interact intensively enough to be recognised as members.
- Inbound (novice): a newcomer heading to become a fully-participating member of the community.
- Insider (regular): a fully committed member of a community.
- Boundary (leader): an experienced person who sustains membership and brings a different set of skills or services to the community.

- Outbound (elder): a person who is preparing to leave the community for a variety of reasons.

Wenger (1998, p. 154) states that ‘by choice or by necessity, some trajectories never lead to full participation yet they may well provide a kind of access to a community and its practice that becomes significant enough to contribute to one’s identity’. This also means that, through these trajectories, students are provided with grounds to decide what matters and what does not. They can choose to remain or leave the CoP depending on a variety of reasons or objectives.

The concepts of LPP and CoP provide important insights in understanding the causes of success and failure in incorporating cognitive apprenticeships. LPP describes the importance of scaffolding in shifting a learner’s position from legitimate to full participation. Students’ participation in learning is viewed as an evolving form of membership instead of a condition for membership; therefore it deserves much care and attention. Sufficient time and space are clearly needed to achieve all this. In addition, the application of cognitive apprenticeship would require a determined mentor who is willing to experiment with different approaches and make adjustments to match the diversity of students (Estudillo, 2008).

(3.2.2) Cognitive and social apprenticeships

While cognitive apprenticeships provide an insight into the possible ways to facilitate newcomers’ enculturation to their disciplinary communities in formal educational settings (within the classroom and between teachers and students), researchers (Beaufort, 2000; Ding, 2008) state that social apprenticeship requires socialisation, interaction and collaboration with the professional community and peers within a more informal environment. As stated by Beaufort (2000, p. 188), social apprenticeship emphasises these contextual factors in learning: 'immediate and long-term social implications; and community's goals and values'. Beaufort's study of socialisation processes of two novice writers into an organisation proposes a framework for social apprenticeship in writing either in school or non-school settings. She emphasises the social motives for writing, the integration of collaborative models for individual and group performance and efforts to make context-specific knowledge transferable for novice writers. Her study however was conducted not in a school setting, but in a workplace environment. Beaufort acknowledges the need for more detailed studies to comprehend the influence of the community's role in supporting or hindering learning in the school environment.

Considerably different to Beaufort's study, Ding (2008) explores the use of both cognitive and social apprenticeships in her study of introducing novice writers into an accredited organisation. Ding clarifies how the integration of cognitive and social apprenticeship is able to facilitate novice writers' enculturation into their disciplinary discourse communities. Ding (2008) notes social apprenticeship to be useful as a supplementary framework to assist novice-expert transformation in informal educational settings. She also notes cognitive apprenticeship to be the main framework assisting students to learn independently. She suggests students be encouraged to interact with experts and peers in order to become competent with the task and the disciplinary culture (Ding, 2008). Ding also advises of the need for careful curriculum design and collaboration if we wish to implement social apprenticeship between academic and disciplinary communities in workplace practice. The process of socialisation in social apprenticeship requires socialising skills, good communication skills, rapport building and the ability to articulate one's research projects with clarity and conciseness. This approach offers promising benefits for the students, although it can be demanding and time-consuming (Ding, 2008). The study of social apprenticeship however has not received much attention in the context of design of learning technology. It has mostly been applied in the field of health and social care. This makes it interesting to explore.

The combination of cognitive and social apprenticeship as proposed by Ding (2008) may provide rich understandings of how to address a complex and diverse learning environment. Learning can be extended to meet the challenges and opportunities from the community within and beyond the classroom. For example, figure 3.3 depicts the possibility for learning to expand with the implementation of both cognitive and social apprenticeship.

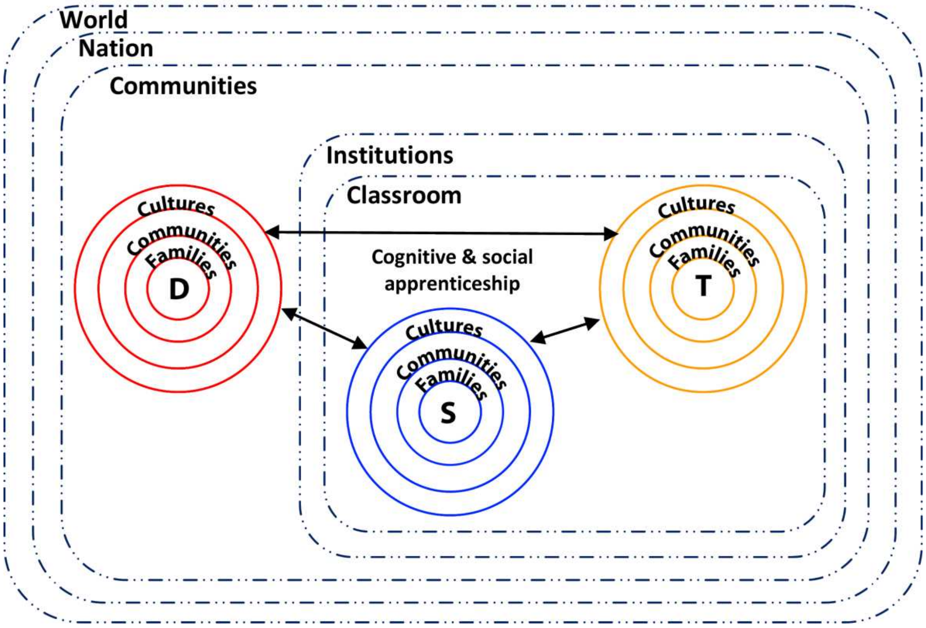


Figure 3.3: Interrelationships between the classroom's ecological systems (adapted from Hawkins, 2005)

Figure 3.3 presents larger discourses involving more communities than the academic institution. The letter 'D' represents the community of designers; 'S' represents students; and 'T' represents teachers. Each student, teacher or designer embodies and represents larger discourses into which they are socialised; they are represented by the circles labelled families, communities and cultures (Hawkins, 2005). Hawkins (2005, p. 28) explains how the interactions in classrooms 'are a dance in which the diverse beliefs, values, and practices from each are constantly being negotiated by the learner and among learners (around specific school-based activities)'. He adds that beyond the naked eye, classroom ecologies are influenced by other factors situated in a larger constitution of the world, communities and institutions. While cognitive apprenticeship encourages interactions between communities in the classroom and institution, social apprenticeship expands the interaction to other communities. Students are required to negotiate meanings with not only communities in the academic institution (S and T) but also other related communities such as designers (D).

(3.2.3) Integrating cognitive and social apprenticeship in a web-based setting and face-to-face

The cognitive and social apprenticeship model aims to provide students with opportunities to engage in meaningful activities; build complex understandings with others and gain prompt feedback throughout the process of learning. The model however is described as being too idealistic and impossible to attain within the constraints of learning institutions (Daniels, 2001). Arguably, with the advent of technology, engagement in new and unique ways of interaction can be achieved. Learning is no longer confined to a physical space. Students are able to connect with real experts as mentors through a variety of technological tools. As stated by Wenger et al. (2009, p. 11):

> Technology extends and reframes how communities organize and express boundaries and relationships, which changes the dynamics of participation, peripherality, and legitimacy. It enables very large groups to share information and ideas at the same time as it helps smaller groups with narrower, more specialized and differentiated domains to form and function effectively. It allows communities to emerge in public, opening their boundaries limitlessly, but it also makes it easy to set up private spaces that are open only to members. It affords many ways to limit access, expressing intimacy or privilege, or it can greatly enlarge the group's periphery.

Problems in gaining access to a community of practice (CoP) now extend through time and space. Researchers (Kozma, 1991; Rodzvilla, 2002) identify that greater opportunities for interactivity and learner control can be achieved through the application of new technologies such as weblogs, social network sites and podcasting. Interaction between individuals through these technologies can encourage creative activities (Loveless, 2008). For example, remote experts can review and comment on student projects (Craig and Zimring, 2000); large classes can hold online discussions (Craig et al., 2000) and students can comment on the work of their peers in other classes (Kolodner and Nagel, 1999). Ada (2008) also notes the fact that the computer-supported environment allows for activities such as social debate and critique, discussion and reflection, and construction of collaborative knowledge to take place within learning communities.

Loveless (2008), however, argues in her research into creative learning and technology that attention should be given not only to the technologies but also to the tension, uncertainty, contradiction and risk in encouraging creativity with these technologies. Educators are encouraged to reflect carefully upon the nature of these technologies and their application to learning, and question the value they may have to support learning in practice (Selwyn, 2007). More research is needed to understand how such socio-technical practices fit within the students' overall learning ecology (Barron, 2006).

Harris et al. (2008) highlight two challenges researchers and developers have to deal with when using technologies to support cognitive apprenticeship learning: (1) to develop a set of procedures to implement cognitive apprenticeship within a technology-based environment; and (2) to develop a technology-based environment (computer programs or applications) that is able to support the procedures. This leads to the question as to what existing technologies would be suitable, and in what ways could they supporting cognitive and social apprenticeship learning.

There is little research on social apprenticeship, e.g., Beaufort (2000) and Ding (2008) but larger numbers of studies on cognitive apprenticeship. Researchers have used different types of technology such as computer simulation and multimedia software to implement cognitive apprenticeship (Jarvela, 1995; Liu, 1998; Liu and Hsiao, 2002); however, very few explicitly investigate the use of cognitive apprenticeship methods in a web-based environment (Dickey, 2008). I present three studies (Dickey, 2008; Liu, 2005b; Rohde et al., 2005) that have come closest to applying cognitive apprenticeship in web-based environments. Two of these studies - Dickey (2008) and Liu (2005b) - however, do not involve the participation of communities other than academia due to their context of study: teacher education.

The first study is one by Dickey (2008) exploring the Integration of cognitive apprenticeship in a web-based educational technology course for teacher education. This research aimed to improve students' technology skills development and knowledge of technology integration. 42 students from 11 different teacher education licensure programmes were involved in a web-based technology integration course entitled Integrating Technology and Education Practicum (I-TEP), guided by an instructor. There were different methods of instruction offered: learning through watching, listening and doing guided by the video presentation prepared by the instructor; performing reflective dialogues with other students and the instructor; and monitoring and guiding students’ work-in-progress by the instructor. Learners with different experiences and skills were able to help each other and gained different levels of support: experienced students preferred scaffolding, for example the video archive, while less experienced students relied more on text-based instruction and email assistance from the instructor than on the other methods. They were also found to use other resources beyond those provided in the I-TEP. The findings from the case studies reveal that the integration of cognitive apprenticeship methods (modelling, scaffolding, coaching and exploration) in a web-based learning environment indeed had a positive impact and assisted teacher education students to immerse themselves in becoming educational technology practitioners. Although there was no other community involved such as a community of practitioners, this study managed to create connections between students to form a learning community with different levels of experiences. Within the learning community, students gained various types of support, from highly structured to more flexible levels of support. Support from the community of students helping each other became part of the accomplishments of this study, since it is impossible for one instructor to fulfil all the needs of all learners. This is an important point to consider. Dickey (2008), however, urges researchers to explore more methods and techniques in applying effective scaffolding within web-based learning environments, and also to allow for more than one instructor to get involved. This forms one of the areas of interest in my study.

The second study is that by Rohde et al. (2005), integrating a computer-supported course in computer science teaching called 'Entrepreneurship and New Media'. The course required students of computer science to collaborate with IT companies and academicians. It was carried out in 2001 and 2002. The course began with the formation of a project group between students and practitioners, accompanied by lecturers and academic supervisors. They were connected and facilitated by online community systems called CommS in 2001 and BSCW in 2002 which allowed for discussions to take place. Students received market-oriented perspectives from the practitioners and relevant learning materials from their lecturers. Additionally, supervisors also provided consultancy and supervision. Several review meetings supported the reflective processes of the students related to their tasks. The cognitive apprenticeship method is described as assisting the participation process, during a time when students were about to enter the community as beginners on the periphery before gaining a more central position over time. The establishment of a CoP between students and IT practitioners was however less successful during the first attempt in 2001. This was because the IT companies involved were very young enterprises which had not established a consolidated practice of their own; there were only few employees and therefore very limited resources to supervise the groups of students, and the supervisors at that time were not experienced in organising the course. Furthermore, spatial distance, cultural differences and different expectations hindered the establishment of a CoP between university students and company practitioners. Fortunately, the second attempt in 2002 became more successful. An established company with higher numbers of staff participated and the course was conducted by distinguished supervisors. Supervisors facilitated meetings, provided supporting materials such as software and books, and offered frequent consultancy to students. The community system was upgraded from CommS to BSCW, allowing for more activities to take place, such as project materials to be published regularly on the net, upload and download of documents, organisation of discussions in a forum, co-authoring of documents, annotations and distribution of information. Bigger student groups were also established (each of the three groups started with six members); each group was supervised by an academic tutor, therefore the supervision of the project groups was strengthened. Moreover, practitioners played their role as group leaders, encouraging students to make progress with their projects.

Overall, this study suggests that trust and team spirit are foremost required in establishing a CoP between academia and industry. Academic tutors have new responsibilities in providing efficient support for students and allocating plenty of time and effort to nurturing a mutual understanding between university students and company practitioners. It illustrates that with good personal relationships and rich social resources, a common practice between students and practitioners can be established.

The third study is that by Liu (2005b), exploring the use of a web-based cognitive apprenticeship model to improve pre-service teachers' performances and attitudes towards instructional planning. Liu identified that there was a lack of contact opportunities between pre-service teachers and experienced teachers in conventional teacher education programmes in universities. This discouraged pre-service teachers from learning how to think like experts. Factors such as a large number of pre-service teachers in a university and geographical distance between them and the expert teachers did not make the situation any better. Fortunately with the existence of digital technologies, a web-based cognitive apprenticeship approach could be applied and the above issues could be managed. This study involved pre-service teachers as the learners, expert teachers as the major instructors, multimedia technologies as the tools, and the Internet as the main learning environment. There were three technologies which were applied in this study: web-based systems (IPASS) that were developed to help teachers in instructional planning; multimedia programmes to support teachers' activities with learning materials; and web-based conferencing to help pre-service teachers to be reflective practitioners and gain sufficient knowledge from expert teachers through active interactions.

Four expert teachers and 24 pre-service teachers collaborated through a web-based system and it was found to offer many benefits to the pre-service teachers. They managed to observe and understand experts' practice, reviewed their own performance, constructed, modified, and elaborated their conceptual models, and detailed and extended their conceptual models with guidance from the expert teachers. The experts also clarified that they could clearly externalise their practical knowledge and thinking skills according to the learners' needs. The technologies provided flexibility for expert teachers to offer guidance where they could review and discuss the instructional plan produced by pre-service teachers at their own convenience through synchronous and asynchronous communication. Other than the experts' review, pre-service teachers also managed to construct new knowledge with support from peers. With expert guidance and peer support, the pre-service teachers became more positive toward developing instructional plans. This study suggests that a CoP of teacher educators, pre-service teachers and in-service teachers can be developed with the proper use of network technologies that integrate a cognitive apprenticeship approach. For future studies, Liu recommends that similar studies be applied with larger samples within different disciplines and within wider communities of teacher-educators, pre-service teachers and in-service teachers.

With the aid of technologies and with careful integration of the cognitive apprenticeship model, these three studies suggest a strong framework for learning to expand outside of classroom environments. Students are able to draw support from multiple sources and from multiple individuals.

(3.2.4) A conceptual framework for development of the CASA4SBL pedagogical model

I propose a conceptual framework of a pedagogical model for this study that captures the notion of cognitive apprenticeship, social apprenticeship and studio-based approach. It is termed CASA4SBL standing for 'cognitive apprenticeship and social apprenticeship for studio-based learning'. Cognitive apprenticeship (Brill, et al., 2001; Collins, 2006) provides the main structure of the model and this is divided into three phases: First phase: modelling and coaching and scaffolding; Second phase: articulation, reflection and exploration, and coaching and scaffolding; and Third phase: final articulation and reflection (see figure 3.4).

	PHASE		PROCESS	ACTIVITY
1	**Modelling**	**Coaching and Scaffolding**	Introduction to design lesson and web-based environment	Lecture on theoretical principles and elements of design in class.
				Design software training in a computer lab and sign up for learning in a web-based environment.
2	**Articulation**	**Coaching and Scaffolding** (Integrating social apprentice-ship and studio-based approach)	Design explanation and clarification	Students create and post their interface design in the web-based environment. They have to explain and clarify their design concept.
	Reflection		Critical reflection (integrating social apprenticeship and studio-based approach)	Students' interface designs are viewed and reviewed (three times). They have to constantly reflect, and compose and re-compose their design with the help of others though coaching and scaffolding.
	Exploration		Goal setting	Students are encouraged to decide and set their own goals for learning.
3	**Final articulation and reflection**		Reflect and conclude design - learning process.	Students have to justify the strengths and weaknesses of their design. They have to leave their design published in the web-based environment. This allows them to continuously reflect on their work and experiences in producing better design.

Figure 3.4: Pedagogical model of cognitive apprenticeship and social apprenticeship for studio-based learning (CASA4SBL)

Social apprenticeship and the studio-based approach are incorporated into the activities of coaching and scaffolding, the intention being to intensify the reflection process involving not only tutors and peers but also professional designers from the creative industries.

All the activities in the CASA4SBL model can take place either in class or online between tutors, students and peers; however the coaching and scaffolding activities with designers are carried out within a web-based setting during off-class periods.

First phase (modelling):

Learning begins with modelling, where the tutor delivers the theoretical parts of design knowledge in class and demonstrates techniques to master design software such as Adobe Photoshop and Flash in the computer lab. The tutor also guides students on how to register in an online private group, i.e., only the class, their tutor and the volunteer designers can access this online space.

First phase (coaching and scaffolding):

Coaching and scaffolding in this phase involves a more knowledgeable other (MKO), whether a tutor, a better-informed peer or even a computer; however designers are not yet involved at this stage.

Second phase (articulation):

Students have to develop and articulate their interface design. They have to post their interface designs in the online private group and explain the design concept to other participants.

Second phase (reflection):

Students' interface designs are viewed and reviewed where they have to constantly reflect on the feedback given. From there they have to compose and re-compose their design. This comparison can lead the students to new ideas or to reconsider an old idea in a new way. I discussed the nature of design practice in Chapter Two: it relies heavily on dynamic interaction and critical reflection. Critical reflection under the studio-based approach has always been an integral part of the creative process (Cobb, 2000) and is commonly used by designers in the creative industries (see section 2.3).

Second phase (exploration):

Students are encouraged to set their own goals for learning in order to encourage exploration and creativity and cope with the issue of unequal student-expert power relationships. The tutor can, at first, set goals for students but students have to alter those goals according to what they are interested in. Students are given control over their own learning.

Second phase (coaching and scaffolding):

Coaching and scaffolding in this phase can apply dynamically in articulation, reflection and exploration. The studio-based approach as 'tricks of the trade' is applied to encourage creative and critical thinking. The tutor, more knowledgeable peers and designers together provide coaching with support and challenge to enhance the quality of the student interface design. Both coaching and scaffolding are crucial in coping with students at different levels: some may require more constant support than others. In contrast to other activities in the model that are carried out during class time, the coaching and scaffolding with designers has to be carried out within a web-based setting during off-class periods. As recommended by researchers, e.g., Chen and Javeri (2005); Craig, et al. (2000); and Ding (2008), this will help overcome the limitations of time, space, expenditure and distance between designers and other participants. However this time commitment aspect might be problematic for students, who may consider this an additional work load. The same issue applied to tutors and designers who need to fit this into their busy lives.

Third phase (Final articulation and reflection):

Students have to make justifications (final reflective report) for what they have achieved at the end of the learning process in the third phase. This will raise their understanding of the strengths and weaknesses of their design. Their designs are then left published in the web-based environment which is open only to members of the group and not to the wider public. This is intended to remind them to continuously reflect on their design and make improvements.

The CASA4SBL pedagogical model aims to enculturate or adapt students into authentic practices through activity and social interaction. In order to understand its attempt to enhance design creativity, Activity Theory is used. The suitability of Activity Theory as an analytical framework is now discussed.

(3.3) Activity Theory as an analytical tool

Researchers (Barab et al., 2004; Blin, 2004, 2005; Brine and Franken, 2006; Issroff and Scanlon, 2002) have used Activity Theory to study the design and implementation of learning supported by technology in various communities of practice (Cobb et al., 2003). Activity Theory therefore seemed suitable to explore as a potential analytical framework, given that part of the CASA4SBL framework involves web-based learning and two different communities: a community of practitioners (designers) and a learning community (students, peers and tutors). In addition, Scanlon and

Issroff (2002) also used Activity Theory as an analytical tool in their study to comprehend the learning experiences of students and teachers in higher education when using technology. They found Activity Theory useful in providing insights into all aspects of interactions and contradictions, and this is relevant to my area of interest.

(3.3.1) What is Activity Theory?

Activity theory, alternatively known as Cultural-Historical Activity Theory (CHAT), had its basis in the ideas of Vygotsky (1978) in the 1920s which were further developed by Leont'ev (1978; 1981) and Engeström (1993). Activity theory can be utilised not only as an analytical tool (Scanlon and Issroff, 2005), but also as an approach (Nardi, 1996), a conceptual theory (Cole, 1999; Nardi, 1996; Russell and Schneiderheinze, 2005) and a philosophical framework (Kuutti, 1996). The theory focuses on the components of an activity system. Engeström (1993, p. 67) elaborates these activity system components:

> [S]*ubject* refers to the individual or subgroup whose agency is chosen as the point of view in the analysis. The *object* refers to the "raw material" or "problem space" at which the activity is directed and which is moulded or transformed into *outcomes* with the help of physical and symbolic, external and internal *tools* (mediating instruments and signs). The *community* comprises multiple individuals and/or subgroups who share the same general object. The *division of labour* refers to both the horizontal division of tasks between members of the community and vertical division of power and status. Finally the *rules* refer to the explicit and implicit regulations, norms, and conventions that constrain actions and interactions within the activity system. (Italics in the original)

Engeström (1999) discusses the activity system components in three generations of Activity Theory (see figures 3.5-3.7). He explains that the first generation of Activity Theory was built on Vygotsky's notion of mediated action; the second generation was based on Leont'ev's notion of the activity system; and the third generation was built on the idea of multiple interacting activity systems focused on a partially shared object.

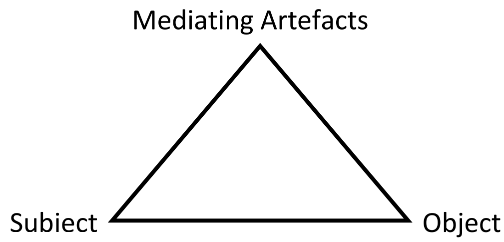


Figure 3.5: First generation of Activity Theory (Source: Engeström, 2001, p. 134)

This first generation of Activity Theory drew heavily on Vygotsky's concept of mediation. This triangle represents the way in which Vygotsky focused on the relations between people and the socio-cultural context in which humans perform and work together in interrelated fields (Beliavsky, 2006; Moll, 1990). According to Vygotsky, humans use artefacts that develop from a culture to mediate their social environments. Vygotsky categorised artefacts into two categories: *signs* used in communicative acts; and *tools* used in instrumental acts (following the terminology of Habermas and McCarthy, 1991). Language is a special kind of artefact; that is, a material thing with ideal properties used by humans to create meaning. Meaning is simultaneously subjective and objective; it can only be accepted and 'understood in specific social contexts' (Daniels, 2001, p. 20).

Vygotsky discussed the general importance of language and schooling for psychological functioning; however he failed to examine them in real social systems (Ratner, 1997). Inspired by Leont'ev's (1981) work, Engeström (1987) refined the model further into a real social system which led to the creation of the second generation of Activity Theory (Figure 3.6).

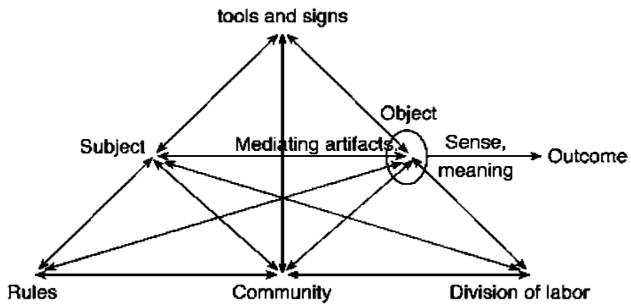


Figure 3.6: Second generation of Activity Theory (Source: Engeström, 2001, p. 135)

Vygotsky's triangle is expanded in the second generation of Activity Theory; elements of community, rules and division of labour are added. The importance of the second generation of Activity Theory is that it emphasises the interrelations between the individual subject and community of which he or she is a member. The community represents a larger group interacting in the activity while division of labour refers to different roles with different power relations (McMillan, 2009). According to McMillan (2009), division of labour is often found to be the component that causes contradictions (explained further in section 3.3.2). All components of the activity system are governed by rules which can be either explicit or implicit.

Based on the second generation's triangle, Mwanza (2002b) incorporates an eight-step model to help researchers better utilise or analyse the activity system.

Table 3.3: The eight step model (Source: Mwanza and Engestrom, 2005, p. 459)

Step	Identify the:	Question to ask:
1	Activity of interest	What sort of activity am I interested in?
2	Objective	Why is the activity taking place?
3	Subjects	Who is involved in carrying out the activity?
4	Tools	By what means are the subjects performing this activity?
5	Rules and regulations	Are there any cultural norms, rules or regulations governing the performance of the activity?
6	Division of labour	Who is responsible for what, when carrying out activity and how are those roles organised?
7	Community	What is the environment in which this activity is carried out?
8	Outcomes	What is the desired outcome from carrying out this activity?

The first and second generations of Activity Theory are said to be based more on research tradition and the teacher-student relationship (Mwanza, 2002b); and both Activity Theory generations fail to recognise cultural diversity (Engeström, 2001). Engeström (2001) explains that Activity Theory began to recognise diversity and dialogue between different traditions or perspectives when it was introduced to an international audience by Leont'ev in the late 1970s. To take account of these issues, a third generation of Activity Theory was proposed. The third generation of Activity Theory was developed 'to understand dialogue, multiple perspectives, and networks of interacting activity systems' (Engeström, 2001, p. 135). It expanded to include two interacting activity systems (figure 3.7).

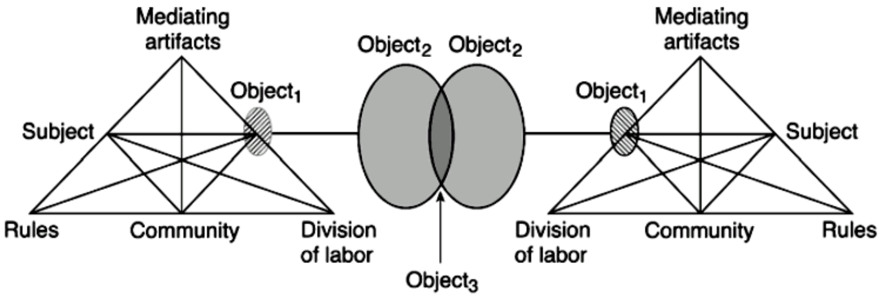


Figure 3.7: Third generation of Activity Theory (Source: Engeström, 2001, p. 136)

The third generation of Activity Theory provides an understanding of how a potentially shared object (Object 3) can be achieved guided by five principles of an activity system (Murphy and Manzanares, 2008b, p. 444):

- According to the first principle, the main unit of analysis in Activity Theory is the activity system (Engeström, 2001).
- Multi-voicedness refers to multiple perspectives, interests and traditions, which can be a source of trouble and of transformation in the system, as members of an activity system 'carry their own diverse histories' and the system itself 'carries multiple layers and strands of history engraved in its artefacts, rules and conventions' (Engeström, 2001, p. 136).
- The principle of historicity argues that the history of activity systems helps understand their problems as well as their potential

because 'parts of older phases of activities stay often embedded in them as they develop' (Kuutti, 1996, p. 26).

- Contradictions can result in tensions but also transformation in activity systems. In the context of education, for example, a contradiction in teachers' practices might occur when a new technology is introduced into their activity system and clashes with an old element.
- Expansive learning relates to the possibility of expansive transformations in activity systems through re-conceptualisation of the object and the motive of activity 'embrac[ing] a radically wider horizon of possibilities than in the previous mode of the activity' (Engeström, 2001, p. 137).

Roth and Lee (2007) find that third-generation Activity Theory offers the possibility to overcome some of the worrying questions in education including the gap between theory and practice (Roth et al., 2000), the differences between de-contextualised and embodied knowledge (Lave and Chaiklin, 1993) and the obvious disengagement between individual learners and other learners and their social environments (Barab and Plucker, 2002; Shultz, 1986). The practice can be viewed as developmental processes where both individual and social levels are interlinked (Cole, 1999). It describes learning as a non-isolated act, situated in time and space and influenced by the surrounding actors, resources and behavioural constraints.

Despite its advantages, Engeström (2001) states that the challenges facing the third generation of Activity Theory are how to initiate new ways of working in collaboration and how to develop concepts and tools in dealing with the intersecting systems (dialogue, multiple perspectives and networks). The object became the main component to unite the activity system as portrayed in figure 3.7; however, in achieving the shared object, many contradictions are predicted to occur. Third-generation Activity Theory recommends that researchers pay attention to identifying contradictions, as these can be the source of innovations that emerge as a result of introducing the new system (Mwanza and Engeström, 2003). As stated by Nardi (1996) cited in Adams et al. (2003, p. 5) ‘Activity Theory sees contradictions not as problems but as sources of development; activities are virtually always in the process of working through contradictions that subsequently facilitate change’.

(3.3.2) Activity Theory and contradictions

Much of the power of Activity Theory as an explanatory framework relies on the concept of contradictions (Engeström, 1999). There are many interpretations of contradiction. It has been variously described as conflict (Dippe, 2006), tension (Basharina, 2007) and problems, ruptures, breakdowns and clashes (Kuutti, 1996). Engeström (2001) sees contradictions as historically accumulating tensions. He further states:

> Contradictions are historically accumulating structural tensions within and between activity systems. (...) When an activity system adopts a new element from the outside, it often leads to an aggravated secondary contradiction where some old element collides with the new one. Such contradictions generate disturbance

and conflicts, but also innovative attempts to change the activity. (Engeström, 2001, p. 137)

Meyers (2007) explains that contradictions arise when there are conflicting ways of thinking and acting between individuals or organisations which result in tensions. The development of new practices is said to emerge following the resolution of these tensions. Amory (2010, p. 76) suggests that studies in education technology design should include 'contradictions that challenge existing paradigms and allow for disruption, and therefore learning'. In the study in this thesis the integration of social apprenticeship, for example, could possibly invite contradictions where students have to engage in design activity with the experts who may have conflicting viewpoints.

Murphy and Rodriguez-Manzanares (2008b) argue that contradictions may not always encourage development as it depends upon whether or not the contradictions are acknowledged and resolved. This is because some contradictions can be difficult to identify. Capper and Williams (2004) provide an example of invisible contradiction: a type of contradiction that is difficult to confront openly because it relates to sensitive or cultural issues such as gender or offensive personal habits. Murphy and Rodriguez-Manzanares (2008b) state that there have been a limited number of studies focusing on identifying contradictions in the context of educational technology. They identify nine relevant studies; however the findings of these studies were not centred on contradictions, e.g., Barab et al. (2002); Basharina (2007); Berge (2006); Dippe (2006); Fåhræus (2004); Hardman (2005); Murphy and Rodriguez-Manzanares (2008a); Peruski (2003); Russell and Schneiderheinze (2005). Some of these studies acknowledge the value of contradictions in leading innovation and shifting pedagogical practice (Hardman, 2005; Murphy and Manzanares, 2008b), while others reveal that contradictions can remain unresolved (Basharina, 2007). Basharina (2007) provides a lens through which to study cultural misunderstandings in the context of intercultural telecollaboration. She reveals how contradictions can be unresolved when a subject (or subjects) in the activity system fails to work on joint activities, and possesses different objects/motives and mediating tools. Based on these studies, Murphy and Rodriguez-Manzanares (2008b, p. 447) prompt researchers to ask better questions related to contradictions, for example:

- 'What practices and contradictions for the students and the teachers emerge due to the design characteristics of the… programme?' (Dippe, 2006, p. 2).
- 'What were the contradictions that emerged in the project under study?' and 'What were the underlying reasons for those contradictions?' (Basharina, 2007, p. 87).
- 'Whether the introduction of a new tool — the computer — into the classroom shift[ed] a teacher's pedagogical practice' (Hardman, 2005, p. 99).
- 'Does participating in [design and teaching] transform the thinking of the participants or the systems on issues such as course design, teaching, learning, technology and face-to-face teaching?' (Peruski, 2003, p. 28).

I shall refer to these questions to identify contradictions in my study, and this will be discussed further in Chapter Four. To relate this to my study, Activity Theory can be used for understanding the challenges, contradictions and turbulences that are inevitable when a community of practitioners (designers) have to work alongside a learning community (students and tutors) to improve design creativity in different settings (web-based and face-to-face).

(3.3.3) The relationship between two concepts: the CASA4SBL pedagogical model and Activity Theory

Scanlon and Issroff (2005) set out two different categories of theories in educational technology: (1) theories that help design effective learning materials or deliveries; and (2) theories that help understand the culture and context of different learning situations and their impact on students' learning.

In this chapter I have discussed both categories of theory. The first category which allied to socio-cultural theory represents the theory of apprenticeship (cognitive and social). Cognitive apprenticeship and social apprenticeship together with studio-based approach were integrated into a pedagogical model called cognitive apprenticeship and social apprenticeship for studio-based learning (CASA4SBL). The CASA4SBL pedagogical model is assembled with the intention to improve learning and develop design creativity among student teachers in higher education. The second category signifies Activity Theory, the type of theory that helps understand factors that contribute to students' development.

While the CASA4SBL model focuses on attaining collaborative learning between students and more knowledgeable others (MKOs), Activity Theory is considered as a systematic lens that can be used to analyse problems that may arise within the collaboration. Figure 3.8 shows how these two concepts complement each other.

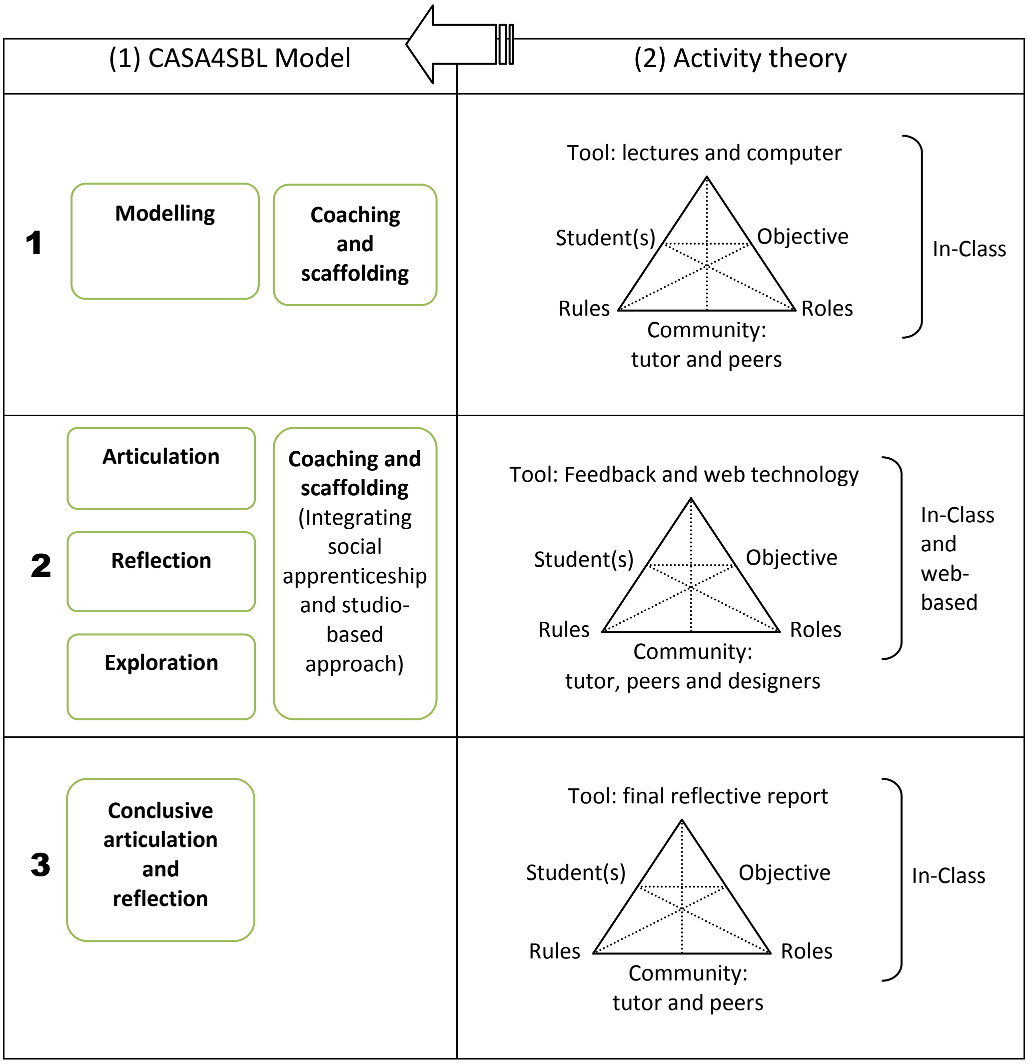


Figure 3.8: Integrating CASA4SBL and Activity Theory in the study

Figure 3.8 describes how the second generation of Activity Theory is systematically used to capture the activities taking place at every phase of the CASA4SBL model. Each activity system in each phase represents different tools, communities and settings. I provide an explanation with one of the triangles from the second phase (see figure 3.9).

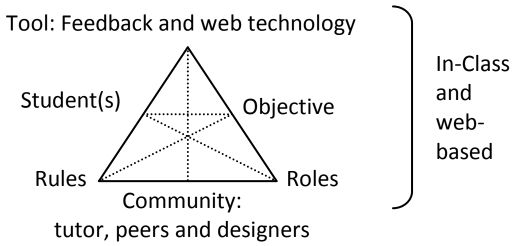


Figure 3.9: Using the second generation of activity system analysis to capture activities within the CASA4SBL

Subject(s) represent students whose *objective* is to develop an interface design. In developing the interface design, *subject(s)* have to use *tools*, e.g., feedback and web technology and learn by the *rule* (CASA4SBL pedagogy instructions). They also have to collaborate with the *community* (consisting of tutors, peer students and designers). Each member of the community has their own *role/division of labour,* e.g., providing scaffolding and coaching. I used the second generation of Activity Theory to capture the activities taking place in the second phase of the CASA4SBL (see figure 3.9) and further understand students' experiences in dealing with the activities, but in order to identify the contradictions, I also refer to the third generation of Activity Theory (see figure 3.10).

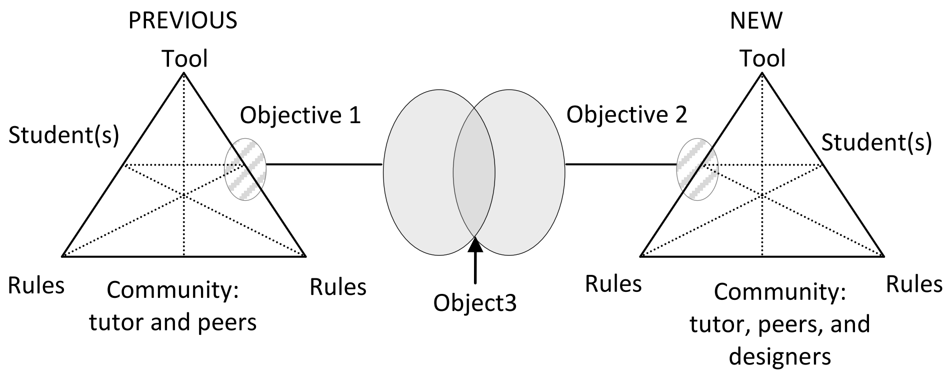


Figure 3.10: Using the third generation of activity system analysis to identify contradictions

The third generation Activity Theory framework is used to identify contradictions where learning within previous and new settings are compared (see figure 3.10). Incorporating a *community* (designers) and applying *tools* (feedback and web-based technology) are considered new ways of practice. If compared to existing ways of working, this may be presumed to cause contradictions and shift the object of activity. However, a proper investigation is required to identify the cause of contradictions and how the object of the activity is re-conceptualised. I will explore this further in the data analysis in Chapter Five.

Central to the literature on cognitive and social apprenticeship are notions advanced by Activity Theory (Ghefaili, 2003). According to DuRussel and Derry (1996), cognitive and social apprenticeship, which fall under situated social cognition theory (see for example Lave, 1991; Lave and Wenger, 1990; Wenger, 1990) is highly compatible with Activity Theory. Both situated social cognition theory and Activity Theory strongly involve context and tool mediation, as well as social roles and conventions, all of which form important clusters in my own thinking about creativity development.

(3.4) Summary

In the search for ways to improve design creativity, I began by referring to the theory of apprenticeship, from traditional apprenticeship to cognitive and social apprenticeship. Cognitive and social apprenticeship remains relatively underexplored as an integrated methodology and pedagogical design model. I have outlined how this has led to the development of a CASA4SBL (cognitive apprenticeship and social apprenticeship for studio-based learning) pedagogical model to support design teaching and learning for this study, and described how Activity Theory will be used as an analytical framework. I will continue to discuss the implementation of the CASA4SBL pedagogical model in the next chapter, which also explores the research design.

Chapter Four: Research Design

(4.0) Chapter overview

This chapter describes in detail the study's research design and the main methodological choices made. It gives a description of the process of recording data, the analysis overview, the data and the determination of trustworthiness and transparency of the data collection. I also discuss the data collection procedures which involve the implementation of the cognitive apprenticeship and social apprenticeship for studio-based learning (CASA4SBL) pedagogic model. A detailed explanation of the CASA4SBL pedagogic model was given in a previous section (see section 3.2.4).

(4.1) Research design phases and instruments

There are five phases of the research design involved in this study (figure 4.1).

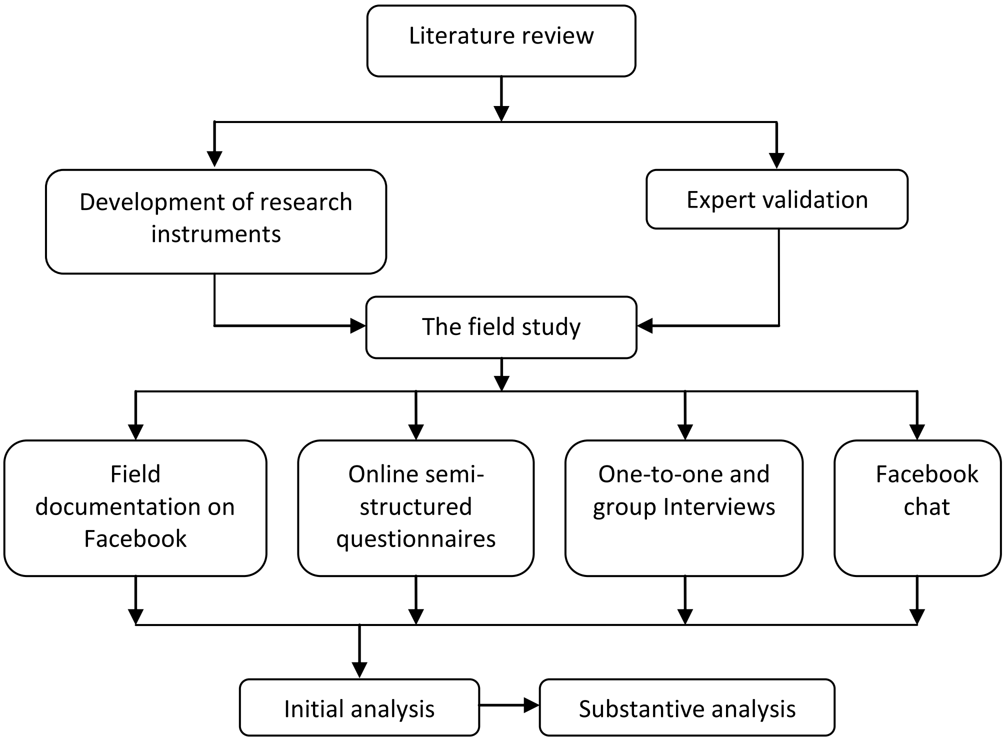


Figure 4.1: Research design phases and instruments

Phase 1: [2008]

This began with the literature review which serves not only to find relevant sources of previous studies that support the research undertaking but also to provide relevant references in the development of the research instruments used in this study.

Phase 2: [mid – end of 2008]

After finding sufficient information, research instruments were developed, revised and validated by an independent expert. More elaboration on this is described in section 4.3.1.

Phase 3: [15 January - 26 March 2009]

The field study began at this phase where I conducted the course of courseware and web-based multimedia design according to the course structure as described later in section 4.2.

Phase 4: [early April – end May 2009]

I used the instruments of field documentation on Facebook, online semi-structured questionnaires, face-to-face interviews, and Facebook chat. Five weeks of field documentation on Facebook (weeks 6 - 11) was scrutinised while a set of online semi-structured questionnaire was distributed to all participants in order to explore the impact of collaborating in Facebook and with the new pedagogical approach. A sample of questions for the online semi-structured questionnaire can be found at Appendix C. Further assessment proceeded from the online questionnaire, when I initiated face-to-face interviews with the participants who gave their consent. I also managed to stay in contact with some of the participants through Facebook chat for data verification - this is described in detail in section 4.3.4.

Phase 5: [early May 2009 – September 2010]

Analysis of the data involved two stages - Initial and substantive. To answer the research questions posed in this study, I employed three types of analyses: thematic and comprehensive data treatment analyses were used at the initial stage while activity system analysis was used at the substantive stage. I also used the qualitative data analysis tool Nvivo 8 to assist the analysis. Further elaboration on data analysis is provided in section 4.6.

(4.2) The courseware and web-based multimedia design course structure

A course of 'courseware and web based multimedia design' was offered to three cohorts in the particular semester when I initiated my field study: cohort 01, 02 and 03. I was granted access to cohort 01. The new CASA4SBL pedagogic model was implemented in the course structure for cohort 01 with permission and approval from the programme coordinator and the tutor in charge (tutor A). This course structure was implemented in phase 3 (the field study) of the research design (see section 4.1).

Table 4.1: Course structure for courseware and web-based multimedia design with implementation of CASA4SBL pedagogic model

Week	Syllabus topics (classroom Lectures)	Task	CASA4SBL
1 [15 January 2009]	Introduction to the course, tasks, the policy of class attendance, and Student responsibilities **Introduction to Multimedia** • The elements of multimedia • Development of multimedia technology • Factors of multimedia development		**Phase 1 of CASA4SBL**: [week1 -4] Modelling, coaching and scaffolding by tutor and peers
2 [22 January 2009]	**Introduction to graphic technology** • Importance of graphic in education • The role of digital graphic in courseware and websites. **Digital graphic technology: technical aspect** • Category of graphic digital: Bitmap and Vector • Digital graphic format • The quality of digital graphic:	Students have to form a project team for the task of interface design (not more than 4 students in one group). Set up project descriptions, e.g., project goals, target learner audiences, software goals and desired outcomes.	

	resolution and colour depth • Image and file size • Demonstration of graphic application in interface design projects.		
3 [29 January 2009]	**Digital graphic technology: Softwares** • Category of graphic Software: Image editing software, drawing and illustration softwares. • Guidelines to design graphic for multimedia applications and websites • Demonstration on using graphic and animation software.	**Computer labs:** Design software training in computer labs begins.	
4 [5 February 2009]	**Introduction to the technology of animation** • Animation Technology at a glance • The important use of animation in everyday life • The importance of animation in education **Digital animation technology: Technical aspect** • Traditional vs. digital animation • Basic techniques in producing animation • Guidelines to implement graphic and animation in courseware and website are provided.	**Quiz for graphic (5 marks)** **Sign up for learning on Facebook** Familiarisation with Facebook environment	
5 [12 February 2009]	**Digital animation technology:** Technical aspect (continues) • Basic concept of digital animation • Techniques to produce digital animation • Categories of digital animation • File format for digital animation **Animation software and hardware** • Animation software: 2D, 3D and special effect • Animation hardware: digital tablet, 3D scanner and etc.	Discuss project summaries for interface design in more depth, e.g., target audience, learning goals, usability and learning theory applications. Development of interface design.	**Phase 2 of CASA4SBL**: [week 5] Articulation, reflection, exploration
6 [19 February 2009]	**Digital animation technology: 3D animation and special effect** • Introduction to 3D animation • Production of 3D animation • Special effect: Morphing, Warping, and Virtual Reality • Guidelines to produce animation such as motion tween, shape tween, and frame by frame animation are provided	**First submission for interface design on Facebook:** [23 Feb 2009] Students create and post their first interface design on Facebook. They have to explain and clarify their design concept.	[week 6-11] Coaching and scaffolding by tutor and peers, designers

7 [26 February 2009]	**Introduction to Audio** • Basic concept of Audio • The use of audio in educational multimedia application • Introduction to analogue and digital audio	**On Facebook:** Critical reflection (integrating social apprenticeships and studio-based approaches) Students' graphic interface designs are viewed and reviewed Students have to constantly reflect, compose and re-compose their design with the help of others though coaching and scaffolding	[week 7 – 8] Articulation, reflection, exploration
8 [5 March 2009]	**Principle of digital audio** • Analogue to digital conversion • Factors affecting the quality of digital audio • File size for Audio Digital	**Second submission for interface design on Facebook:** [5 Mac 2009] Students continue to refine and post their second interface design on Facebook	
9 [12 March 2009]	**Principle of digital audio (continue)** • Digital audio compact • File format for digital audio • Digital audio softwares and its application • Demonstration of audio and video projects	Students are encouraged to decide and set their own goals for learning. **Third submission for interface design on Facebook:** [12 Mac 2009] Students refine and post their third and final interface design on Facebook	[week 9-10] Exploration
10 [19 March 2009]	**Introduction to video** • The application of video in educational multimedia • Basic principles of video • Introduction to analogue video • File format and standards of analogue video.		
11 [26 March 2009]	**Discussion on interface design project** • Reflect and conclude design learning process by comparing all three designs	Students have to justify the strengths and weaknesses of their design in a brief report. They have to leave their design published on Facebook. This allows them to continuously reflect on their work and	**Phase 3 of CASA4SBL:** [week 11] Conclusive articulation and reflection

		experiences in producing better designs **Graphic assignment - interface design and report: (See Appendix I for marking criteria)**	
12	Introduction to digital video • Production of digital video • Digital video equipments • Advantages and disadvantages of digital video Digital video editing • Techniques of video editing	Quiz for audio (5 marks)	
13	Digital video editing softwares • File size and quality of digital video • Factor determining the quality of digital video • File size and format for digital video • Demonstration on using digital audio softwares	Dateline for animation assignment – 60 seconds animation	
14	Digital video compression • The principles of video compression • Type and standards of video compression • Disadvantages of video compression		
15		Dateline for video and audio assignment – Short video 2 to 5 minutes	

The course structure involved students attending a 2 hour lecture (once every week), and participating in group work, discussions and a 1 hour computer lab sessions (twice every week). Students had to work in a group (3 or 4 students) to complete the assignments and engaged in the learning activities (on Facebook and in class). The assessment of the course was done continuously throughout the semester based on coursework and final exam. Assessment of coursework was based on the quiz and assignment projects. Coursework is counted for 60% of the final mark with 40% for final examination. University regulations would not allow more than 60% for the coursework. I gave a lecture every week covering the syllabus topics and assigned students to complete the tasks as described in table 4.1. I conducted the course for cohort 01 for 11 weeks (week 1-11) before handing over to tutor A at week 12.

The first phase of the CASA4SBL (cognitive apprenticeship and social apprenticeship for studio-based learning) pedagogic model: 'modelling' and 'coaching and scaffolding' - learning began with modelling, where I delivered the theoretical aspects of graphic design knowledge in class and demonstrated how to use the design software, e.g., Adobe Photoshop and Flash in the computer lab. The coaching and scaffolding activities at this phase involved a more knowledgeable other (MKO), whether myself as the tutor, a better-informed peer or even a computer; however designers were not yet involved in this phase. I also guided students in how to register/ sign up on Facebook (see figure 4.2).

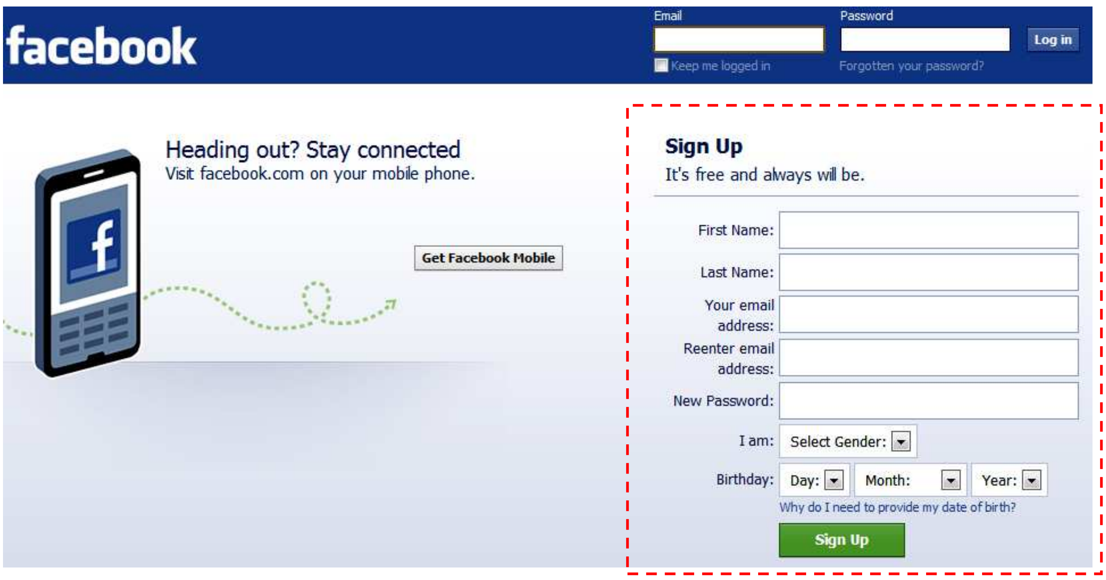


Figure 4.2: Register on Facebook (source: http://www.facebook.com/)

Upon opening their accounts in Facebook, students were gathered into a private group called ‘DC’ (see figure 4.3). Within this thesis, the name of the group has been changed to protect participants’ confidentiality. A further explanation of this is given in section 4.5 of the research ethics procedures.

Figure 4.3: DC group on Facebook (source: http://www.facebook.com/)

The second phase of the CASA4SBL pedagogic model: ‘articulation, reflection, and exploration’ and ‘coaching and scaffolding’ - students were assigned to develop and post their interface design in a photo format (jpeg) to DC group on Facebook (see figure 4.4).

Figure 4.4: Interface designs in a photo format (jpeg) were posted in DC group on Facebook (source: http://www.facebook.com/)

Students had to post their designs in three submissions according to a set of dates: first submission: 23 February 2009; second submission: 5 March 2009; and third submission: 12 March 2009 (see figure 4.5). This was the phase where their compositions of design were viewed and reviewed through a series of discussions with fellow colleagues, tutors and designers. Their designs were left published in Facebook which was open only to members of the DC group and not to the wider public. This was intended to remind them to continuously reflect on their design and make improvements.

First submission, e.g., first interface design produced by group 2:

Second submission, e.g., second interface design produced by group 2:

Third submission, e.g., third interface design produced by group 2:

Figure 4.5: Design interactions on Facebook (Source: facebook.com)

Figure 4.5 depicts three interface designs posted on Facebook by students from group 2, followed by interactions taking place between participants (located under the designs). Students had to explore, compose and re-compose their design based on the feedback provided to them. Other than peers and the tutor, designers began to participate and deliver their critical reflections on students' work. Students were then encouraged to set their own goals for learning in order to encourage exploration and creativity, and cope with the issue of unequal student-expert power relationships. The tutor could initially set goals for the students, but students had to alter those goals according to their interests. Students were given control over their own learning.

The implementation of the third and final phase of the CASA4SBL pedagogic model: 'conclusive articulation and reflection' - students had to make justifications (final reflective report) for what they had achieved throughout the development of their interface design. They had to reflect upon the strengths and weaknesses of their interface design.

Before I continue to discuss in detail the participants involved (section 4.4), I describe the research instruments for this study.

(4.3) Triangulation of instrumentation and data sources

I have used data and methodological triangulation in this study. Data triangulation involves gathering information from a variety of people (Bryman, 2004); in my case, data as collected from students, tutors and designers. Methodological triangulation, on the other hand, involves the use of more than one method for gathering data (Bryman, 2004). I have used the instruments of online semi-structured questionnaires, face-to-face interviews, field documentation on Facebook, and Facebook chat. Triangulation is used with the intention to provide trustworthiness and also to minimise bias (Bryman, 2004; Golafshani, 2003) for this study.

The combination of online and offline data instruments can offer a range of information (Merriam, 2009). Mercer (2000) suggests that online and face-to-face methods are not to be separated but should be used to complement each other. Since none of the participants in this study had an issue with getting access to computers and the internet, an online approach was applied. In addition, issues with collecting data from designers who were in different locations around Malaysia and one (designer L) in Australia could be dealt with through the use of online data-gathering.

(4.3.1) Online semi-structured questionnaire

An online semi-structured questionnaire was used in this study to overcome the limitations of distance and time (Bryman, 2004) between the researcher and participants. Furthermore, this method is extremely economical to conduct, compared to face-to-face interviews (Bryman, 2004; Chen and Hinton, 1999; Montoya-Weiss et al., 1999; Underhill and Olmstead, 2003). Participants in the research (see section 4.4) were able to fit the interviews into their own time and did not have to make additional allowances for the time spent travelling to face-to-face meetings (Bryman, 2004; Zinchiak, 2001). In addition, participants did not need to wait for their turn to speak, nor was the group dominated by a single member (Reid and Reid, 2005) thus this provided greater equality in participation. This method also helps participants generate more honest feedback (Anderson-Mejias, 2006). Reid and Reid (2005) identify that participants' answers were enhanced faster and more efficiently online than face-to-face. This is due to the 'psychological distance' when participants do not have to face each other, leading to them feeling more comfortable in giving feedback (Reid and Reid, 2005, p. 132; Zinchiak, 2001). Pressure from having an interviewer in front of the interviewee can also be avoided (Birbili, 2000).

The online semi-structured questionnaire was placed on a private database which was confidential and secure (figure 4.6).

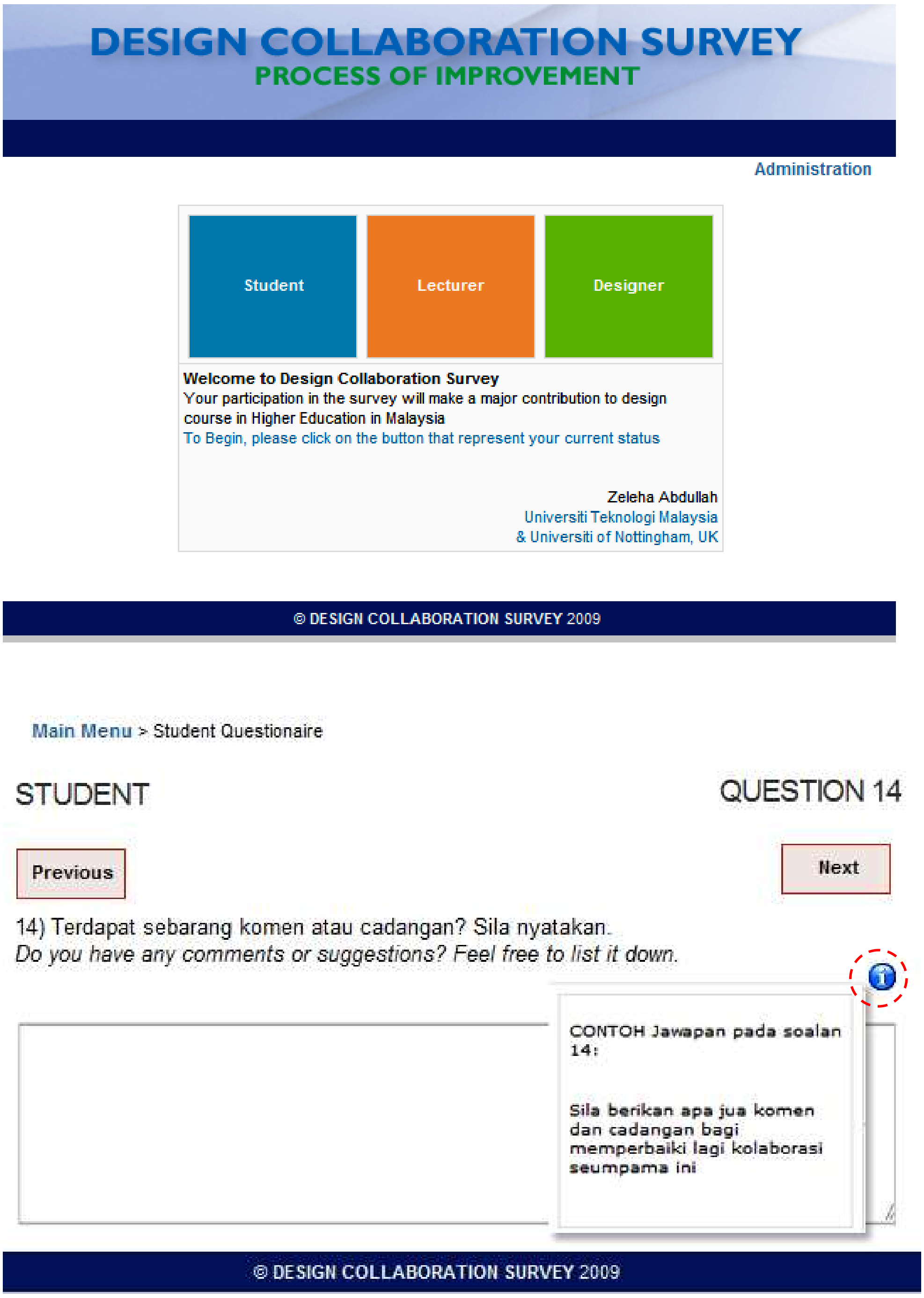


Figure 4.6: Database for the online semi-structured interview (Source: twinsystems, 2009)

A detailed description was provided for each question in the database to assist participants who were having difficulty in understanding the questions. For more detail, participants could roll their mouse to the symbol of and details would appear (see figure 4.6).

I used semi-structured questions to let the interviewee develop ideas and comment more widely on the issues discussed (Denscombe, 2003). The semi-structured questions comprised 14 open-ended questions (see Appendix C). The participants were given the opportunity to respond in their own words and according to their own preferences. According to Johnson and Turner (2003), the order of responses to open-ended questions might depend on what question participants prefer to answer first, although normally many might opt to start with the first question and respond according to the order of the questions. In this case, participants were given the freedom to respond based on their preferences by clicking on the ‘next’ or ‘previous’ buttons provided on each question (see figure 4.2). All 15 groups of students as well as two designers (designer D and L) and one tutor (tutor B) responded to the online semi-structured questions.

The online questionnaires were delivered both in Malay and English. The translated questions were validated by an independent expert who was well-versed in Malay and English. The questions were developed based on my research questions which were guided by Mwanza’s eight-step model (refer to table 3.3). Mwanza’s eight-step model can help researchers to pinpoint areas to focus on during investigations, and can also help to trigger questions to ask in interviews (Mwanza, 2002a).

I found this online method useful as it provides an immediate transcript (Bryman and Bell, 2007). The transcripts are more likely to be accurate since there are no problems involving mishearing (Bryman, 2004; Underhill and Olmstead, 2003). However, although online semi-structured questionnaires may offer many benefits, there are also some disadvantages that this study needed to consider. The lack of nonverbal feedback may affect qualitative findings (Zinchiak, 2001) where messages can be easily misinterpreted (Bryman and Bell, 2007; Mantovani, 1996). To counter this, I organised face-to-face interviews in which I validated questionnaire answers and explored issues in more depth.

(4.3.2) Face-to-face semi-structured interview

According to Opdenakker (2006), semi-structured interviews are most extensively used for qualitative research and can occur either with an individual or in groups. DiCiccio-Bloom and Crabtree (2006) add that this method is able to offer researchers rich and in-depth information about the experiences of participants. Face-to-face interviews help to further explore the answers participants gave in online semi-structured questionnaires. They allow the interviewer to 'probe the interviewee for clarity or for more detailed information when needed' (Johnson and Turner, 2003, p. 305).

The face-to-face semi-structured interview sessions were audio recorded with the permission of the interviewees. Notes were also taken during the interviews as a backup to counter recording failures, to ensure all the questions had been answered, and to keep myself as the interviewer on the right track (Opdenakker, 2006). As stated by Johnson and Turner (2007), these methods help to clarify any doubts and enables the interviewer to respond directly to the interviewee. The interview sessions were conducted in Malay, the national language of Malaysia. This had to be done due to participants' preference to communicate in Malay.

(4.3.2.1) One-to-one interviews

Interviews with the designer and tutor participants were conducted one-to-one. Three designers (designers A, B and C) and one tutor (tutor A) agreed to be interviewed. The interview with designer A lasted for 67 minutes and 32 seconds; the interview with designer B lasted for 32 minutes and 02 seconds; the interview with designer C lasted for 35 minutes and 45 seconds; and the interview with tutor A lasted for 27 minutes and 38 seconds.

I had to travel to different states of Malaysia to meet with the designers. I knew the designers and the tutor as I had established a good rapport with them over many years and this provided me with deeper insights and disclosure (Zakaria et al., 2010).

(4.3.2.2) Group interviews

Interviews with student participants were performed in groups because during the study, students were assigned to develop the interface designs in groups. The three or four students in each group were interviewed together. The interview sessions took place in the vicinity of the university after week 11 of the semester (see table 4.1) and after all students had answered the online semi-structured questionnaire. Nine out of 15 groups of students agreed to be interviewed face-to-face. The duration of interviews varied from 20 minutes to one and a half hours, depending on the students' availability. For instance, students in group 2 managed to only allocate 20 minutes and 11 seconds of their time because they had to attend another class right after the interview session.

Group interviews were chosen instead of focus groups because most of the students preferred to be asked a question directly rather than to initiate their own discussion. Their behaviour can be associated with the findings of some studies (Koo, 2004; Song and Chan, 2008; Zakaria, et al., 2010) that describe undergraduate students in Malaysian public universities as being passive (having a quiet manner) or submissive rather than active or assertive contributors. Nevertheless, the group interview encourages 'recall and opinion elaboration' (Song and Chan, 2008, p. 62) which can be useful in eliciting students' learning experience.

As a tutor conducting the interview, I was aware that the students may have felt uneasy due to the power relations. According to Koo (2004), the power relations between interviewer and interviewee can influence the quality of data. To help ensure honesty in informants (Benson and Haith, 2009), I referred to Myers and Newman's (2007) guidelines and gradually built my rapport with the students through eleven weeks of conducting the class. I conducted the interview sessions in an informal manner; I spoke in the same way as the students (using casual intonation and jargon); I showed interest, empathy, understanding and respect to the students before, during and after the interviews. During the interviews, I listened not only for the content of group responses, but also for emotions, irony, contradictions and tensions. This enabled me to learn or confirm not just the facts (as with the survey method), but the meaning behind the facts. At the end of the interview sessions, I asked students' permission to stay in contact for data verification if needed.

(4.3.3) Field documentation on Facebook

Facebook as a research instrument was very important, allowing interactions between students, tutors and designers participating in the study to be documented. Introducing students to a community of practitioners (designers) was part of the main agenda of this research, and Facebook was chosen mainly because it provided easy access and opportunities for students to interact virtually with the community of practitioners (Bos et al., 2009). Selwyn (2007) states that there is a possibility to lessen the gap between learning in educational settings and in real practice through the critical use of technology-based instruments such as Facebook.

Furthermore, designers involved in this study had been using Facebook for quite some time and were active users of this social network site. Facebook had become a virtual meeting place for me and the designers as it provides a way for friends and acquaintances to remain in contact with each other (Ellison et al., 2007). It was hoped that students would also find this a beneficial technology.

As compared to other popular social network sites (MySpace, Friendster, Flickr), Facebook is listed as the largest social network site targeted to the academic environment (Charnigo and Barnett-Ellis, 2007; Educause, 2006;

Hewitt and Forte, 2006). It has become an informal medium for facilitating communication and community among students in higher education (Bedford and Golbeck, 2008; Cain, 2008). Facebook has demonstrated some benefits in breaking down barriers between students and faculty (Duboff, 2005; Liu, 2005a). It has been found to help students to develop, reflect on and share their identity growth and conflicts with wider groups (Mintz, 2010). Facebook has been shown to create a positive environment for students to develop motivation (Mazer et al., 2007), life satisfaction, social trust and civic engagement (Ellison, et al., 2007), but most importantly, research suggests that social network sites such as Facebook are able to inspire creative values such as sharing ideas, provide useful peer feedback and support engagement in critical thinking (Bugeja, 2006; Selwyn, 2007, p. 4; Ziegler, 2007). In addition, the documentary evidence within Facebook provides researchers with a large amount of data and allows for more sophisticated kinds of analysis to take place, such as content analysis (Ary et al., 2009).

Figure 4.7.1 – 4.7.7 depict some features that can be found on the Facebook website: chat; messages and inbox; networks and groups; notifications; wall and photos; and discussions.

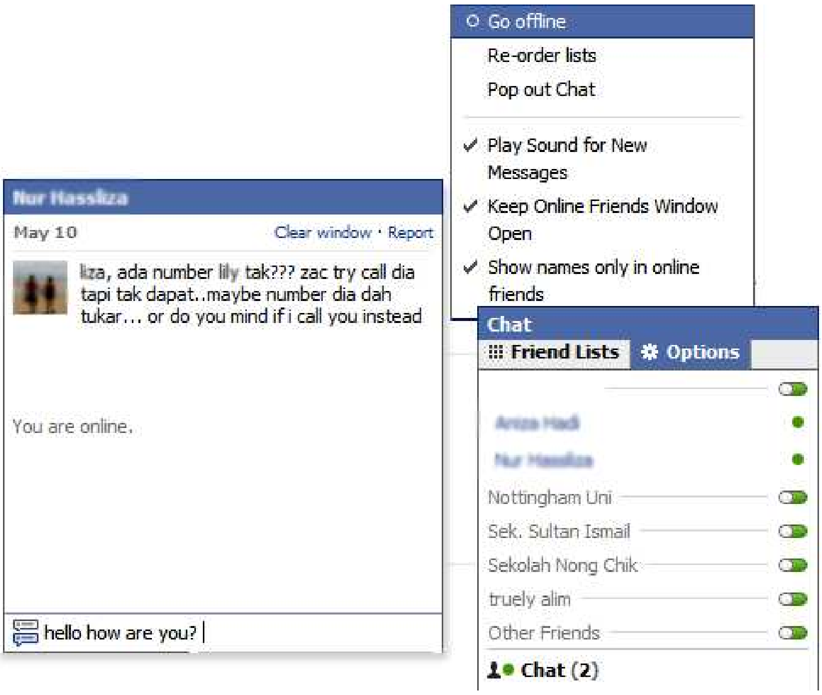


Figure 4.7.1: Chat - users can chat with their Facebook friends

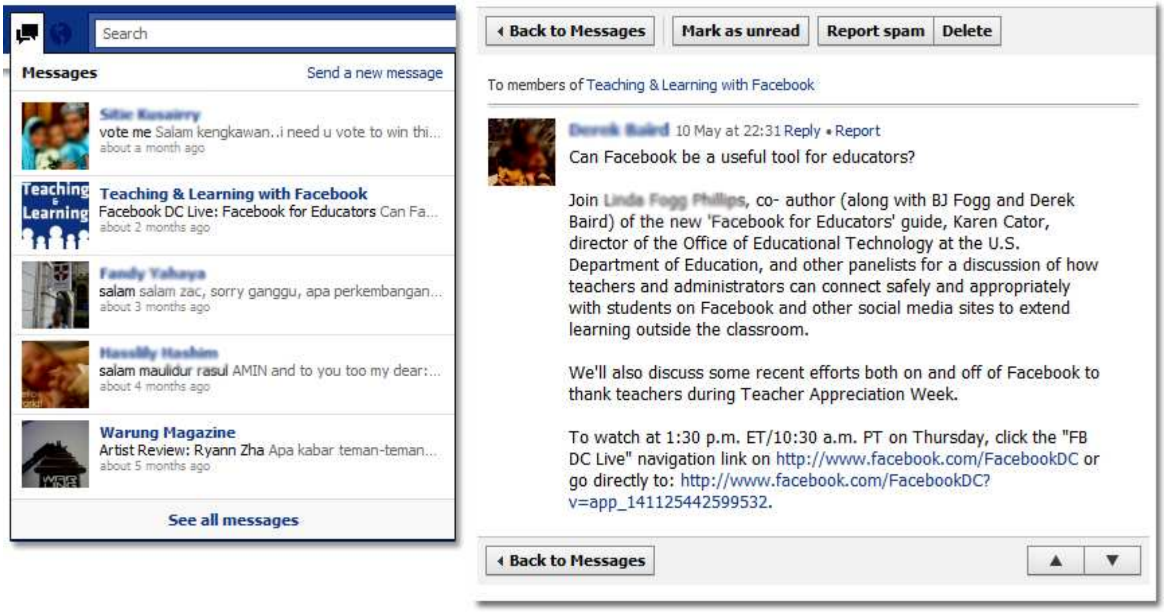


Figure 4.7.2: Messages and Inbox - users can send messages (similar to email inbox) to any number of friends at a time

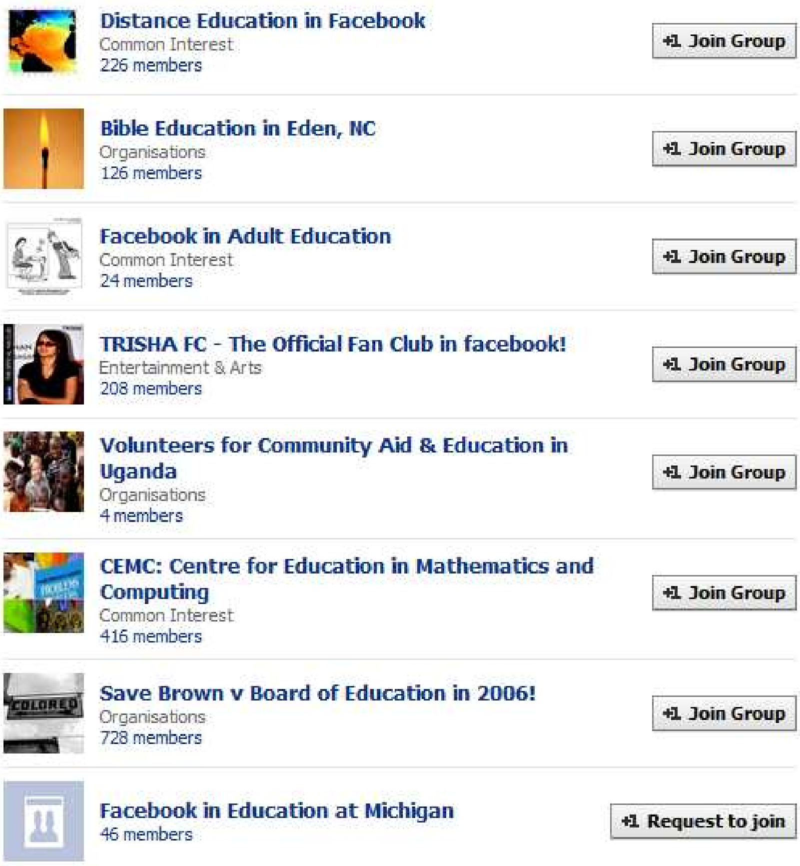


Figure 4.7.3: Network and groups - users are allowed to join different networks and groups within Facebook -

Figure 4.7.4: Notifications - users are notified with status updates and incoming messages from friends and groups

Figure 4.7.5: Wall - users are allowed to post messages, photos, web links, videos, and questions on Facebook wall for other group members to see

Figure 4.7.6: Photos - users can upload albums of photos, tag friends on photos and also leave comment on photos

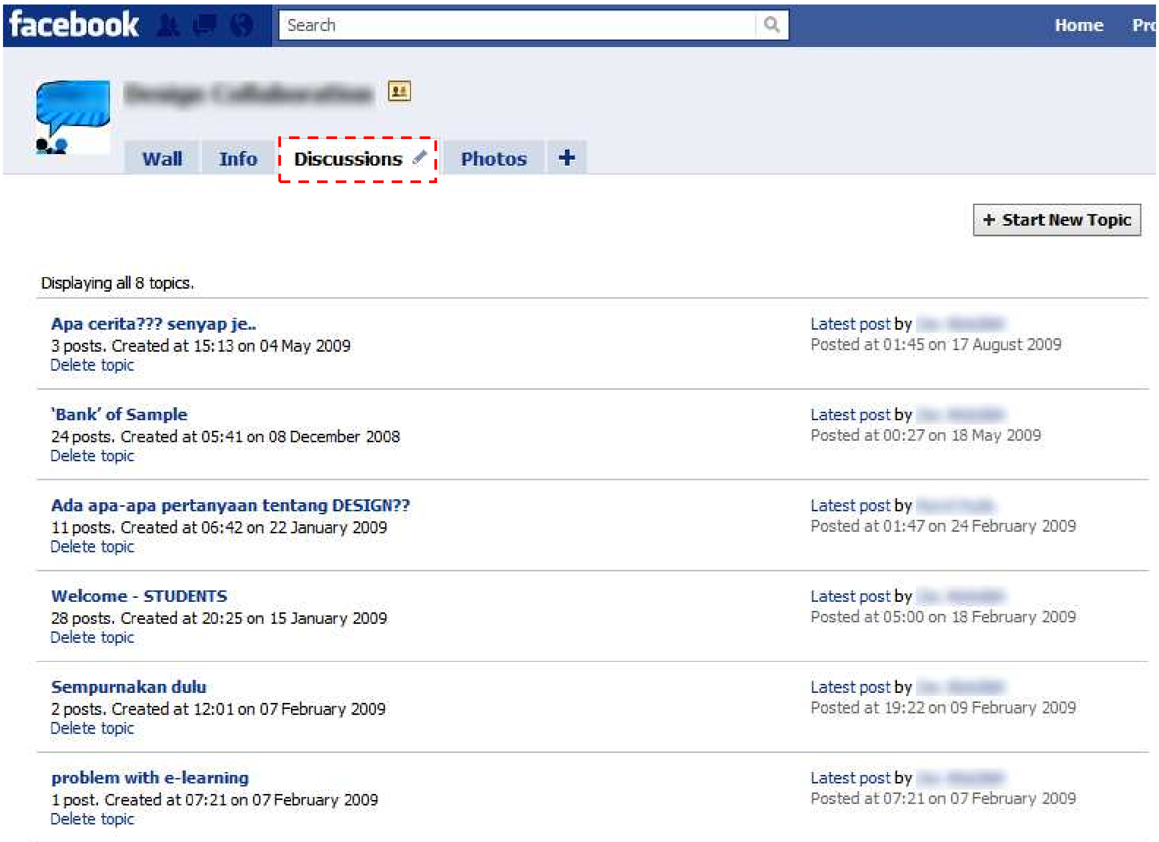


Figure 4.7.7: Discussions - users can post any topic for discussions on Facebook

(4.3.3.1) Privacy implications on Facebook

There are, however, ethical issues related to privacy control and protecting the anonymity and confidentiality of research participants on Facebook. Researchers are advised to think of ways to protect their participants' anonymity and confidentiality if they wish to use online settings (Bruckman et al., 2010). This requires more than simply removing names from data (Bos, et al., 2009). Gross and Acquisti (2005) suggest participants should not use their real names, should not expose personal contact information, should not post clear shots of personal photos, and should not allow others to gain access to their personal information. In addressing this issue, Facebook provides step-by-step settings for every user to control their privacy (Jones and Soltren, 2005): see figure 4.8.

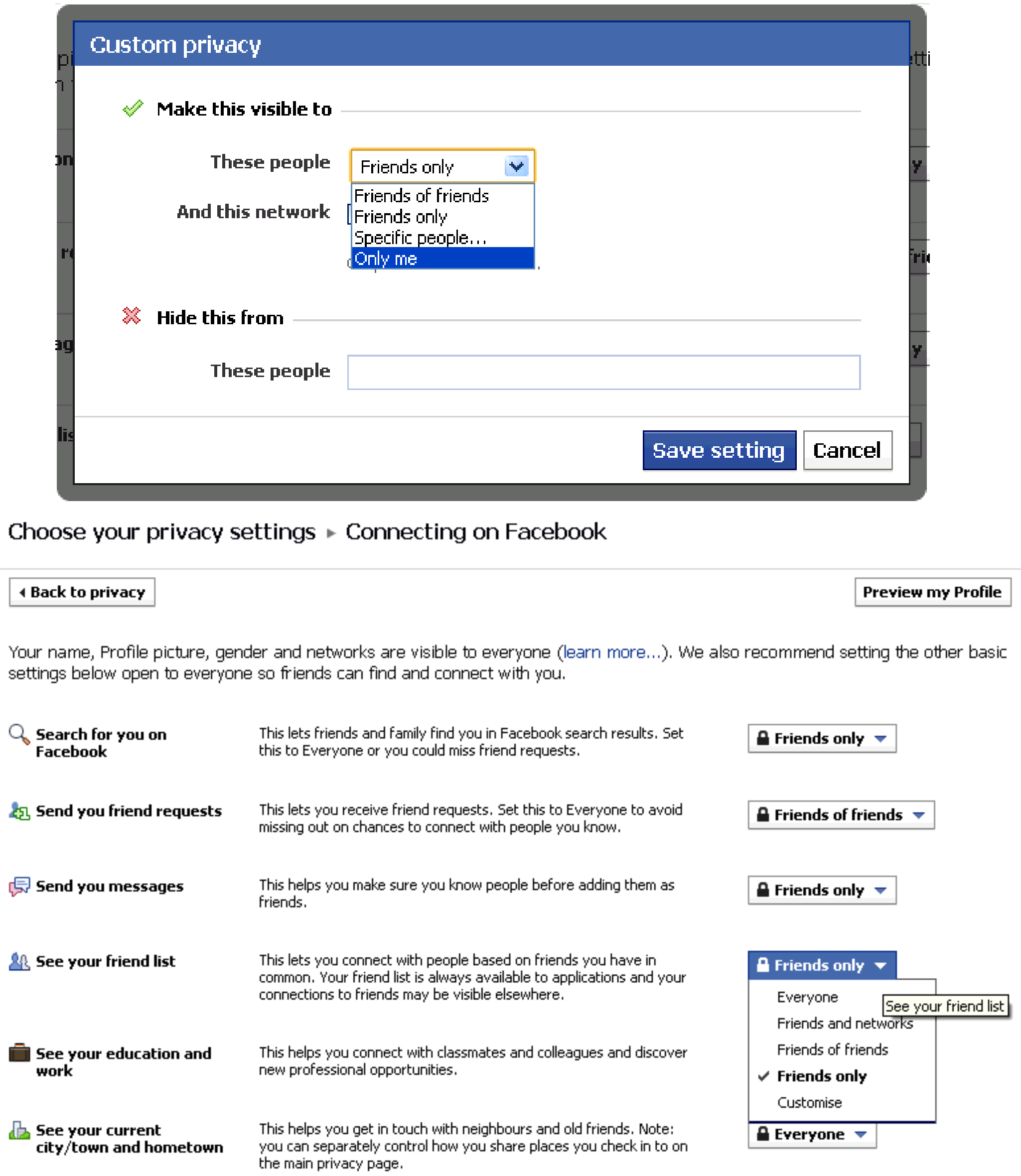


Figure 4.8: Privacy settings in Facebook (Source: facebook.com)

The privacy settings in figure 4.8 allowed participants in the study to set their account to be available only to members of the group and not to the wider public. According to research evidence, no matter how hard researchers try to educate participants about ethics in the context of online research, there are still some participants who willingly disclose all of their information to other users (Bruckman, et al., 2010; Villiers, 2010). Researchers (Goettke and Christiana, 2007) have clarified that users of social network sites are mostly either unaware and/or unconcerned about protecting their privacy.

To enhance the privacy control of participants, I asked participants to open a new Facebook account purely for the purposes of this study. I found the method useful as it encouraged participants to make a separation between their professional and personal accounts (Mintz, 2010). They were reminded to restrict access to their profiles and properly read the privacy instructions provided on Facebook (Jones and Soltren, 2005).

(4.3.4) Facebook chat

I asked permission from participants to stay in contact for data verification if needed. The chat feature on Facebook provided an easy way for me to get in touch with the participants. For example, I managed to gain verification of students' (group 5) and designers' (A and L) interpretations of the nature of feedback. This helped answer research questions 2 and 2.1, which sought to understand the contradictions that arose during the study and how they impacted on learning. This is discussed in section 5.1.1.2 of sub-theme 2.1.

(4.4) Participants

This study located and recruited participants based on purposive sampling. This type of sampling was selected according to predetermined criteria which related to the need to involve participants on the teaching and learning interface design course in the School of Education, Malaysia Higher Institution.

(4.4.1) My participation in the study

I conducted the study as a participant observer holding a position as a tutor (tutor C) as well as an interviewer. Participation is meant in the sense of ‘being there’ and ‘in the middle of action’ (Denscombe, 2003, p. 202). As a tutor and a researcher carrying out a study in the university which I work for, my participation, as described by Hargreaves (2004, p. 193):

> permits an easy entrance into the social situation by reducing the resistance of the group members; decreases the extent to which the investigator disturbs the 'natural' situation, and permits the investigator to experience and observe the group's norms, values, conflicts and pressures, which (over a long period) cannot be hidden from someone playing an in-group role.

Since I already possessed a solid base of cultural awareness, I was able to focus more on seeking answers to the research questions. Shenton (2004) states that it is important to develop familiarity with the culture of participating organisations. Having said that, I managed to develop greater understanding of the project impacts (Fraenkel and Wallen, 2005) concerning students’ experiences. In addition, I was able to relate what was being said by the participants during the interviews with what actually happened in the study by being the interviewer in this study - this contributed to the trustworthiness of the data (Temple and Young, 2004).

Nevertheless, there were some unavoidable difficulties in noticing important events while participating in the study, for example, I was not able to monitor closely all 15 groups of students in the class. This is where field documentation within Facebook (see section 4.3.3) was found to be very helpful in comprehending the issue.

In minimising the research bias, I applied techniques suggested by Maykut and Morehouse (1994) and also Silverman (2010). Maykut and Morehouse (1994, p. 25) suggest researchers be ‘in-depth researcher[s]’ while they ‘can also remove themselves from the situation to rethink the meaning of experience’ in a more objective manner. Silverman (2010) on the other hand suggests researchers treat perspectives coming from other participants with whom they are familiar as problematic.

(4.4.2) Student participants

I identified nine out of 20 public universities in Malaysia offering educational multimedia programmes for student teachers (Appendix A). Compared to other universities in Malaysia, the UTM Faculty of Education was the earliest to apply ICT courses in its educational programmes (MQR, 2008). I have mentioned earlier about the importance of these courses in section 1.2.

UTM students registered for the courseware and web based multimedia design course in year 2009 were divided into three cohorts (01, 02 and 03). I was granted access to cohort 01. I notified the students of my study and a total of 57 third-year undergraduate students from cohort 01 agreed to participate in the study (see table 4.2): see section 4.5 for the ways informed consent was gained.

Table 4.2: Student participants

Cohort	Physics	Chemistry	Mathematics	TOTAL
01	19	14	24	57

19 students were from the Bachelor of Science and Computer with Education (Physics); 14 students were from the Bachelor of Science and Computer with Education (Chemistry); and 24 students were from the Bachelor of Science and Computer with Education (Mathematics). These students were assigned to develop interface design as part of the course requirements, and this is relevant to the topic of my investigation (Denscombe, 2003). They were then divided into 15 groups of three or four. Students decided to work with their existing group members which had formed in previous semesters.

(4.4.3) Designer participants

13 designers with no less than ten years of work experience agreed to participate in this study; however only four designers (designers A, B, F and L) were found to be actively involved throughout the study. Meaning, as compared to other designers, these four designers frequently delivered feedback to students throughout the collaboration for a duration of five weeks (week 6-11). The designers' participation was voluntary; no payment was involved. They were willing to participate in the study as a means of raising awareness of the importance of design to students (based on an online discussion between the designers and myself). The designers' profiles are listed in Appendix B. They were located in different states around Malaysia, while one of them (designer L) was located in Melbourne, Australia.

(4.4.4) Tutor participants

Two tutors (A and B) participated in the study. Tutors A and B from the same course but different classes (cohorts 02 and 03) participated as observers. Their participation remained as 'outsiders' who simply observed the events being studied on Facebook. Tutor A chose to be interviewed face-to-face, while tutor B preferred to answer the online semi-structured questionnaire. Their responses were essential to confirm the nature of the learning process; the contradictions that occurred during the field study; and the design improvement made by the students. This helps to reinforce the trustworthiness (Guba, 1981) of the findings (see section 4.9).

(4.5) The research ethics procedures

I had to get approval from various parties to conduct the study. To begin with, an application was sent to the university in Malaysia and approval was obtained on the 20 November 2008 (see Appendix D). I then obtained approval from the research ethics committee of the School of Education at Nottingham University on 28 November 2008 (see Appendix D).

Before the collaboration began, I developed a clear written and verbal explanation of what I was doing, why I was doing the research and my role as both tutor and researcher, and this was given to all participants. Since this research involves online collaboration using Facebook, steps to protect the research participants' privacy were provided. Each participating student, tutors and designer was supplied with the policy and information on privacy controls in using Facebook. Guidelines on how to make participants' status anonymous during the online collaboration were also presented in the letter of information, together with the consent form (see Appendix D). After obtaining written consent from all participants, I asked them to open a new Facebook account and they were invited to join the DC group on Facebook. Information about privacy control was again posted on the DC group's discussion board as a reminder to the participants. Every participant was advised to read through the rules and guidelines before beginning to collaborate. Regarding the ownership of intellectual property and copyright, Facebook (2011) clearly states that every item belongs to the individual who posts it on Facebook. Facebook users are encouraged to file reports to the Facebook team if they suspect their rights are being violated.

As for the participants' involvement, there was no payment involved but as a form of recognition of the designers' and tutors' contribution, a certificate and a letter of appreciation were provided at the end of the collaboration (see figure 4.9).

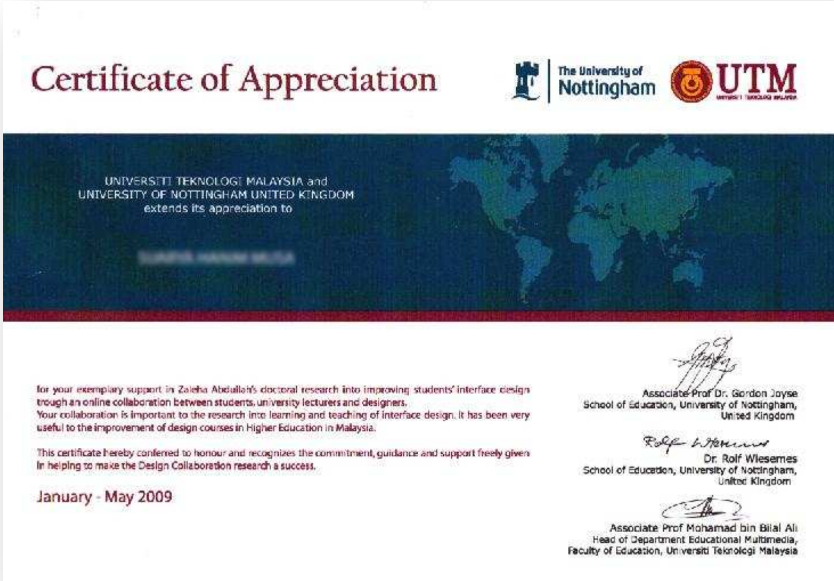


Figure 4.9: Certificate of appreciation (researcher's own design)

(4.6) Data analysis methods

The study yielded a vast data set, with over ten hours of audio interviews (one-to-one and group interviews); five weeks of field documentation on Facebook (weeks 5-11); and 28 sets of documented data from the online semi-structured questionnaires.

Yin (2008) suggests researchers play around with their data and develop their own analytic strategies. Taking into account Yin's proposal, I decided to divide the analysis process into two stages: initial and substantive analysis. The initial analysis began with the analysis of field documentation on Facebook using a thematic approach (Braun and Clarke, 2006) and comprehensive data treatment (Silverman, 2010). I then scrutinised all of the data from the interviews and online semi-structured questionnaires for comparison and verification. In the substantive analysis, I focused on four chosen groups of students as case studies, in which I coded the data from an Activity Theory perspective as a means to answer my research questions.

The reason for analysing the data in two stages was because I wanted at first to analyse the content of the data from a broad perspective before viewing it from the perspective of Activity Theory. Joyes (2008) states that a broader view of the nature of learning and learners' perceptions are required in coping with limitations of Activity Theory which focuses on separate elements and their interactions within the activity system with the risk of not giving clear sense of the whole. Meaning, in order to explore the research questions using the Activity Theory approach, I had to at first become immersed in the activity process by listening to what the participants had to say and to make sense of the nature of learning they were experiencing during the collaboration. This helped reveal the overall direction and significance of an activity (Nardi, 1996). In addition, according to Braun and Clarke (2006), an inductive approach allows for themes to be identified in the data themselves, meaning the themes identified may bear little relation to the specific questions that were asked of the participants. 'In contrast, a 'theoretical' thematic analysis would tend to be driven by the researcher's theoretical or analytic interest in the area, and is thus more explicitly analyst driven'(Braun and Clarke, 2006, p. 84).

Table 4.3 summarises the qualitative approaches and analysis used in the initial and substantive analyses.

Table 4.3: Summary of initial and substantive analyses

Initial analysis		
Key theme	**Research instrument**	**Analysis**
Key theme 1	• Facebook: students in groups 1-15; tutor C; and designers A - M	Thematic analysis Comprehensive data treatment
Key theme 2	• Facebook: students in groups 1-15; tutor C; and designers A - M • Interviews : groups 1-9; designers A,B and C; and tutor A • Online questionnaire: students in groups 1-15; designers D and L; tutor B • Facebook chat: group 5; and designers A and L	Thematic analysis Comprehensive data treatment
Key theme 3	• Interviews: students in Groups 1-9 • Online questionnaire: students in groups 1-15 • Facebook chat: group 5	Thematic analysis

Substantive analysis		
Research Question	**Research instrument**	**Analysis**
1. What is the nature of the learning experience and how does this promote understanding of creative design of websites or courseware?	• Interviews: students in groups 2-5	Activity system
2. What are the contradictions caused by this new pedagogic approach?	• Interviews: students in groups 2-5	Activity system
2.1 How did the students respond to the contradictions?	• Interviews: students in groups 2-5 • Online questionnaire: groups 2-5 • Data from initial analysis of Key theme: impact of feedback	Activity system
2.2 How are the contradictions reconciled, if at all?	• Interviews: students in groups 2-5 • Data from initial analysis of key theme: impact of feedback	Activity system
3. What are the factors within the learning experience that contribute to the	• Interviews: students in groups 2-5	Activity system

development of design creativity?		
3.1 How did the factors support students developing an understanding of effective website design?	• Interviews: students in groups 2-5	Activity system

(4.6.1) Initial analysis

At the initial stage of analysis, the first thing I did was immerse myself in the transcripts in their entirety, to get a feel for the data as a whole. I then scrutinised the field documentation on Facebook to gain an understanding of the collaboration process and to witness the students' design progress. In-situ coding was utilised to explore emerging themes from the data. A thematic approach (Braun and Clarke, 2006) and comprehensive data treatment (Silverman, 2010) were used at this stage. The thematic approach allows for careful analysis in finding coherent and distinctive themes. Table 4.4 describes how the thematic process was carried out.

Table 4.4: Phases of thematic analysis (Braun and Clarke, 2006, p. 84).

	Phase	Description of the process
1	Familiarising yourself with your data	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas
2	Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3	Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
4	Reviewing themes	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5	Defining and naming themes	Ongoing analysis to refine the specifics of each theme, and the overall story the analysis tells, generating clear definitions and names for each theme.
6	Producing the report	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research

		question and literature, producing a scholarly report of the analysis

In determining the codes, I asked a colleague who had not participated in the study to take part as second coder and verifier. I also had discussions with my supervisors. Once I was confident that appropriate measures were taken to ensure the trustworthiness of the codes, I coded the entire data set using NviVo 8. The NviVo software is designed to make sense of unstructured information by classifying, sorting and arranging data information (Bazeley and Richards, 2000). It provides a sophisticated workspace that enables researchers to work through information and develop meaningful conclusions (QSR, 2007). Based on the collating codes, three key themes relating to feedback have been identified. I will explain this further in Chapter Five: analysis of data.

(4.6.2) Substantive analysis

In the substantive analysis, I focused on only four groups of students as case studies to explore the research questions. The selection was made through the comprehensive data treatment and the thematic approach used in the earlier analysis. I then employed activity systems analysis (Engeström, 1999) to examine the selected four cases in more depth by considering seven elements of the activity system (role, rule, community, tool, subject, object and outcome).

The four case studies were chosen because they represented more distinctive traits than the others (Silverman, 2010): for instance, the group that received recognition for developing appropriate designs, the group that was most independent and the group that received the highest feedback for confrontation from designers. Most importantly, it was crucial to select groups that managed to receive feedback from all categories of participant (peers, tutors and designers). Compared to the chosen four groups, the other groups were not fortunate enough to obtain feedback from all three categories of participants. The selected groups are shown in table 4.5.

Table 4.5: Four selected groups for case studies

Case	Group	Group members (names have been changed)	Interview duration
Case study A	Group 2	Alley, Jane, Emma and Arial	20:11
Case study B	Group 3	Nicole, Dane, Zelda and Flora	45:05
Case study C	Group 4	Nancy, Irene and Kate	52:53
Case study D	Group 5	Alan, Zoe, Zea and Jade	38:04

In the substantive analysis, data were gathered mostly from group interviews. In order to answer the research questions, which relate to students' design creativity development, students' perspectives became the main focus at this point of the research. The seven components of activity (role, rule, community, tool, subject, object and outcome) were used to assist the inspection of each case and report the results.

(4.6.3) Activity theory compatibility with case studies

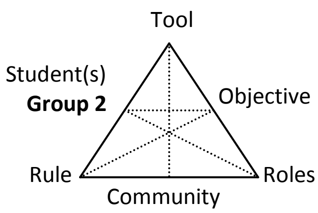
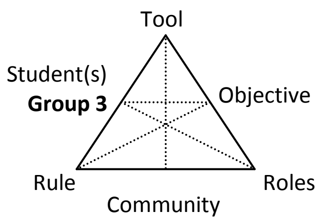
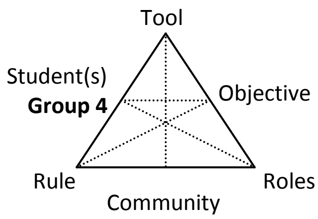
Yamagata-Lynch (2010) states that Activity Theory and case studies are compatible. She explains that Activity Theory emphasises 'identifying object-oriented activities', while case studies are able to identify object-oriented activities, goal-directed actions and activity settings as a 'viable case to study' (Yamagata-Lynch, 2010, p. 79). Table 4.6 summarises the compatibilities.

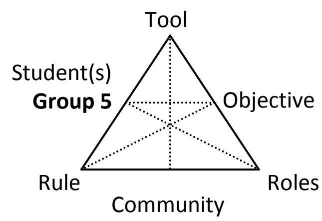
Table 4.6: compatibilities between activity systems analysis and case study research (Yamagata-Lynch, 2010, p. 79).

	Activity system analysis	**Case study**
Bounded system	Object-oriented activities, goal-directed actions, or activity settings	Case
Unit of analysis	Object-oriented activities that could be identified in the personal, interpersonal, or community/ institutional planes	Case

I used Activity Theory to identify and understand the transformation taking place within each case under study (table 4.7).

Table 4.7: the use of activity systems analysis and case studies in this research

Activity system analysis	**Case study**
	Case study A: group 2
	Case study B: group 3
	Case study C: group 4



Case study D: group 5

Engeström (2001) suggests that contradictions take a central role as sources of development and change. The intention of the analysis was to examine: the causes of contradictions in each case study; how students in each case study responded to the contradictions; and how they reconciled themselves with the contradictions, if at all.

(4.7) Defining the research

This is applied research because I seek a useful pedagogical approach that can contribute to the improvement of interface design learning, and I also intend to examine how the proposed pedagogical approach can add to the development of design creativity among student teachers in Malaysia. As stated by Ary et al. (2009), applied research aims to improve learning through a practically designed and tested approach. It emphasises understanding real-world problems which require practical solutions (Bickman and Rog, 1997). Ary et al. (2009) adds that educators use applied research to solve teaching-learning problems; however the same approach may not generalise to other problems. This is because applied research is conducted to 'answer a practical question, not necessarily to make broad generalisations' (Ary, et al., 2009, p. 35). Gomm et al. (2000), however, argue that results from studies can provide grounds for making generalisations about the case under study and about other similar cases. I discuss the issue of generalisation further in section 4.8.

This study examines ways that a new pedagogical approach can contribute to the development and improvement of interface design learning for student teachers in the context of higher education. It required researching students interacting with each other and also with tutors and a community of practitioners (designers).

This study is also described as a qualitative case study. I chose a qualitative study with the intention to gain rich data, which includes thoughts, feelings and emotions (students' experiences). This calls for a relatively flexible approach that captures the complexities and subjectivity in the narratives of human experience. Maykut (1994) strongly recommends qualitative research in dealing with these matters. Banister et al. (1994) add that qualitative research can be useful in revealing stories behind a complex and dynamic social environment; it allows for data to be explored in more depth using methods such as in-depth interviews and case studies.

(4.8) The rationale for choosing qualitative case study research

According to Gomm et al. (2000), case study refers to research that investigates a few cases in considerable depth. Robson (1993, p. 146) defines a case study as 'a strategy for doing research which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence'. The case study approach is favoured generally in the study of contradictions, and particularly in contexts of technology use (Murphy and Manzanares, 2008b). I find this very relevant to my research into understanding contradictions which partly took place in a web-based setting. Furthermore, researchers (Yamagata-Lynch, 2010; Yin, 2008) clarify that case studies are suitable for research investigating contradictions in an activity system.

Despite these advantages, it is often argued that the results of a case study are impossible to statistically generalise beyond the specific research context (Bryman, 2004). Statistic generalisation concerns with the possibility of using smaller sample size to represent the larger group/ population (Vaus, 2002). Qualitative researchers respond to this argument by advocating different types of generalisation, such as analytical generalisation (Yin, 2008), naturalistic generalisation (Stake, 2000) and fuzzy generalisation (Bassey, 2001).

Yin (2008) states that case studies can be analytically generalised, meaning that a particular set of results based on the theoretical propositions of a study can be projected onto a new situation. Stake (2010) adds that case studies can also be naturalistically generalised. Naturalistic generalisation does not simplify a single study to a population, instead allowing readers, e.g., educators or policy makers to make connections between elements of the study and their own experiences (Mantovani, 1996). Bassey (2001), in addition, introduces fuzzy generalisation to represent the type of generalisation that is based on prediction rather than calculation.

> For the user of research, generalisation in the form of prediction is what is usually wanted. Users want to know what may happen in their situation if a particular action is taken. Teachers, for example, are likely to be interested in what has happened in other classrooms insofar as it predicts what may happen in their own classrooms. (Bassey, 2001, p. 12)

This study is intended to achieve either naturalistic or fuzzy generalisations. As stated by Yin (2008, p. 128), ‘the basis of the generalisation is not the representativeness of the sample, but the fact that we discovered a general principle about a phenomenon’. I leave it to readers to decide and relate the findings of this study to their contexts and experiences.

(4.9) Researcher trustworthiness

I have attempted to be transparent from the outset in my actions and intentions, when designing, carrying out, analysing and disseminating the outcomes of this study. The research has been informed by Guba (1981) cited in Bassey (2001) as described below:

- *Thick description:* I provided thick description of the phenomena under study, exposing detailed descriptions of the procedures employed and the analysis process (Merriam, 2009).
- *Familiarity:* I initiated an early discussion with designers and gatekeepers before the field study began to gain an adequate understanding and to establish trust between the parties.
- *Background, qualifications and experience of the researcher:* I managed to make full use of my background as a qualified tutor and

designer to conduct the study and gain the participation of two different communities of learners and practitioners.

- *Data verification:* I presented the results to participants and asked for verification. Staying connected with participants through Facebook allowed for the verification process to run smoothly.
- *Member checking:* I organised a member checking session, and had professional conversations with my supervisors (Lincoln and Guba, 1985; Yamagata-Lynch, 2010) to reinforce the research's credibility. As well as discussing with my research supervisors, I took the precaution of discussing the process of this research with two fellow Ph.D students, who offered feedback as I proceeded.
- *Examination of previous research to frame findings:* I relate the findings of my study to an existing body of knowledge to address some comparability (Silverman, 2010).
- *Transferability/Generalisation:* I discussed this criterion in section 4.8, where I explain how this study has aimed to achieve either analytic, naturalistic or fuzzy generalisation, rather than statistic generalisation. In addition, I have listed in detail the number of participants involved in the fieldwork, the data collection methods that were employed, the number and length of the data collection sessions, and the time period over which the data was collected.
- *Dependability:* I have described the strategy of the research design and its implementation, as well as the way data was gathered. I have also evaluated the whole process followed in the study.
- *Conformability:* From the outset I considered my objectivity in carrying out this research study. By frequently reflecting on the research

questions I questioned my own immersion and how this may impact on students' performance. Having been involved with the development of design creativity, I am engaged with the subject at a deep level and I acknowledge that I am passionate about the importance of creativity development in design, not just within individuals but on a larger scale in groups. Data from a variety of participants (students, tutors and designers) were gathered and more than one method (online questionnaires, face-to-face interviews, field documentation on Facebook and Facebook chat) was applied to minimise bias.

(4.10) Limitations of the methodology

This section discuses two specific issues which have a potential impact on the research design:

The first difficulty that I encountered was how to gain full participation from designers, due to issues of unpaid involvement and their busy working schedules. The exact same problem was faced by Hartfield et al. (1992) in their study of appointing designers as mentors in students' interface design projects (see section 2.4.2 in Chapter Two).

Designers in this study were asked to offer their professional feedback on students' interface designs for a duration of five weeks (week 6-11 of the semester). Since their participation was voluntary, designers were not restricted to rigid predetermined rules or a central authority. This resulted in designers choosing to respond to whichever group of students they preferred.

To encourage active participation, Russell et al. (2000) recommend researchers to give more emphasis on recognising the time and effort spent by research participants. Monetary incentives could be used as a tool to increase response rates and encourage participation (Singer and Kulka, 2002); however this could also raise some moral questions (Geisinger, 1994) and create a bias in participant responses (BERA, 2004). According to Geisinger (1994), social research is generally dedicated to the wellbeing of society, and participants should participate without expecting something in return. However, it seems unfair for participants such as the designers in this study to spend the required time for the studies over the five weeks and share their expertise without gaining equivalent recognition. Grant and Sugarman (2004) state that incentives can be used in the form of signs of respect to participants' skills and expertise. They argue that incentives only become problematic when combined with the following factors (singly or in combination with one another):

> Where the subject is in a dependency relationship with the researcher, where the risks are particularly high, where the research is degrading, where the participant will only consent if the incentive is relatively large because the participant's aversion to the study is strong, and where the aversion is a principled one—when these conditions are present, the use of incentives is highly questionable. (Grant and Sugarman, 2004, p. 732)

Designers' participation was not influenced by any of these factors. Nonetheless, the proposition of whether monetary incentives would somehow offer a better quality of participation remains unanswered until further research is carried out. In this study however, I offered each designers a certificate of appreciation (see figure 4.9).

The second difficulty that occurred during this study involves translating data from one language to another. Data for the study were collected and translated from Malay to English. Designers in this study used colloquial Malay a great number of times. Hiring a professional translator does not guarantee that the data would be free from misinterpretation because, as stated by Qureshi et al. (2009), colloquialisms in one language may be misinterpreted in another language. Singal and Jeffery (2008) suggest that data be translated by a translator who clearly understands both languages and the cultures or subcultures of the people being studied.

The approach adopted was informed by the method of multiple-forward translation which has been used in other studies, such as those by Mundia and Hj Abu Zahari (2010), and Mimura and Griffiths (2007). Multiple-forward translation requires two or more translators to translate the original language (Malay) into the new language (English). The new language (English) translations are then compared. As one of the translators and also the interviewer, I tried to capture the original meaning of the data as closely as possible, e.g., Young and Ackerman (2001). I also used a certified translator to translate, check and edit all transcriptions. The translator was from Malaysia and Malay by ethnicity. She has taught TESL (teaching English as a second language) programmes in a considerable number of universities locally and internationally. I discussed and verified all translated data with her to ensure its clarity.

(4.11) Summary

In this chapter I have critically reviewed the research process, including the selection of participants, data collecting procedures and methods of data analysis. The authenticity and credibility of the study, ethical issues and limitations were discussed. In the following chapter, Chapter Five, I provide a detailed account of the analysis process.

Chapter Five: Analysis of data

(5.0) Chapter overview

This chapter presents the process of data analysis and findings from the research study. The process of analysis is divided into two parts: initial analysis and substantive analysis. In the initial analysis, I examine all the data from fifteen groups of students, designers and tutors. I used a thematic approach (Braun and Clarke, 2006) and comprehensive data treatment (Silverman, 2010) to analyse the initial data which includes the whole corpus of exchange from both sides of the partnership (the learning community and community of practitioners). The process of generating codes and themes involved the six phases of thematic analysis, consisting of data familiarisation, generating initial codes, searching for themes, reviewing themes, defining and naming themes, and reporting. This produced initial findings using key themes and sub-themes which helped refine my research questions. In the substantive analysis, I focused on only four groups of students as case studies. The selection was made as a result of the comprehensive data treatment and the thematic approach from the initial analysis. I then employed activity systems analysis (Engeström, 1999) to examine the four selected cases in more depth in order to answer my research questions which were:

(4) What is the nature of the learning experience and how does this promote understanding of the creative design of websites or courseware?

(5) What are the contradictions caused by this new pedagogic approach?

    (2.3) How did the students respond to the contradictions?

(2.4) How were the contradictions reconciled, if at all?

(6) What are the factors within the learning experience that contributed to the development of design creativity?

(3.2) How did the factors support students to develop an understanding of effective website or courseware design?

(5.1) Analysis phases

Figure 5.1 depicts the phases of analysis involved in this study together with the key themes and sub-themes from the initial analysis.

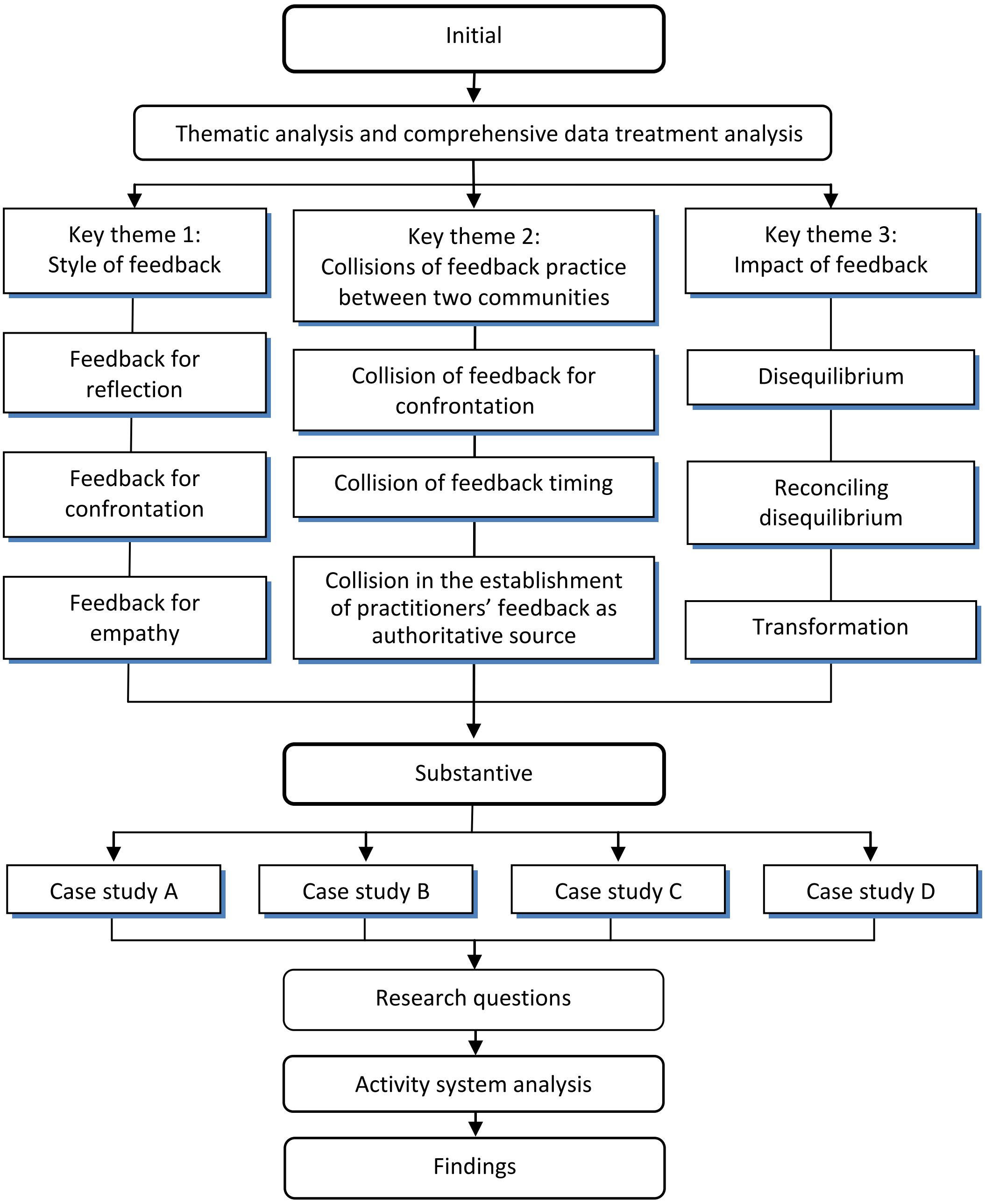


Figure 5.1: Analysis phases

(5.1.1) Initial analysis

I used a thematic analysis approach (see table 4.4) to find coherent and distinctive themes and sub-themes. Most importantly, the approach allowed for me to actively engage with the data and the analysis process. Thematic analysis, revealed three key themes relating to feedback. I now explain how the key themes were identified, starting with 'style of feedback', followed by 'collisions of feedback practice between two communities' and, finally, 'impact of feedback'. The sub-themes to every key theme are also described.

(5.1.1.1) Key theme 1: style of feedback

After familiarising myself with the data (field documentation on Facebook), I noticed that different styles of interactions occurred, delivered by the tutor, designers and students. Style of feedback refers to the type of discourse/ specialised language (Mercer, 2000) used by participants. I continued to focus on analysing dialogue between the participants on Facebook. To generate the initial codes, I used the open coding approach whereby I examined chunks of data from field documentation on Facebook line by line (Bryman, 2004). The process of reading and rereading the data from field documentation on Facebook led to identifying salient information delivered by the participants during the collaboration. Appendix E provides an example of how the coding process was performed on the field documentation. As a result, 15 codes were generated from the dialogue, as shown in table 5.1. Some of the codes overlap; this was developed further into the representation of categories.

Table 5.1: Codes and indication from field documentation on Facebook

Code	Indication	Definition	Sample of participants' quote
ACK	Acknowledgement	Confirms or assures the student that some event has taken place	• "You have made an improvement!" [Facebook: group 14] • "I take group 3 and others, especially group 5 have very good eyes / senses of colour." [Facebook: designer L to group 3]
COBCOM	Collaboration instead of	Represents learning together instead of	• "Font too small, making it hard to read – what is the size of your

	competition	against each other: learning from others or learning by teaching others	website? Please refer and ask group 5 regarding this matter." [Facebook: tutor C to group 1]
EDM	Encouraging decision making	Encouraging students to make use of cognitive process in reaching a decision	• "We can give you millions of comments and you can take every comment into consideration. But you have to ask yourself... and always believe in what you are doing… and always be proud with your own design =) [smile]." [Facebook: designer E to group 13] • "You will have to read comments given by others and make evaluations. You have to think and decide who makes more sense…" [Facebook: designer E to group 14]
EQ	Enquiry	Questioning students' level of understanding towards design knowledge. A method to encourage deep thinking.	• "If this design is created for secondary five students, then it has to focus on two target groups of female and male; however the design above seems to focus only on a male audience. Tell me why this is so." [Facebook: designer L to group 2]
EQC	Emotional quality control	Controlling the quality of design with emotional expressions using text, e.g., angry, annoyed etc.	• "Your design does not suit with your secondary two target audience! And there is not a single bloody visual that you used relates to mathematics lesson!" [Facebook: designer A to group 4]
ESF	Encountering spoon-fed behaviour	Confronting spoon-fed behaviour demonstrated by students	• "Group 12, I suggest that after you receive our comments, you should first refer to your tutor. Do not post unnecessary questions to us. I don't think it's fair that you simply post your design and hope for us to spoon-feed you…You have to think and find your own solution. Ask your tutor as much as you can. Our role is only to judge your work and provide tips, not to answer all your unnecessary questions." [Facebook: designer L to group 12]
F2F	Face-to-face	Providing face-to-face	• "Group 8, please come and see me.

	support	support for students	(1) Bring a sample of a website that you find interesting, attractive, neat, clean and up-to-date. (2) Also bring photos (in jpg format) that relate to your topic of design. Please make an appointment with me as soon as possible." [Facebook: tutor C to group 8]
MOK	Mocking	Responding with expressions of ridicule, contempt or derision	• "Your design looks neat and clean at a glance. But when I look at it again....busted! It's like looking at a transvestite. You thought it was a girl at a glance but it was not a girl after all....This is how I viewed your design...The reason why I say so is because your layout composition is still not in a proper structure." [Facebook: designer A to group 14]
MOT	Motivation	Providing support and encouragement to face pressure and make improvements	• "I like the tagline that you used – touch your mind. It is kwell! ['Kwell' means 'cool' in internet slang] You can become a copywriter in the future." [Facebook: designer E to group 12] • "Overall, good effort! There's improvement." [Facebook: designer E to group 12] • "Remember, practice makes perfect, OK! All the best." [Facebook: designer E to group 12]
MP	Middle person	Person who acts as an intermediary between participants to maintain harmony or to clarify indistinct communication	• "Dear designer L, can you please give further explanation of your statement as requested by group 7, which is 'Background image is fine but this one overwhelmed. Limit your visuals'. Do correct me if I'm wrong: (1) their background design 'math formula' is already suitable but (2) They have to be careful with using a visual that does not carry any relevant information, e.g., the hand image. (3) There is a limit to visual usage. It is not necessary to add plenty of images within one design. Is this correct? Thanks darling! Appreciate your feedback a lot. :)" [Facebook: tutor C to

			designer L, group 7]
PA	Personal attack	Making of an abusive remark instead of providing evidence	• "This is the work of lazy person!" [Facebook: designer A to group 13] • "Looks like this design is being produced by school kids not university students." [Facebook: designer A to group 2]
PM	Peace maker	Addressing misunderstanding	• "Group 2, please do not get offended by designers' comments. They are only trying to help you. Their words might be a bit harsh but they meant well. Take it positively. Dear designer friends, let us not forget that these students are not from a design background. They are mathematicians, physicists and science students. Your positive guidance will come in handy for them." [Facebook: tutor C to group 2 and designers]
PR	Provide resources	Providing help to students by giving website links of useful information or any related resources	• "Check out this website: https://www.hsbc.com.my/1/2/!ut/p/kcxml/.. Observe how they apply font size and colour (greyish) in their Grey box." [Facebook: tutor C to group 6]
PROV	Provocation	A means of arousing or stirring to action	• "To me, you are trying to avoid getting negative feedback. This is a 'play safe' design – very bad choice of fonts and colour. There is nothing special about this design. NO PAIN NO GAIN." [Facebook: designer F to group 10]
QC	Quality control	Controlling the quality of design by giving comments and suggestions	• "The font is too small; I'm having a hard time reading them. It seems that you used shadow on the body text, is that right? If it is, there's no need to add shadow. If you insist, add it only to your sub-heading." [Facebook: designer C to group 1]

These codes are not closed categories, as sometimes they could overlap. For example, face-to-face support (F2F) and motivation (MOT) can be used conjointly. I then gathered the codes in table 5.1 into potential categories, as follows: feedback for reflection, feedback for confrontation and feedback for empathy, as shown in table 5.2. I constantly reviewed my data using NviVo software to ensure the feedback categories fitted the data codes.

Table 5.2: Categorising codes from field documentation on Facebook into three styles of feedback

Codes (see table 5.1)	**Categorisation of codes into style of feedback**
QC, EDM, EQ, PR, and COBCOM	Feedback for reflection
MOK, EQC, PA, PROV, ESF	Feedback for confrontation
MOT, ACK, MP, PM, F2F	Feedback for empathy

Based on table 5.2, the codes of quality control (QC); encouraging decision making (EDM); enquiry (EQ); provide resources (PR); and collaboration instead of competition (COBCOM) were categorised under a style of feedback for reflection. Feedback for reflection was very technical, involving a questioning approach, locating flaws in an outcome and providing suggestions for improvement.

Codes of mocking (MOK); emotional quality control (EQC); personal attack (PA); provocation (PROV); and encountering spoon-fed behaviour (ESF) were categorised under the ‘feedback for confrontation’. Feedback for confrontation was delivered with intention of challenging students by reminding them to put more effort into their work. It was also intended to change their attitudes.

The remaining codes of motivation (MOT); acknowledgement (ACK); middle person (MP); peace maker (PM); and face-to-face support (F2F) were categorised under the 'feedback for empathy'. Feedback for empathy was delivered to respond to another person's emotional state, such as low motivation or confusion. Feedback for empathy was applied to reduce chaos and sustain learning. Further elaboration on each style of feedback is described next.

Sub-theme 1.1: Feedback for reflection

Feedback for reflection was delivered in a form of suggestions to encourage students to reflect and make improvements. The feedback for reflection was directed towards refining the technical aspects of design where emphasis was given to the use of elements and principles of design such as choice of image, colours, fonts and layout composition.

Based on the data, all participants, i.e., tutor, designers and peers, took part in delivering the feedback for reflection. For instance, they pointed out flaws in the design produced by students related to less suitable choices of heading, colour, image, tagline, legibility and readability of the font. Suggestions for improvement were also offered to the students. Students responded positively to the feedback for reflection. The following are the examples of feedback for reflection delivered on students' designs (on

Facebook) by one designer (designer J to group 13), a tutor (tutor C to group 1) and peers (group 6 to group 8):

Designer J: "(1) You have to differentiate which is the header and which is the dominant title. If MRP is the header, then please make sure MRP stands out so that it can be more dominant than the other text. Use a different style of font, with more bold and strong colours. (2) The tagline 'Learn anytime, anywhere' does not jive with the picture. The picture depicts more of a parliament meeting [laugh]. So, please get the right picture for the right tagline. Please get a reference for this design; there are many good references out there. Or you can just GOOGLE and you will get wonders. Hope my comments help."

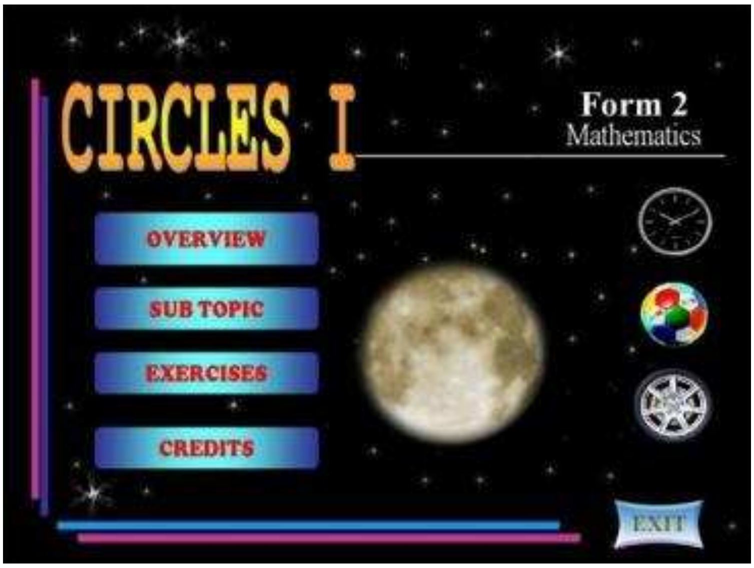
Group 13: Thanks for the comments! Had to admit, we did not do much research before starting on the design. It's just something out of the blue. Our tutor emphasised a lot about research in class yesterday, now we see where it leads..."

[Facebook: designer J to group 13: first design]

Tutor C: "Why is there a picture of kindergarten / primary school children at the bottom left hand side of your layout? I thought this website was meant for secondary four and five students? I can't see and read those texts in the box located next to the picture. The font size is too small."

Group 1: "Thank you for the feedback. This website is actually meant for both primary and secondary students but only those in secondary four and five will be learning this physics topic. They may find this website useful but generally, this website is meant for anyone who is interested with the topic. We will find a different picture to replace that picture of kindergarten children..."

[Facebook: tutor C to group 1: first design]



Peer students: "The whole layout is less interesting, and the choices of images and background colour are dull. This is our sincere view, no offense group 8."

Group 8: Thanks... this is our first design. We will try to produce something better than this [laugh]".

[Facebook: group 6 to group 8: first design]

Sub-theme 1.2: Feedback for confrontation

Feedback for confrontation as advocated in my research is central to the sentiment of messages used to deal with students' behaviour and attitudes. Designers confronted students with less empathetic feedback.

This approach, according to Lombardi (2007), is used by experts to develop more mature mental models that match the problem-solving method. There were some dialogues used particularly by three designers (A, F and L) that included ‘direct’ language with emotions such as anger, provocation, mocking and personal attacks. The use of such direct language had the potential to threaten or undermine the status of some students. Even though not as much help was offered in feedback for confrontation as compared to feedback for reflection, there were still some technical suggestions related to faults in the design offered.

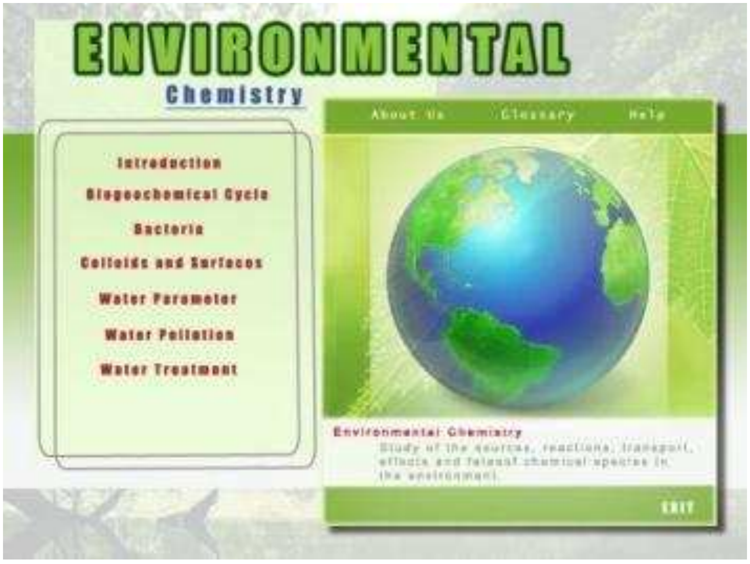
Designers were expressive with their words where they directly described students’ design as low in standard (designer A to group 2) and scolded students when they felt that the students were not putting enough effort (designer L to group 2). Designers mocked students’ design (designer A to group 14) and they provoked students by telling them to take risk and be more adventurous with their design (designer F to group 10). One designer (designer F) used text symbols, e.g., #@%* which indicate cursing to express his dissatisfaction when he thought that design produced by the students (group 3) was not up to expectation. Students were indeed shocked when they received feedback for confrontation. These are examples of feedback for confrontation delivered on students’ designs on Facebook by designers and some group responses:

Designer A: "Frankly I think this design is bloody rubbish. There is no simplicity at all. This design looks like it is being produced by school kids not university students."

Designer L: "You are submitting a work/project without providing us with any description and you expect us to give feedback. This is lame and unprofessional, especially when you are training to be a teacher."

Group 2: "wow... never before we received this kind of feedback from our tutor... there is plenty of rational in what has been said which made us thinking... thank you all..."

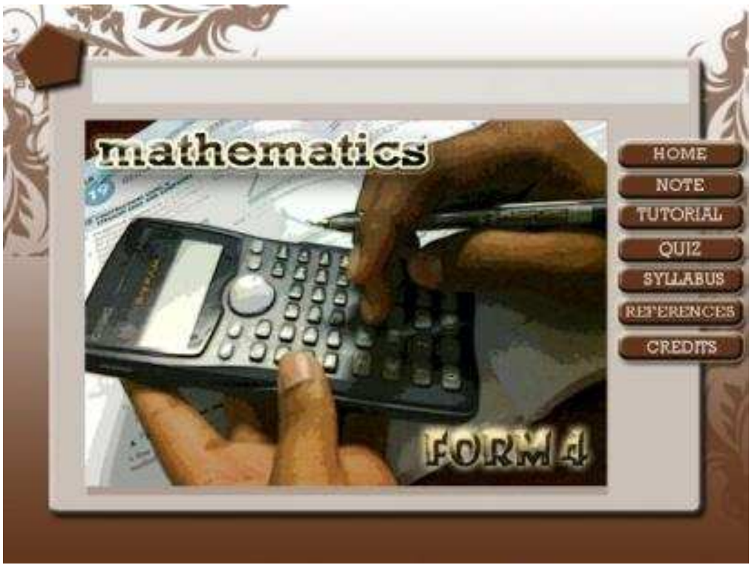
[Facebook: designer A and L to group 2: first design]



Designer A: "Your design looks neat and clean at a glance. But when I look at it again….busted! It's like looking at a transvestite. You thought it was a girl at a glance but it was not a girl after all....This is how I viewed your design...The reason why I say so is because your layout composition is still not in a proper structure."

Group 14: "To all designers, we have taken all of your comments into consideration... thank you and we will try to improve this design..."

[Facebook: designer A to group 14: first design]



Designer F: “To me, you are trying to avoid getting negative feedback. This is a ‘play safe’ design – very bad choice of fonts and colour. There is nothing special about this design. NO PAIN NO GAIN.”

Group 10: “Thank you all for your comments... Actually, we tried to come out with a new idea by placing the button on the right instead of on the left hand side...anyway... thanks again”.

[Facebook: designer F to group 10: second design]

“Can somebody please tell me what the #@%* this is? What is the function of those texts at the bottom? Are they supposed to change colour when we roll our mouse over? I don’t think the effect matters when you are producing a nonsense design!!”

[Facebook: designer F to group 3: second design]

It can be seen that students managed to respond calmly as they received feedback for confrontation. This is due to delivery of other style of feedback in between the feedback for confrontation, e.g., feedback for reflection and feedback for empathy (see Appendix H).

Sub-theme 1.3: Feedback for empathy

Feedback for empathy comprised empathetic communications consisting of support delivered to motivate students' from emotional states such as low confidence and confusion. For instance, the tutor tried to comfort students with positive encouragement. The tutor even acted as the peace maker to maintain harmony throughout the collaboration (tutor C to group 2 and to designers). Some designers motivate students by asking them to be more prepared with the development of their design and encourage the students to not give up (designer J to group 13). Designers also asked the students to take the feedback as a challenge to make improvement (designer E to group 13). Feedback for empathy was delivered in between of other feedback particularly after feedback for confrontation (see examples in Appendix H). These are some examples of feedback for empathy delivered by the tutor and designers to the students:

> "Group 2, please do not get offended by designers' comments. They are only trying to help you. Their words might be a bit harsh but they meant well. Take it positively. Dear designer friends, let us not forget that these students are not from a design background. They are mathematicians, physicists and science students. Your positive guidance will come in handy for them."
>
> [Facebook: tutor C to group 2 and to designers: first design]

> “Group 13, please try again and this time gather Intelligence before you execute. I believe you can do better.”
>
> [Facebook: designer J to group 13: first design]

> “Slowly but surely, don’t give up with the comments given. Group 13, I know it’s a bit harsh but take it as a challenge.”
>
> [Facebook: designer E to group 13: first design]

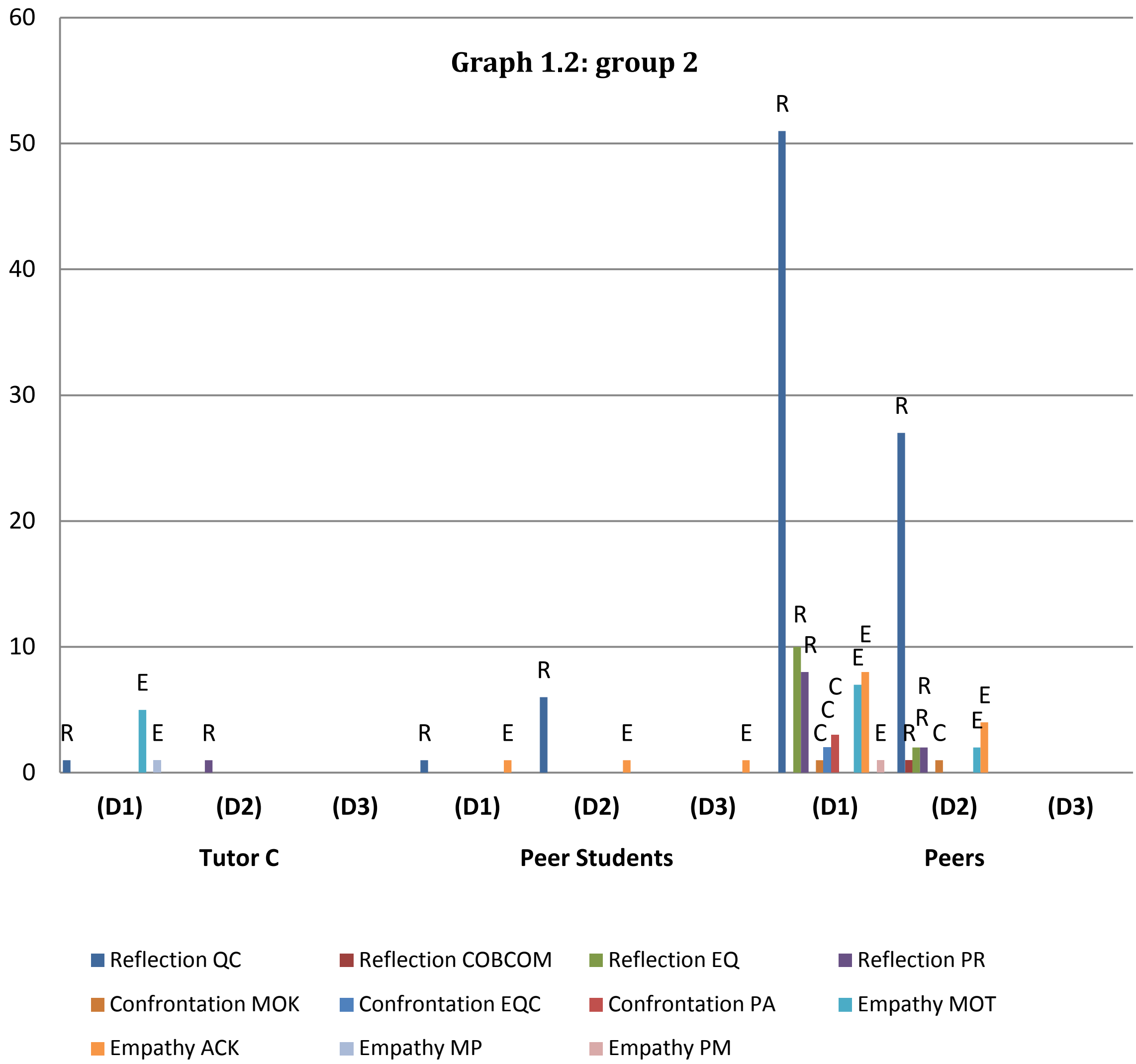
(5.1.1.2) Key theme 2: Collisions of feedback practice between two communities

From the data on Facebook and in the interviews, I also noticed that there occurred conflicts of feedback between the two communities of learning (tutor and students) and practitioners (designers), which involved a difference in the nature of feedback for confrontation, different feedback timing, and complication in the establishment of designers’ feedback.

Sub-theme 2.1: Collision of feedback for confrontation

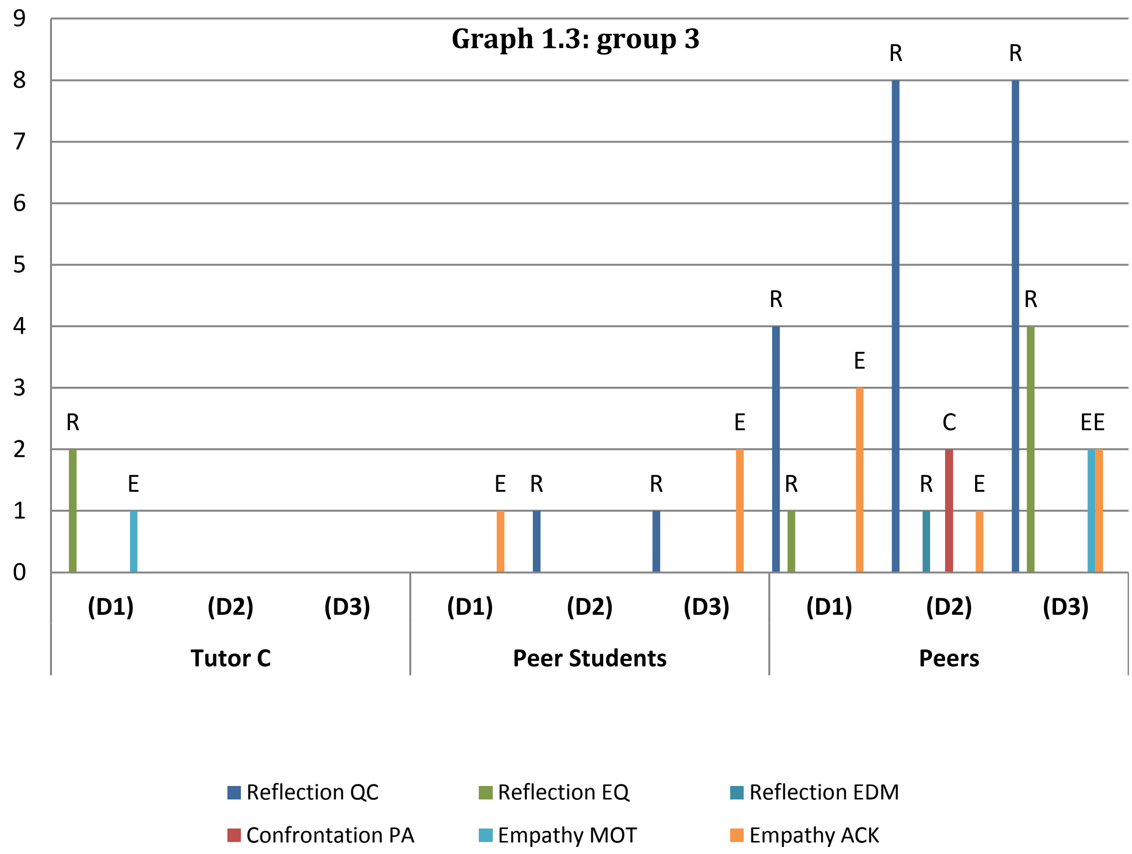
All three categories of participant delivered feedback for reflection, feedback for confrontation and feedback for empathy. However, the tutor and peer students were found to use feedback for confrontation on a very small number of occasions compared to the designers (see Appendix F: graphs 1.1 – 1.15). In this section I provide a few examples of graphs taken from Appendix F, indicating the style of feedback delivered by participants (tutor, peer students and designers) at three different phases of the design (D1, D2 and D3) to related group. R, C or E on top of each bar stand for the style of feedback: R for Reflection, C for Confrontation and E for empathy. Numbers on the left hand side of the graph represent the amount of feedback being delivered. Different colours of bars represent different types of feedback; colour indication is given below every chart. The graphs

(1.2 - 1.5) emphasise that feedback for confrontation was delivered by only participant designers.



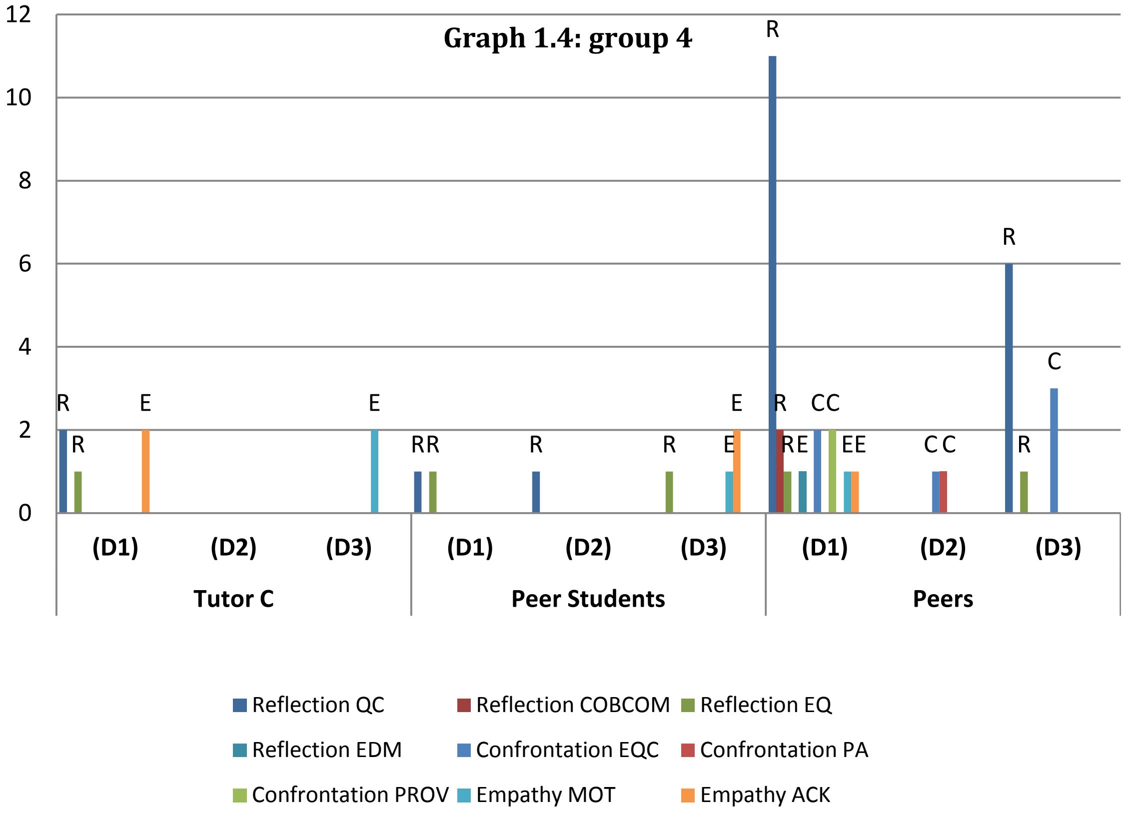
Graph 1.2 illustrates that the tutor delivered one feedback for reflection and six feedback for empathy on group 2's first design; and one feedback for reflection on the second design. The tutor however did not leave any feedback on the third design. Peer students delivered one feedback for reflection and one feedback for empathy on group 2's first design; six feedback for reflection and one feedback for empathy on the second design; and one feedback for empathy on the third design. Designers delivered sixty-nine feedback for reflection, six feedback for confrontation,

and sixteen feedback for empathy on group 2's first design; thirty-two feedback for reflection, one feedback for confrontation and six feedback for empathy on the second design. Similar to the tutor, designers did not leave any feedback on group 2's third design.



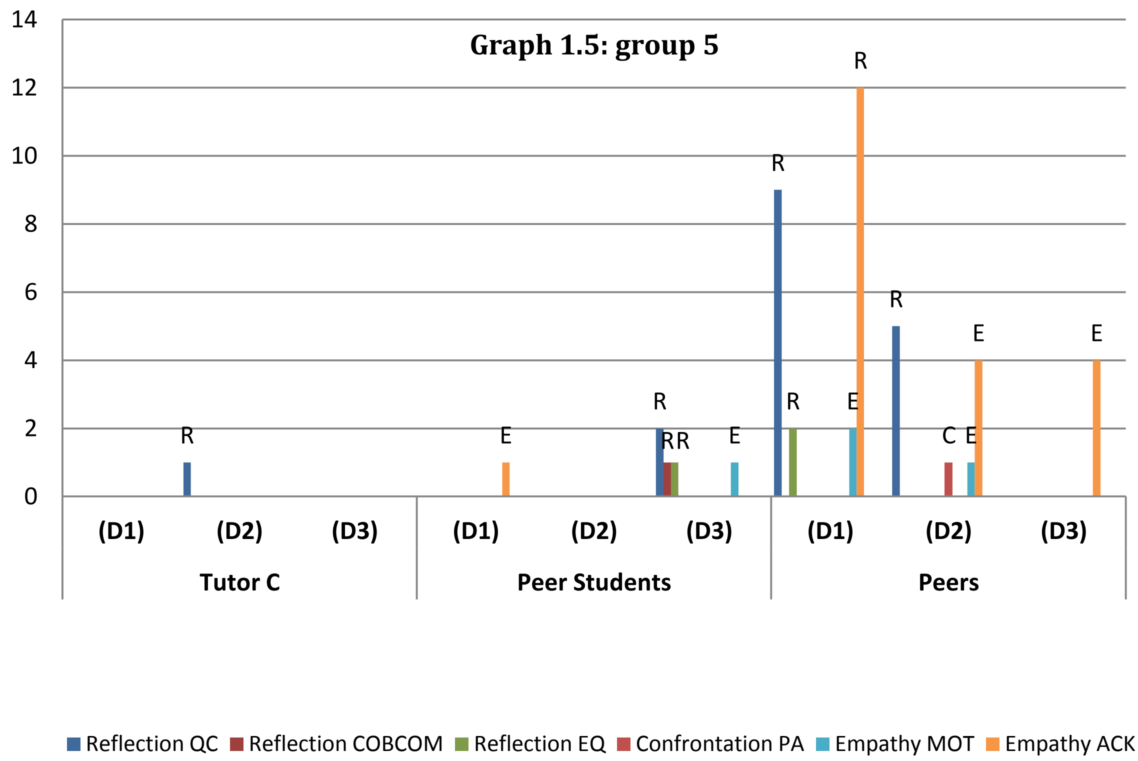
Graph 1.3 illustrates that the tutor delivered two feedback for reflection and one feedback for empathy on group 3's first design; however the tutor left no feedback on the second and third designs. Peer students delivered one feedback for empathy on group 3's first design; one feedback for reflection on the second design; and one feedback for reflection and two feedback for empathy on the third design. Designers delivered five feedback for reflection, and three feedback for empathy on group 3's first

design; nine feedback for reflection, two feedback for confrontation and one feedback for empathy on the second design; and finally twelve feedback for reflection and four feedback for empathy on the third design.



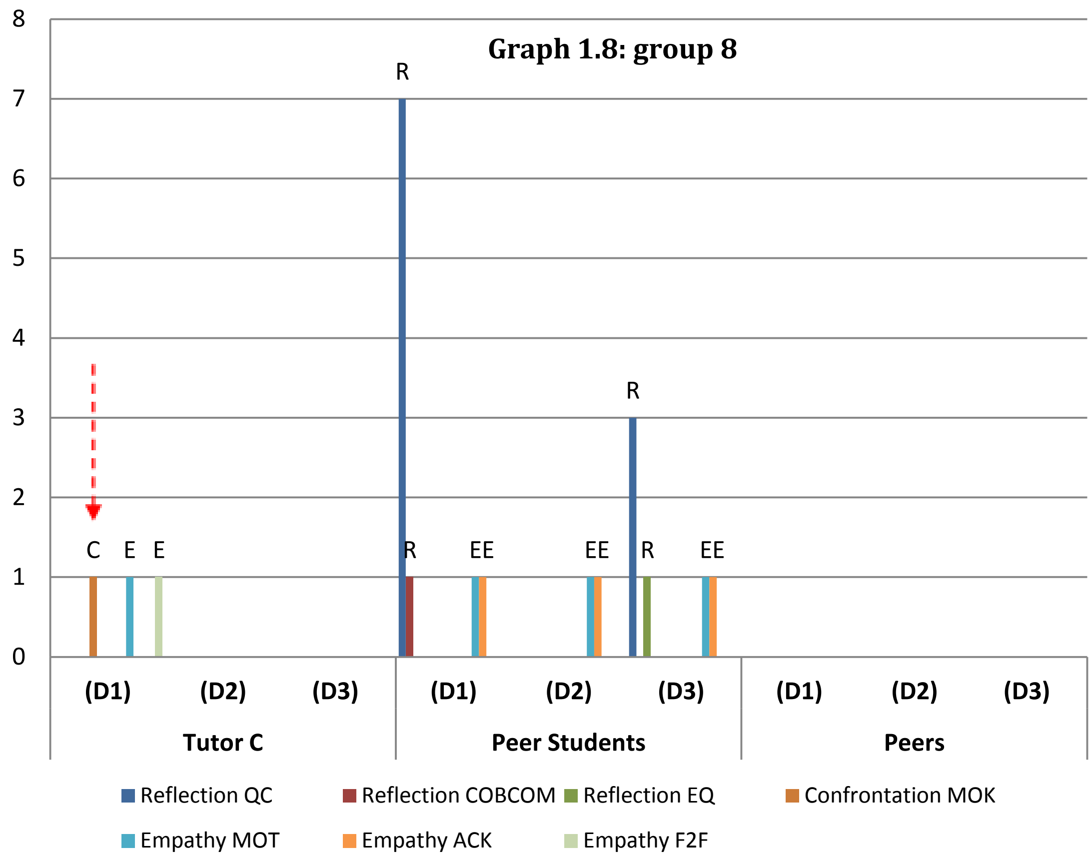
Graph 1.4 shows that the tutor delivered three feedback for reflection and two feedback for empathy on group 4's first design; the tutor left no feedback on the second design but delivered two feedback for empathy on the third design. Peer students delivered two feedback for reflection on group 4's first design; one feedback for reflection on the second; and one feedback for reflection and three feedback for empathy on the third design. Designers delivered fifteen feedback for reflection, four feedback for confrontation and two feedback for empathy on group 4's first design; two feedback for confrontation on the second design; and finally seven

feedback for reflection and three feedback for empathy on the third design.



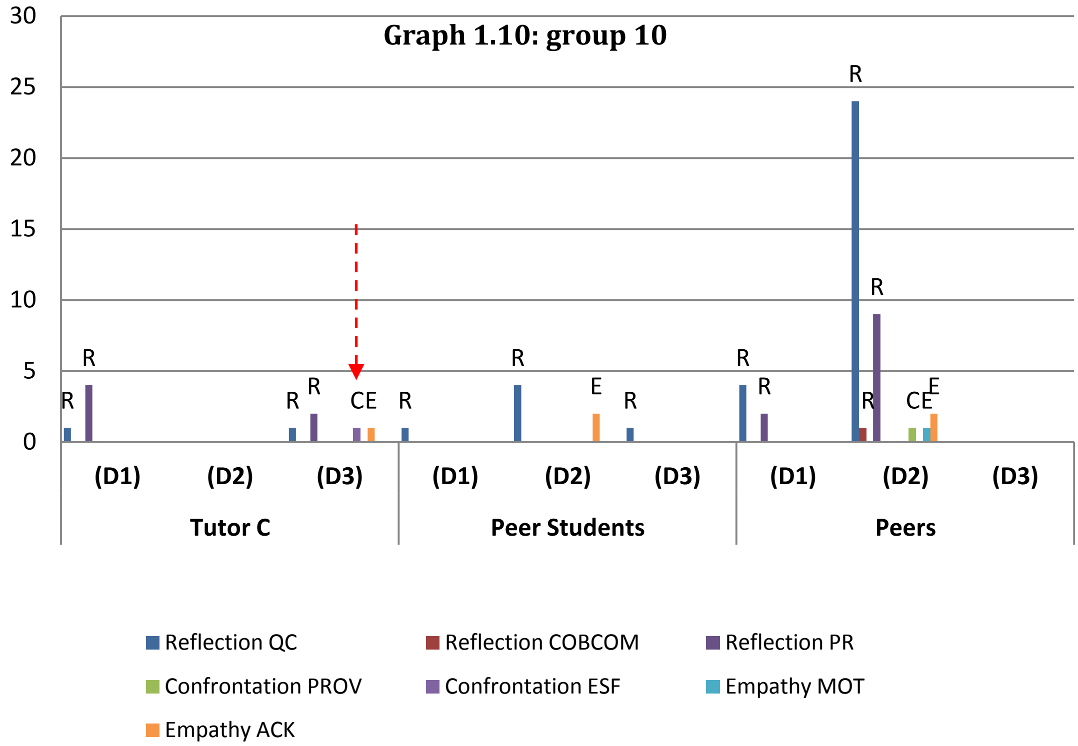
Graph 1.5 shows that the tutor delivered only one feedback for reflection on group 5's first design but left no feedback on the second and third designs. Peer students delivered one feedback for empathy on group 5's first design; left no feedback on the second design but delivered four feedback for reflection and one feedback for empathy on the third design. Designers delivered eleven feedback for reflection and fourteen feedback for empathy on group 5's first design; five feedback for reflection, one feedback for confrontation and five feedback for empathy on the second design; and finally four feedback for empathy on the third design.

As compared to the designers, the tutor delivered only one example of feedback for confrontation to Groups 8, 10 and 11, while peer students from group 10 delivered only one example of feedback for confrontation to group 14. Next I present graphs 1.8, 1.10 and 1.11 representing the delivery of feedback for confrontation by the tutor and peer students.

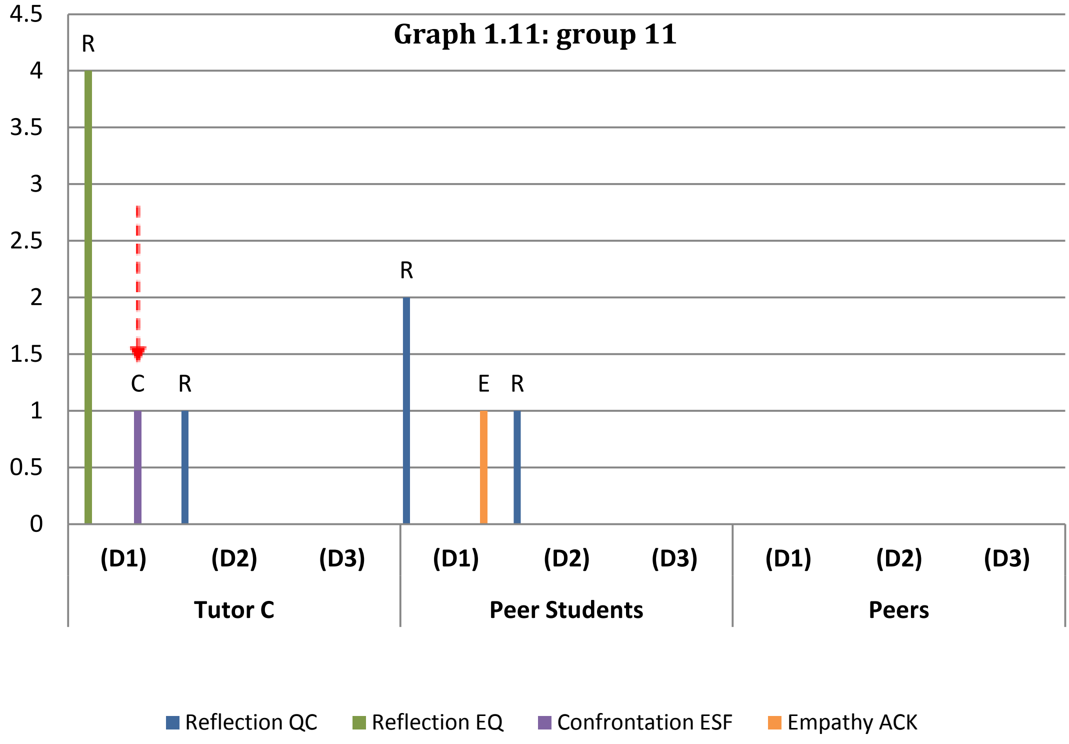


Graph 1.8 shows that the tutor delivered one feedback for confrontation and two feedback for empathy on group 8' first design but left no feedback on the second and third designs. Peer students delivered eight feedback for reflection and two feedback for empathy on group 8's first design; two feedback for empathy on the second design; and four feedback for reflection and two feedback for empathy on the third design. Group 8

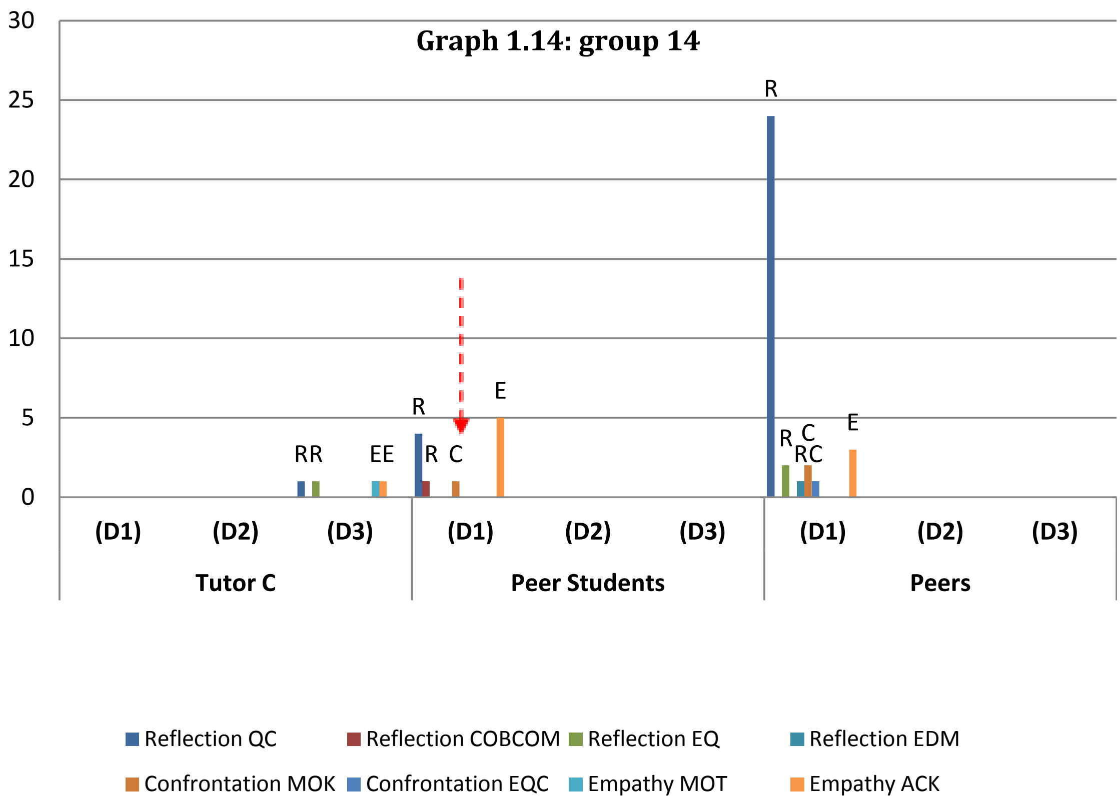
however received no feedback from the designers for their first, second and third designs.



Graph 1.10 shows that the tutor delivered five feedback for reflection on group 10's first design; left no feedback on the second design; and delivered three feedback for reflection, one feedback for confrontation and one feedback for empathy on the third designs. Peer students delivered one feedback for reflection on group 10's first design; four feedback for reflection and two feedback for empathy on the second design; and one feedback for reflection on the third design. Designers delivered six feedback for reflection on group 10's first design; thirty-four feedback for reflection, one feedback for confrontation and three feedback for empathy on the second design; designers however did not leave any feedback on the third design.



Graph 1.11 illustrates that the tutor had delivered four feedback for reflection and one feedback for confrontation on group 11's first design; one feedback for reflection on the second design; but left no feedback on the third design. Peer students delivered two feedback for reflection and one feedback for empathy on group 11's first design; one feedback for reflection on the second design; and no feedback on the third design. Group 11 unfortunately received no feedback from designers on any of their designs.



Graph 1.14 shows that the tutor delivered no feedback on group 14's first and second designs but left two feedback for reflection and two feedback for empathy on the third design. Peer students delivered five feedback for reflection, one feedback for confrontation and five feedback for empathy on group 14's first design but left no feedback on the second and third designs. Designers did not deliver any feedback on group 14's second and third designs but left twenty-seven feedback for reflection, three feedback for confrontation and three feedback for empathy on their first design.

More importantly, the nature of feedback for confrontation carried out by the tutor and peer students were found to be culturally very different from that carried out by designers. I compared samples of feedback for confrontation delivered by the tutor, peer students and designers:

The tutor was identified as using a subtle approach before she began to critique the students' work (tutor C to group 8) while peer students delivered their critique in a teasing manner instead of directly (group 10 to group 14).

> "OK, do not take this to heart... your design is a bit old fashioned... it looks like those websites built during the time when the internet was first introduced."
>
> [Facebook: tutor C to group 8: first design]

> "What is the function of that exit button? So that users can exit from the website? [Laugh]"
>
> [Facebook: group 10 to group 14: first design]

In contrast to the tutor and peer student, the designers' style of feedback for confrontation is more direct. Designers expressed dissatisfaction with the design produced by the students using words and symbols that can threaten the status of the student (designer A to group 7 and to group 14; and designer F to group 4).

> "Your copyright is too small…[laugh]…what a joke! The copyright symbol is not important. For me, this is rubbish!"
>
> [Facebook: designers A to group 7: first design]

> "My goodness... Sigh… I have to use a magnifying lens to read what you wrote there in your design. Freaking blur!"
>
> [Facebook: designer A to group 14: first design]

> "WHAT THE *%^"@*@*!!!!! We have wasted our time. Is this the best that you can do after all the feedback given to you? … Be creative in solving your problem NOT in giving excuses. Come on guys. 'Not bad' is not in our dictionary. In this industry, you have to produce great / excellent designs. There are a lot of people like you out there. What makes you better than the rest?"
>
> [Facebook: designer F to group 4: second design]

Designers were supportive but in different non-pedagogical ways. Their nature of feedback for confrontation was found to be more direct and was filled with emotion when compared to the tutor and peers. They used colloquial language which was very casual. To further understand the nature of designers' feedback, I managed to gain some insights from two of the designers (designers A and L) through Facebook chat. When asked about what they thought of designers' feedback, designer L admitted that the feedback was meant to be delivered in an unsympathetic way to make students realise their design flaws. Designer L related the feedback for confrontation with the history of design education during her undergraduate years in the School of Art and Design. Designer L explained that all designers used the same feedback model for educating students in this study. Designer L believed that feedback for confrontation could have a greater impact on students' learning than other types of feedback. Similar view was shared by designer A. Designer A stated that less empathetic feedback can encourage students to work harder and take lessons vigilantly.

> "We were responding in a harsh way yet honest / pure."
>
> [Facebook chat: designer L: 22 October at 11:16]

> "More impact and realisation could occur if the comments were put in a brutal yet honest manner."
>
> [Facebook chat: designer L: 22 October at 12:49]

> "For example, look at our previous design tutor during undergraduate. Their critiques made us cry! But because of those harsh critiques, we became determined! And that is why I and most of the designers used the same approach on your students."
>
> [Facebook chat: designer L: 22 October at 12:54]

> "Provoking students and giving feedback without any emotional attachment will only make them work harder. They will learn to take the lesson seriously."
>
> [Facebook chat: designer A: 23 October at 1:52]

Designers' views on feedback for confrontation were also shared with tutors A and B who provided some reflection on the collaboration. Both tutors A and B were not worried over the delivery of feedback for confrontation by the designers. They viewed feedback for confrontation as a real life lesson for students to get exposure to the world of work: a lesson which is not normally available in current higher education institutions.

> "Students have to learn to accept criticism. It is part of informal learning. The designers may sound a bit more ruthless than lecturers but we have to let them experience it in order to improve. What we can do is to give moral support and advise them to take every critique positively."
>
> [Interview: tutor A]
>
> "Feedback given by designers is based on real life experiences which relate to the actual working scenario...customers' demands. This is seen as good exposure for students to learn about the design world."
>
> [Online semi-structured questionnaire: tutor B]

Nevertheless, holding the position of the tutor in this study (tutor C) I provided students with feedback for empathy, being aware of students' uneasiness towards receiving feedback for confrontation at the beginning of collaboration (see data from Facebook: tutor C to group 2 and to designers: First design). Some designers (designers H, M and F) and peer students also showed their support through delivery of empathetic feedback. For instance, designer H posted messages confronting designer L on her style of feedback which seemed intimidating to the students.

Designer F was also sometimes found to support students with feedback for empathy although he had been identified as one of the designers who actively delivered feedback for confrontation. These are some of the examples:

> "Greetings all...hmm... What do you expect from a student... we are all in the age of learning...right group 2?! :)
> I agree with some feedback delivered by designer L! [Laugh], but designer L, you should take it easy, babe! You are scaring these kids away. Just provide them with input! :)"
> [Facebook: designer H to group 2 and designer L: first design]
>
> "Don't be afraid to get criticised, it is part of the learning process. Maybe those earlier comments have caused you to play safe with your design. Good job and keep it up."
> [Facebook: designer F to group 2: second design]

The data illustrates an initial conflict of community practices leading to some adjustment (designers provided feedback for empathy) as part of the ongoing feedback process. Meaning, designers also played their role to delivered feedback for empathy to students. Comparison of feedback practice between higher education and the creative industries was discussed in Chapter Two (see sections 2.3 and 2.4).

Sub-theme 2.2: Collision of feedback timing

In addition to the conflict nature of feedback for confrontation, students also faced difficulties adapting to the timing of the feedback which was based on studio-based assessment. Studio-based assessment procedures distinguished delivery of critique as early as possible and as an ongoing process (see Burroughs, et al., 2009). An elaboration of studio-based learning can be found in Chapter Two, section 2.4.

Students felt that feedback for confrontation should be delivered at the final stage instead of at the beginning of the collaboration. The following data describes the students' disagreement with the timing of feedback for confrontation (group 2, 3 and 4).

Emma: "We feel closer to the designers after some time, but at the beginning, we were shocked at their harsh comments!"

[Group interview: group 2]

Nicole: "Designers should not expect too much from us at the first stage. They were pushing too hard."

Dane: "We can accept if they condemn our design at the final stage but not at the beginning."

[Group interview: group 3]

Nancy: "At the first stage, we were warming up by uploading the 'panda' design but we did not expect to receive such cruel feedback from the designers."

Irene: "Designers should not react too aggressively at the beginning. We can accept harsh critiques only if they find us not improving at the second or third stage."

[Group interview: group 4]

Sub-theme 2.3: Collision in the establishment of practitioners' feedback as authoritative source

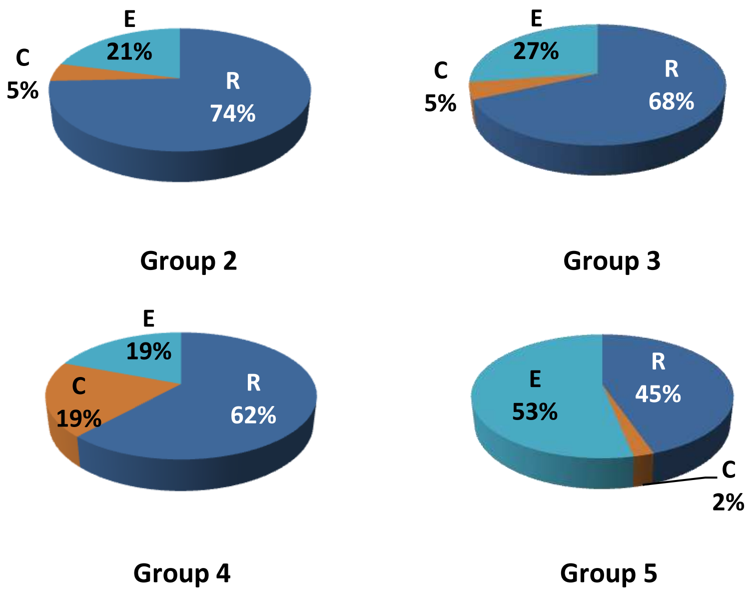
This research was undertaken with hope that students could benefit from designers' feedback but students in case study B were not in agreement with most of designers' feedback which they found irrelevant to their motive of design. This shows that not all feedback given by the designers was viewed as being from an authoritative source. An authoritative source is defined ‘as the knowledge that dominates and, that holds weight’ (Millard and Kingfisher, 1998, p. 450). Designers’ feedback was only distinguished as authoritative when it was found relevant and adequate to the students. Group 3, in contrast to other groups, wanted to know how well qualified were the designers to make the judgments they were giving. Group 3 was the only group who requested to view the designers’ profiles. This is because group 3 preferred to receive feedback from qualified designers who specialised in specific kinds of design: in their case, a design for children. They were also concerned about the designers’ understanding of academic requirements. This led to doubts for group 3 in fully acknowledging the designers’ feedback. I further elaborate and discuss this issue in section 6.2 of Chapter Six.

> Zelda: “It would be great if we could have a look at the designers’ profiles or CVs. We were wondering about their expertise. It would be useful in relation to the style of design. I mean, knowing their expertise would help us to understand the reason for the comments – why was it given the way it was?…For example, if one particular designer has experience with producing designs for children, we may listen to him/her more than others.”
>
> [Group interview: group 3]

> “We are a bit sceptical about whether the designers are truly qualified to give advice – since they are from pure design backgrounds, they might not understand educational needs.”
>
> [Online semi-structured questionnaire: group 3]

(5.1.1.3) Key theme 3: impact of feedback

Students emphasised the use of feedback for confrontation even though this type of feedback represented a low percentage compared to feedback for empathy and feedback for reflection (except for group 4: refer to Appendix G for feedback percentages delivered to each group). In this section, I present some examples of feedback percentages in a form of pie chart taken from Appendix G (group 2-5). R, C or E on the pie chart stand for the style of feedback: R for reflection, C for confrontation and E for empathy:



The pie charts demonstrate that feedback for reflection and feedback for empathy were delivered to students in higher percentages as compared to feedback for confrontation, except for group 4 who received 19% of feedback for confrontation and 19% of feedback for empathy. However, the most important question behind these feedback percentages relates to its impact on students and their learning.

From the interview sessions, I analysed students' responses towards the feedback and there were a mixture of experiences. Students were not pleased with the designers' feedback for confrontation but at the same time found the feedback useful: nine groups (groups 1 – 9) described the designers' feedback for confrontation as harsh, yet they acknowledged they contained useful messages. Some examples of students' responses are as follows:

> "Sometimes we feel dissatisfied with comments given by designers although the comments were useful, but they were delivered in a very harsh manner."
>
> [Online semi-structured questionnaire: group 4]

> Nancy: "The comments and critiques posted by designers had a deep impact on us. The designers' critiques were actually valuable but at the same time we found them terrifying."
>
> [Group interview: group 4]

> Jade: "There is logic in every comment given by the designers, although it may sound a bit harsh to some students."
>
> [Group interview: group 5]

As shown in the data, it was clear that the students were experiencing disequilibrium (Piaget, 1964): see section 2.4. I present more data indicating disequilibrium in the next section.

Sub-theme 3.1: Disequilibrium

Students clarified that while they found the designers' feedback useful, they could not help from feeling miserable, anxious, dissatisfied, surprised and de-motivated with the designers' ruthless use of language. Nonetheless, students were able to accept the feedback and some of them (Sherry, Yan and Alice from group 1) even described the feedback as clear and direct, easy to understand and suitable for their age group. Students became more alert and thoughtful in producing their designs due to the feedback delivery.

Zelda: “We do not really agree with their style of language. It makes us de-motivated sometimes.”

[Group interview: group 3]

Nancy: “Because of those harsh critiques, we felt miserable and decided to change the whole concept of the design. This was because we were trying to avoid getting more harsh critique.”

Kate: “...We became anxious about getting feedback and started being extremely careful with any action taken…”

[Group interview: group 4]

Jay: “Some language used by the designers could de-motivate students but for our group, we just could not care less! [Laugh] But the truth is that their language is not suitable for us in the education line.”

[Group interview: group 7]

Tim: “The language the designer used is no doubt a bit harsh but we can accept it.”

[Group interview: group 9]

Sherry: “Although most of the language used by designers was ruthless, we can accept it. …Never before did we get this kind of critique!”

Yan: “Comments were given in a clear and direct way.”

Sherry: “The designers did not use fancy words, which made them easy to understand.”

Alice: “The language used by the designers suits us teenagers.”

[Group interview: group 1]

Sub-theme 3.2: Reconciling disequilibrium

The finding of disequilibrium caused by the feedback for confrontation led me to question the way students' regained equilibrium. In dealing with their disequilibrium, students were found to: (1) seek cognitive and emotional support; (2) utilise self-coping mechanisms; (3) use previous experience; (4) recognise the various roles played by the designers; and (5) acknowledge the balance delivery of all three styles of feedback.

(1) Cognitive and emotional support:

Students sought support from similar and as well as different sources. One group obtained support from a designer in their personal and professional network (Zelda from group 3). Others admitted that they requested help from the tutor through face-to-face and online meetings (Alley from group 2 and Jade from group 5).

Zelda: "We did seek advice from a friend who is a designer. Not just any designer but one who specialises in children's design..."

[Group interview: group 3]

Alley: "The tutor has helped us more than the designers. After receiving comments from the designer, we will modify our design and then consult with the tutor. We had frequent face-to-face and online meetings with the tutor before continuing to upload the design."

[Group interview: group 2]

Jade: "When we received comments on our first design from the designers, we cautiously made changes and then asked for a second opinion from the tutor before uploading the second design."

[Group interview: group 5]

(2) Self-coping mechanisms:

Students in group 4 (Nancy and Irene) explained that they coped with disequilibrium by focusing on their goal: to produce quality design. They also gained confidence after witnessing other groups being criticised the same way.

Nancy: "When we saw other groups being criticised the same way, we learned to accept the fact that it happened to every student and we did not feel as bad as before."

Irene: "Everybody gets criticised! We keep on telling ourselves to throw away the feeling of embarrassment. Producing quality design is more important than our feelings."

[Group interview: group 4]

(3) Previous experience:

Two groups stated that their previous experience helped them in dealing with the task in this study (Flora from group 3 and Zoe from group 5).

Flora: "We also used our previous experience. Yeah, last semester we took an elective course of graphic design. It was our own initiative. We learned to design logos, paper bags and hanging mobiles during the course."

[Group interview: group 3]

Zoe: "Experience in teaching practice from last semester has helped us in making some of the decisions at the beginning of our design process, especially in getting ideas."

[Group interview: group 5]

(4) Various roles played by designers:

Student in group 2 (Alley) explained how designers took turns to provide different styles of feedback to them. One student in group 4 (Nancy) also noticed a change of character in designer A as the collaboration progressed, from being aggressive to more approachable. This also indicates that designer was making some adjustment as the collaboration progressed to deal with an initial conflict of community practices.

> Alley: "The designers took turns to challenge and motivate us; for example when designer L delivered criticism, designer A offered motivation."
>
> [Group interview: group 2]

> Nancy: "At first we preferred designer L's style as compared to designer A, but towards the end, we began to favour designer A as he became more approachable...As the collaboration progressed, we somehow found the designers' feedback hilarious. For example, the critique delivered by designer A to group 14. Designer A associated their design with a transvestite [laugh]!"
>
> [Group interview: group 4]

(5) The balance of delivery of all three styles of feedback

The earlier data - (1) and (4) - showed that delivery of all three styles of feedback (feedback for confrontation, feedback for reflection and feedback for empathy) have played a part in helping students to deal with their disequilibrium.

Sub-theme 3.3: Transformation

Students were found to have a better perception of feedback for confrontation after reconciling equilibrium. They began to: (1) consider different professions; (2) improve their social communication; and (3) develop knowledge of different professional practices and settings.

(1) Considering different professions

Interactions with the designers opened up a professional dialogue with the students. In some cases, this led to the consideration of different career paths.

> Zea: "If I can't become a teacher, I might turn out to be a designer! [Laughs] This style of collaboration is important to us as preparation for future careers."
>
> [Group interview: group 5]

(2) Improving social communication

Group 12 admitted the collaboration developed their courage, awareness, acceptance of criticism and communication skills.

> "This collaboration has made us bold, conscious and ready to accept criticism. It has also helped improve communication between friends, the tutor and outsiders."
>
> [Online semi-structured questionnaire: group 12]

(3) Developing knowledge of different professional practices and settings

Emma in group 2 stated that they were able to share knowledge and gain plenty of information from practitioners in the creative industries.

Emma: “This collaboration gave us many inputs and let us share a real working scenario with those in the industry.”

[Group interview: group 2]

(7) Developing understanding of effective design

Students described that they had learnt to produce simple and appropriate designs for a specific target audience (group 4). Tutor A and B confirmed that most of the students had made improvements. Tutor A even admitted that their designs were better than other students in another class (cohort 02).

Nancy: “...with this collaboration, we became more alert. We learnt to relate every element of our design to the target audience...although there was no continuity in our design throughout the process we have learnt to produce a simple composition of layout design.”

[Group interview: group 4]

Tutor A: “I have seen so much improvement taking place! Their designs are better than most students in my class.”

[Interview: tutor A]

Tutor B: “They went through a number of evaluations and through these evaluations; I can see the students were making progress and improvements.”

[Online semi-structured questionnaire: tutor B]

(5.1.2) Substantive analysis of case studies

It is important to mention that the initial and substantive analyses are not separate sections but strongly linked to one another; data from the initial analysis will also be referred to in this section particularly in relation to data related to group 2, 3, 4 and 5. These four groups were chosen for further in-depth analysis. Among the 15 groups involved, nine groups were interviewed face-to-face; however only four groups were discovered to have received feedback from every category of participant: the tutor, peer students and designers. It was important to select groups that had received feedback from every category of participant because part of my research question and theoretical position (Activity theory) focused on the notion of roles in developing creativity. Furthermore, the four selected groups were unique in their own ways, which I describe next.

Case study A represents group 2

There were four members of the group: Alley, Jane, Emma and Arial. Group 2 was among the earliest to post their interface design on Facebook and they received the largest amount of feedback compared to the other groups (see Appendix F, graph 1.2). They showed the most effort, were very hardworking and critically analysed every piece of feedback given to them. Group 2 received feedback from the tutor C, peers and designers A, F, H, J, K, L and M.

Case study B represents group 3

There were four members of the group: Nicole, Dane, Zelda and Flora. Group 3 was reported as seeking support from other parts of the community; they were very independent and in control of their learning. This group was able to argue with the designers and defended their design with reasonable explanations and references. Group 3 received feedback from the tutor C, peers and designers A, C, E, F, G and L, as well as a designer from their own personal and professional network.

Case study C represents group 4

There were three members of the group: Nancy, Irene and Kate. Group 4 in case study C received the largest amount of feedback for confrontation (see Appendix G). This group produced entirely different designs at every phase. There was no consistency in their designs. Group 4 received feedback from the tutor C, peers and designers A, F, G and L.

Case study D represents group 5

There were four members of the group: Alan, Zoe, Zea and Jade. Group 5's design was highly accepted by the designers, and the group was very active in responding to the designers' feedback. This group was among the best and they managed to produce a quality design without much difficulty. They attentively analysed every piece of feedback given. Group 5 received feedback from the tutor C, peers and designers A, B, C, F and L.

(5.1.2.1) Activity system components and analysis

In the substantive analysis of case studies, I used activity system analysis (Engeström, 1999) to organise the findings and answer my research questions. Table 5.3 describes the components of the activity system for this study based on Mwanza eight step model (Mwanza and Engestrom, 2005): see table 5.3. The rational and advantages of using activity system analysis have been discussed in sections 3.3 and 4.6.3.

Table 5.3: Activity system for design learning activity

Components	Question to ask:	Description
Activity of interest	What sort of activity am I interested in?	Develop design creativity on Facebook-based setting
Objective	Why is the activity taking place?	Restructure design learning to encourage creativity through joint activity
Subjects	Who is involved in carrying out the activity?	Student teachers : 3 or 4 students in a group
Tools	By what means are the subjects performing this activity?	Facebook technology, feedback and discussion
Rules and regulations	Are there any cultural norms, rules or regulations governing the performance of the activity?	Based on CASA4SBL pedagogic model which includes modelling ; coaching and scaffolding; articulation, reflection and exploration; and final articulation and reflection (see section 3.2.4, figure 3.4)
Division of labour/ role	Who is responsible for what, when carrying out activity and how are those roles organised?	Tutor C: mediator Designers: advisor/design experts Students: respondent
Community	What is the environment in which this activity is carried out?	Community of practitioners (designers) have to work alongside a learning community (students and tutor C)
Outcomes	What is the desired outcome from carrying out this activity?	Develop and improve design understanding, awareness and outcome

This study aimed to develop design creativity using a Facebook-based setting. Its main *objective* was to restructure design learning and encouraged design creativity through collaborating with a wider community, e.g., a community of practitioners. *Subject(s)* in this study represented students in groups who were expected to develop interface design, thus improve their design understanding and awareness *(outcomes)*. In developing the interface design, *subject(s)* have to use *tools* (for instance, Facebook technology and discussion) and learn by the *rule* (based on the CASA4SBL model). They also have to collaborate with the *community* (consisting of tutor, peer students and designers). Each member of the community has their own *role/division of labour* (for example, providing scaffolding and coaching, mediation and responding to feedback). I used the second generation of Activity Theory to capture the activities that took place in every case study and also to further understand students' experiences in dealing with the activities, but in order to identify the contradictions; I also utilise the third generation of Activity Theory.

(5.1.2.2) Activity system analysis for research question 1:

What is the nature of the learning experience, and how does this promote the understanding of the creative design of websites or courseware?

Students in every case study experienced socially constructed learning. They critically assessed the designers' feedback on Facebook; made modifications based on the feedback; performed research and exploration; and also consulted the tutor. Some students (case study B) received support from their own personal and professional network which was found to be more relevant to the context of their design: a design for children.

Alley: "We did lots of exploration and searching. For example, we referred to http://www.colorblender.com/ and many other website templates."

Emma: "...at the same time, we also take designers' comments seriously. Every modification to the design is made based on designers' comments and by consulting our tutor."

[Case study A: group interview: group 2]

Dane: "After uploading our first design, we received comments from the designers. We analysed those comments and decided to work on certain areas such as correcting the size of the design and making extra references on some samples of the website. We did have some disagreements with the designers' feedback. For example, we found our choice of image suitable although the designers found it otherwise. The designer insisted that we change our animated image to a real photo but we decided not to because based on our research, there are a number of websites with a similar context using animated images."

Zelda: "We did seek advice from a friend who is a designer. Not just any designer but one who specialises in children's design..."

[Case study B: group interview: group 3]

Kate: "After both designs at phase one and two had been criticised terribly by the designers, we decided to seek help from the tutor where we arranged for a number of face-to-face meetings with the tutor... We did not receive much feedback after our third design but we were advised to keep on making improvement by the designers and the tutor."

[Case study C: group interview: group 4]

Jade: "When we received comments from the designers on our first design, we cautiously made changes, and before proceeding to upload the next design we sought a second opinion from the tutor."

[Case study D: group interview: group 5]

Students experienced learning of a different nature to what they had been used to. I have already explained the previous course structure of courseware and web-based multimedia design in section 1.2.1. I refer to the previous course structure as a Virtual Learning Environment (VLE) based course. This is because e-learning was used in the previous course to supplement traditional face-to-face classroom activities between a tutor and students (Weller, 2007). Students were expected to submit their design at the end of the course, meaning students had to submit only one design at the end of the course and their design was judged by a single tutor. As part of the task requirement, their objective (objective 1) was to produce and submit a design based on what they had learnt from the course.

The new course structure of courseware and web-based multimedia design in this study on the other hand, ventured more into dynamic and social activities where Facebook was employed alongside with the face-to-face approach. I refer to the new course structure as the Facebook-based course. In the Facebook-based course, students were required to submit three designs and had to collaborate with a community of designers as well as the tutor and their peers. Students were found to analyse the feedback given to them by the designers and the tutor (all case studies). They also carried out exploration and searching (case study A), and sought additional advice from their own personal and professional network (case study B). The learning objective was no longer only about submitting a design but about getting the design accepted by the community involved in the collaboration (objective 2).

Figure 5.2 illustrates a 3rd generation activity system comparing the learning environment between the old and new courses: that is between VLE-based and Facebook-based courses.

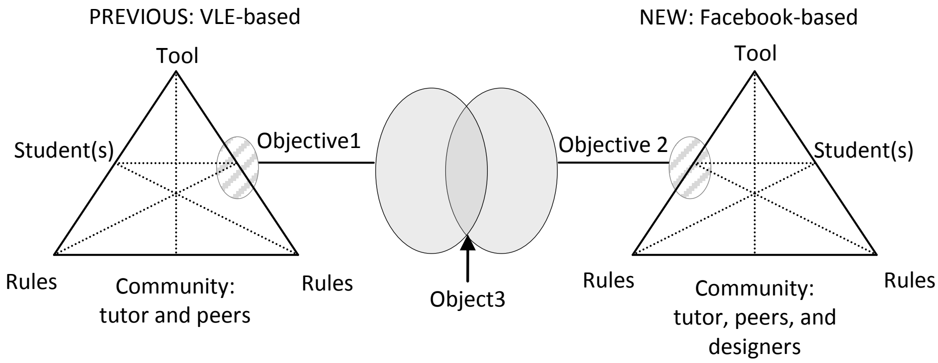


Figure 5.2: Difference between the learning environments for the old and new courses

The nature of the learning experience in the Facebook-based course is more socially constructed compared to the previous learning, as students were required to expand their social interactions with not only the community of learners but also with design practitioners. Their understanding of the creative design of websites or courseware was influenced by the community practices and was shaped by others' actions and feedback. In other words, the objective of the activity has transformed from developing a design understanding and outcome based on the course requirements (objective 1) to developing a design understanding and outcome based not only on course requirements but also communities' demands and expectations (objective 2). I discuss objective 3 - which emphasised the socio-cultural process of creativity - in section 6.6 while answering the research question of 3.1.

(5.1.2.3) Activity system analysis for research question 2:

What are the contradictions caused by this new pedagogic approach?

Data for this section is that revealed by the initial analysis (see section 5.1.1.2; Sub-theme 2.1, 2.2 and 2.3). There were three contradictions found in this study related to the different nature of feedback for confrontation, different feedback timing, and complication in the establishment of practitioners' feedback. Students emphasised the designers' feedback for confrontation which they described as out of the ordinary. Students expressed that they felt uneasy with the designers' feedback for confrontation at the beginning, but as the collaboration progressed they felt more at ease. They also felt that feedback for confrontation should be delivered at the final stage not at the beginning. Nonetheless, students found that the designers' feedback for confrontation useful, although the feedback was delivered in a harsh manner. A group of students in case study B chose not to fully acknowledge designers' feedback as they felt that most of the feedback was not relevant to their design motive.

Activity Theory sees contradictions as sources of learning and development (Engeström, 1987) therefore it is important to identify contradictions that occurred in this study. All of the case studies described feedback for confrontation - the tool - as the primary contradiction (I). They were shocked at the beginning of the collaboration and felt the feedback for confrontation was delivered in a very harsh manner. The secondary contradiction (II) was related to the timing of the feedback for confrontation - the rule. Critical reflection such as feedback for confrontation is commonly delivered as early as possible in a studio-based assessment and has become part of the practice (see section 2.4). Although the majority of the students acknowledged the value of feedback for confrontation, they were not used to receiving feedback for confrontation at the beginning of learning and instead felt that feedback for confrontation should be delivered towards the end of the collaboration. Tertiary contradiction (III) was related to the rule of the activity (implementation of CASA4SBL pedagogy model) which implied that students are expected to make use of designers' feedback through the process of scaffolding. However, students in case study B did not view designers' feedback as being from an authoritative source.

Figure 5.3 indicates three contradictions (I, II, and III) that occurred within the activity system.

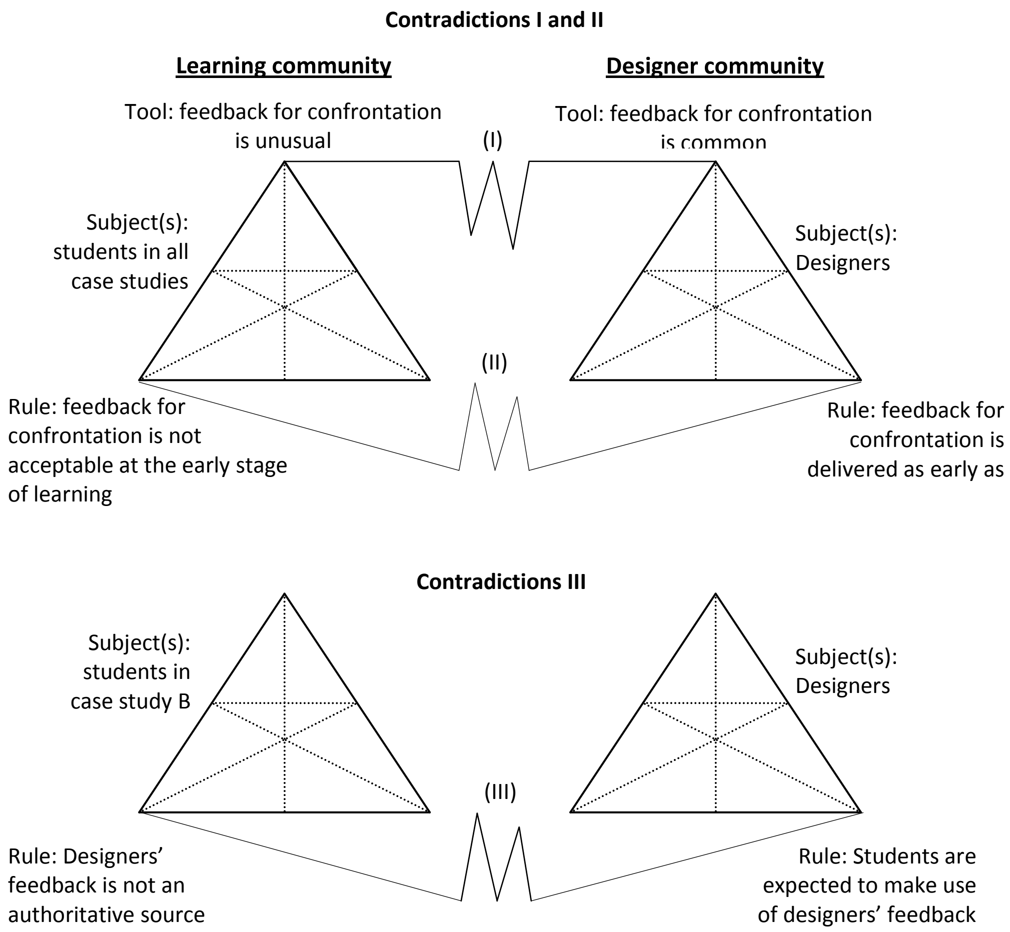


Figure 5.3: Contradictions in the Facebook-based course activity system

The three contradictions occurred due to the adaptation of a new approach in feedback delivery by designers; the approach used by designers collided with the students' previous way of learning and this caused conflicts (Engeström, 2001). Students struggled to understand and accept the new style of feedback for confrontation at the early stage of learning and for one case (case study B), the contradictions caused students to change the activity: students in case study B sought help from another community instead of relying on the existing online community of tutor, peers and designers. All three contradictions (I, II and III) as showed in figure 5.3 have affected students and managed to somehow facilitate change (Nardi, 1996) in their learning activity. I describe these responses to the contradictions next.

(5.1.2.4) Activity system analysis for research question 2.1:

How did the students respond to the contradictions?

I have previously explained in the initial analysis that students were emotionally and cognitively affected by the feedback for confrontation (see sub-theme 3.1). In this substantive analysis, I describe how students' respond in more detail based on the four case studies. The delivery of feedback percentages in every case study is also presented in table 5.4 (see also Appendix G).

Table 5.4: Percentage of style of feedback delivered in each case study and in total

Case study	Feedback for confrontation	Feedback for reflection	Feedback for empathy
Case study A	5%	74%	21%
Case study B	5%	68%	27%
Case study C	19%	62%	19%
Case study D	2%	45%	53%
Total	7.75%	62.25%	30%

Students in all four case studies had similar responses at the beginning of collaboration. They expressed their groups' experience of collaborating with the designers as unpleasant at the beginning, but they were able to accept designers' feedback for confrontation as the collaboration progressed. The contradictions of I, II and III (see figure 5.3) had affected their learning objectives for case study A, C, and D; and transformed students into self-directed learners for case study B. I describe this further by referring to each case study.

Group 2 in case study A received 21% feedback for empathy, 74% feedback for reflection and 5% feedback for confrontation (see table 5.4). They were shocked and thinking the comments were unpleasant. Their intention to get good grades had changed to wanting to produce an appropriate design that could make them feel satisfied. They also wanted their group to become one of the best groups.

Emma: "They were not using formal language. We prefer an informal type of communication; besides, the designers speak from their hearts and they were being honest. We feel closer to the designers after some time, but not at the beginning, we were shocked at their harsh comments!"

[Case study A: group interview: group 2]

Jane: "We were sad at first but then determined to prove to the designers that we can do it!"

[Case study A: group interview: group 2]

Arial: "It is more about self-satisfaction than marks."

Jane: "We just want to apply our knowledge properly to the design."

Alley: "We want to compete with other groups and become one of the best!"

[Case study A: group interview: group 2]

Group 3 in case study B received 5% feedback for confrontation, 27% feedback for empathy, and 68% feedback for reflection (see table 5.4). Due to the contradictions (I, II and III), late responses from designers and having difficulties in understanding some feedback given by the designers, group 3 became very self-directed with their learning. They decided to deal with the design problem themselves. Students in case study B chose to refer to another designer who acted as a critical friend. In contrast to other case studies, group 3 in case study B confessed that they had a clear objective from the beginning: getting good grades. Their objective never changed.

Flora: "Sometimes designers did not give prompt feedback and it worries us as this task has deadlines."

Dane: "Comments given by the designers were sometimes hard to understand. Although we have discussed with them several times, we still find it hard to compute."

Flora: "When this happened, we ended up discussing amongst ourselves and decided to follow our own way by referring to significant references."

[Case study B: group interview: group 3]

Zelda: "We did seek advice from a friend who is a designer. Not just any designer but one who specialises in children's design. We are aware that every designer has a different style of design. Some are minimalist, futuristic, Windows Vista kind of look [laugh], but we wanted to make sure that we referred to the right one."

Dane: "It is important to refer to the right people who can advise us on children's design."

[Case study B: group interview: group 3]

Flora: "To be honest, it is because of marks. It has nothing to do with trying to be the best or being afraid of becoming the worst."

Dane: "We were not concerned about competing with others but more with aiming for good marks."

[Case study B: group interview: group 3]

Group 4 in case study C received 19% of feedback for empathy, 62% of feedback for reflection and 19% of feedback for confrontation (see table 5.4). In reality, there should be a higher percentage of feedback for confrontation delivered to group 4 than is shown in table 5.4.

Unfortunately during the collaboration, group 4 deleted an amount of data containing feedback for confrontation posted on their first design on Facebook. I was not able to obtain access to this data. When asked the reason for their action, group 4 explained that they were shocked and ashamed of receiving harsh feedback from designers on their first design thus they decided to delete the related post. Group 4 describes the designers' feedback as valuable as well as terrifying. Not only did they feel miserable and anxious due to receiving feedback for confrontation, they also became more careful in producing their design. Group 4, however, continuously changed the look of their design (see figure 5.4). As a result, there was no consistency in their three designs, as shown in figure 5.4: they produced an entirely different design at every phase of submission. When asked further about the inconsistency of their design, group 4 explained that they faced many difficulties in finding the right image for their design and when none of their efforts were appreciated, they determined to change the whole design layout. Another reason for doing so as explained by one of the group members (Nancy) was because they were trying to avoid getting more feedback for confrontation. Similar to case study A, the contradictions affected group 4's objective. Group 4 had less concern about getting good grades but they wanted to make improvements with their design.

Nancy: “The comments and critiques posted by designers had a deep impact on us…The designers’ critiques were actually valuable but at the same time we found them terrifying. Because of those harsh critiques, we felt miserable and decided to change the whole concept of the design. This was because we were trying to avoid getting more harsh critique.”

Kate: “We became anxious about getting feedback and started being extremely careful with any action taken…”

[Case study C: group interview: group 4]

Design 1

Design 2

Design 3

Figure 5.4: Designs produced by group 4

Kate: “We had many problems with choosing images for our design. We failed to find images that reflect Malaysian school students, our target audience. We then decided to take our own photos but they were not good.”

Irene: “After all the effort made and not getting any satisfying feedback, we determined to change our design to what you have seen.”

[Case study C: group interview: group 4]

Nancy: “Frankly it is not about marks, but we were hoping to make an improvement. We hoped to produce an ‘up to standard design’ at the end of the collaboration. There is no such thing as trying to be the best but we sure do not want to become the worst! [Laugh]”

Kate: “We wanted to show everyone that we can produce an acceptable design despite being criticised badly.”

Irene: “We did not consider marks at all. It was more about improving ourselves.”

[Case study C: group interview: group 4]

Group 5 received 53% feedback for empathy, 45% feedback for reflection and only 2% feedback for confrontation (see table 5.4). Group 5 stated that they did not have a problem communicating with the designers. They accepted feedback for confrontation as a common language used for criticism. This group was fond of the designers' informal language, where the informality allowed them to become bold in expressing their opinions. They also said that the designers' feedback contained facts, although sounded ruthless. Their team member, Jade further explained the importance of the designers' feedback. She defined the feedback as 'free consultation' to assist improvement. Jade was open to the idea of receiving help from 'outsiders' in making changes: 'outsiders' refer to those from outside the educational institution; in this case, the designers. Similar to other case studies A and C, Jade admitted that their objective was focussed more on producing an appropriate design for their target audience. There was less concern about getting good grades.

Jade: "We like it. Since we do not have problems communicating with them, we find their language is acceptable. Besides, that is how criticism works. We prefer informal language. It is friendlier and we feel comfortable having an open discussion… more daring to voice our opinions. There is logic in every comment given by the designers, although it may sound a bit harsh to some students."

[Case study D: group interview: group 5]

Jade: "They are experts in their own field and they were willing to spend time sharing opinions. This is an excellent opportunity for us as we do not have to pay their consultation fee."

[Case study D: Facebook chat with Jade from group 5: 11:44]

Jade: "I have no objection to receiving critiques from these experts...it's for the best. If our own tutor can't change us then let the outsider help us to change [laugh]."

[Case study D: Facebook chat with Jade from group 5: 11:52]

Jade: "To produce a design that is suitable to our target audience."

[Case study D: group interview: group 4]

Students in case study A had to adhere to the new tool (feedback for confrontation) and rule (delivery of immediate feedback for confrontation), this brought difficulties to the students. As a result they had to make some changes to their objective. According to Verenikina (1998), it is possible that the objective might shift as the participants respond to contradictions. The contradictions between subjects-tool (I) and subjects-rule (II) caused students in case study A to shift their objectives to producing an outcome for self-improvement, applying design knowledge appropriately and becoming one of the best groups. Figure 5.5 illustrates how the contradictions (I and II) affected students' objectives in case study A.

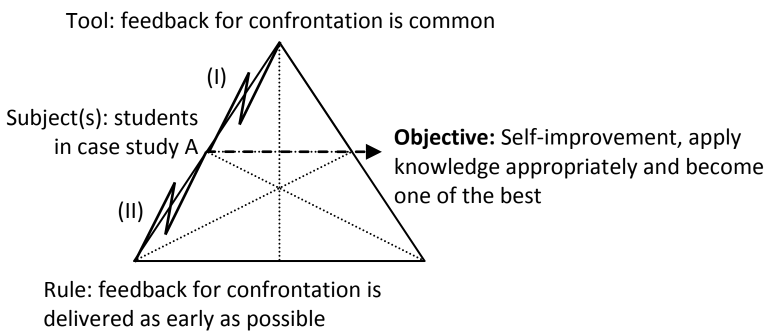


Figure 5.5: The impact of contradictions on case study A

Students in case study B did not seem to agree on the implementation of the new tool and rules. As compared to students in other case studies, students in case study B refused to fully recognise the authority of the designer's feedback. The contradictions between subjects-tool (I), subjects-rules (II and III) caused students to become more self-directed in their production of designs. They chose to mediate their learning by referring to their own personal and professional contact. Figure 5.6 illustrates how the contradictions (I, II and III) affected students' roles in case study B.

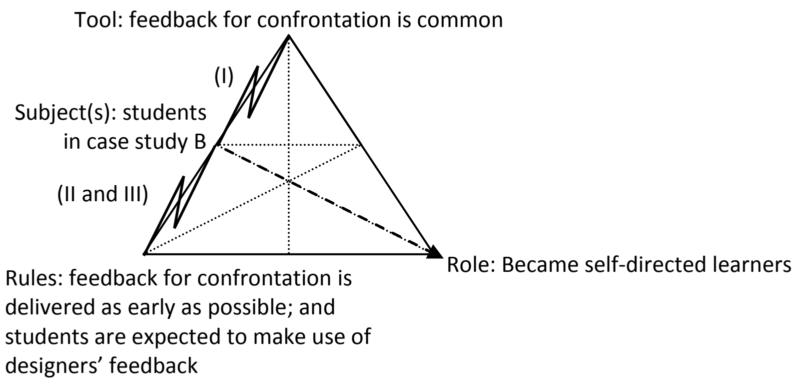


Figure 5.6: The impact of contradictions on case study B

The contradictions (I and II) affected group 4's outcomes in case study C, when no consistency was found in their design. Students' objectives also changed to making self-improvements, producing a design according to the standard and not becoming the worst group. Figure 5.7 illustrates how the contradictions subjects-tool (I) and subjects-rule (II) affected students' objective and outcome in case study C.

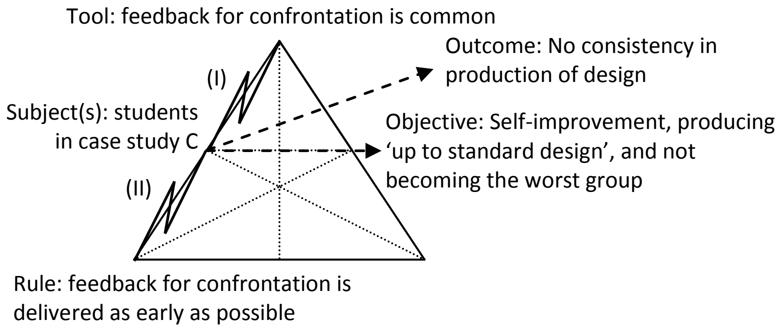


Figure 5.7: The impact of contradictions on case study C

The contradictions (I and II) changed group 5's objectives to producing a purposeful design; and in contrast to case study B, group 5 in Case study D perceived the designers' role as consultants. Figure 5.8 illustrates how the contradictions between subjects-tool (I) and subjects-rule (II) affected students' objectives and perceptions of the designers' roles in case study D.

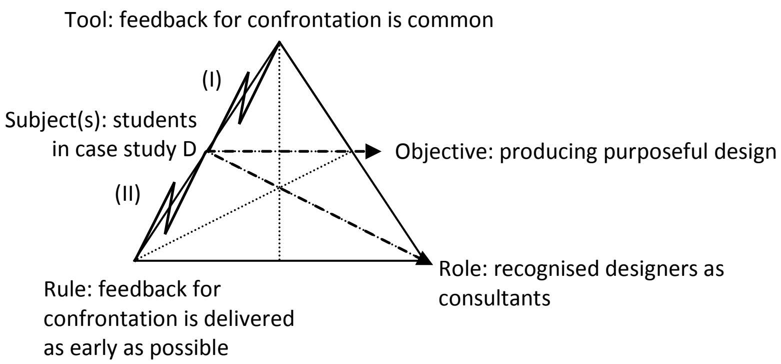


Figure 5.8: The impact of contradictions on case study D

(5.1.2.5) Activity system analysis for research question 2.2:

How were the contradictions reconciled, if at all?

Data for question 2.2 can be located in the initial analysis (see sub-theme 3.2). Every group had its own way of comprehending the contradictions. There were similarities as well as differences in the approaches they used.

The similarities were that the delivery of all three styles of feedback (feedback for confrontation, feedback for reflection, and feedback for empathy) played a part in helping students in all case studies to deal with their disequilibrium. This means that the need for all three styles of feedback is important.

Students in case study A sought face-to-face and online support from their tutor. The tutor's role was seen more as a mediator or a second advisor to them. Students also noticed that designers were taking turns to deliver different styles of feedback. This gave them some comfort. For example, when one designer delivered critiques, another designer made an effort to offer motivation.

Students in case study B gained support from their personal and professional networks. They also utilised their experience gained from previous elective course in design.

Students in case study C sought face-to-face support from the tutor. They learnt to cope with their disequilibrium stage by acknowledging the fact that every group was criticised and received similar treatment from the designers. Students also focused on their objective of producing purposeful designs rather than on their feelings. Towards the end of the collaboration, they learnt to accept confrontation as part of the learning process.

Students in case study D sought support from their tutor for a second opinion. They also utilised their previous experience from practical teaching and also in handling the design software.

Activity Theory incorporates strong notions of mediation as it has important implications for learning (Nardi, 1996). All three styles of feedback (feedback for confrontation, feedback for reflection, and feedback for empathy) have mediated students in all case studies; although feedback for confrontation can be threatening for students, e.g., case study C, it has somehow stimulated students' awareness to produce appropriate design for their target audience. The fact is that all three styles of feedback have conjointly functioned to mediate learning. In addition, students in every case study had their own different as well as similar way of reconciling the contradictions. This is described next.

Students in case study A acknowledged the different roles played by the designers, whom they noticed, were not confrontational all the time. They also sought support from the tutor, whom they recognised as a mediator and second advisor. Figure 5.9 illustrates the approach students in case study A used to reconcile the contradictions.

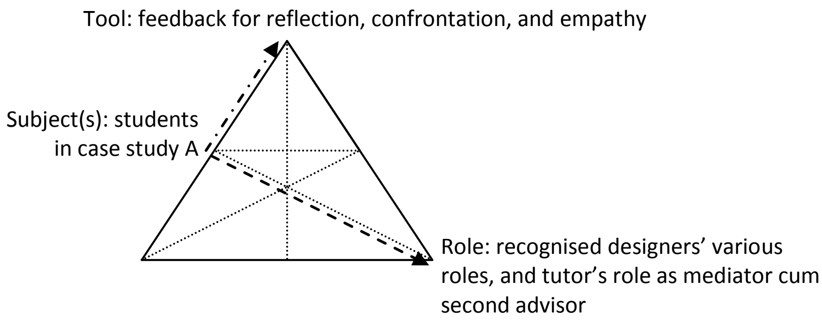


Figure 5.9: Reconciling contradictions in case study A

Case study B gained help from their personal and professional network and also utilised their previous experience. Figure 5.10 illustrates the approach students in case study B used to reconcile the contradictions.

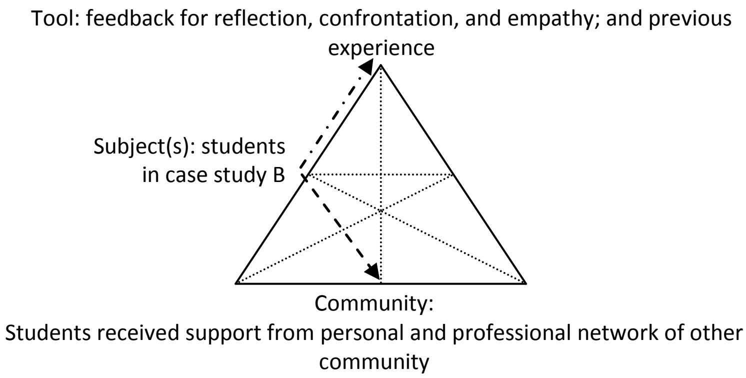


Figure 5.10: Reconciling contradictions in case study B

Case study C used self-coping mechanisms as mediating tool and tutor support to cope with the contradictions. Figure 5.11 illustrates the approach students in case study C used to reconcile the contradictions.

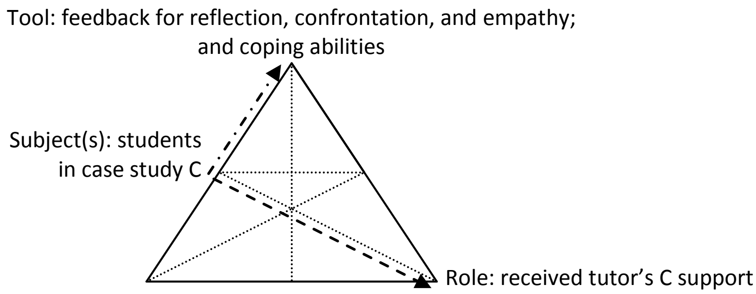


Figure 5.11: Reconciling contradictions in case study C

Students in case study D sought support from the tutor and also used their previous experiences. Figure 5.12 illustrates the approach students in case study D used to reconcile the contradictions.

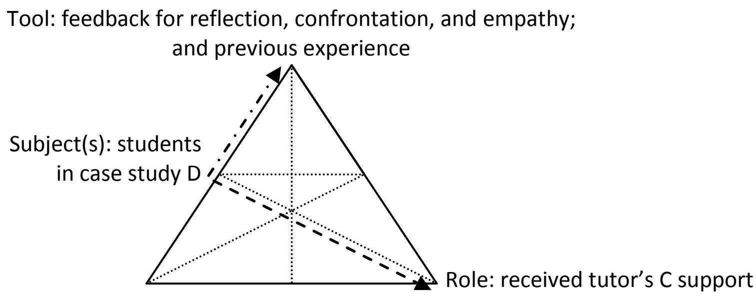


Figure 5.12: Reconciling contradictions in case study D

(5.1.2.6) Activity system analysis for research question 3:

What were the factors within the learning experience that contributed to the development of design creativity?

All four case studies have described feedback (tool) as one of the factors that contributed to the development of their design creativity, as well as three phases of coaching and scaffolding (rule), tutor’s support (role), and designers’ critiques and support (role). As for case study B, support from their own personal and professional network (community) has added to the contribution of their improvement. Data on feedback can be located in the initial analysis (see key theme 3). These were some of the other factors acknowledged by the students:

Students in case study A clarified that Facebook (tool) allowed them to develop knowledge of different practices, in this case the designers' practice. They also found the studio-based assessment procedure (three design submissions) very practical. Students described how the tutor played a role in providing motivation, while emphasising the designers' role in giving feedback for design improvement.

> Emma: "We prefer Facebook to e-learning because it gave us many inputs and let us share knowledge of professional practice in the design industry."
>
> Emma: "We agreed with the three phases of assessment which were very helpful. We used the first stage to get to know everyone and at that stage, we critically constructed our idea."
>
> [Case study A: group interview: group 2]
>
> Alley: "The tutor has helped us more by giving motivation. After receiving feedback from designers, we modified our design and then consulted with the tutor face-to-face and online before continuing to upload the next design."
>
> Arial: "I think opinions given by others play an important role. The designers mostly gave us lots of feedback for design improvement."
>
> [Case study A: group interview: group 2]

Students in case study B described the tutor's role as the person who reminded the students of deadlines and who taught the theoretical aspects of design. The designers' role, on the other hand, was recognised as the experts in design. Students clarified that they sought advice from their designer friend, an expert in children's design. They added that they also referred to samples of designs which targeted a similar audience.

Zelda: "The tutor acted more like a reminder to us. For example, the tutor constantly reminded us to complete our designs and upload them on time. We do need this kind of reminder. The tutor delivered the theory part of design teaching while the designers helped in the development of the designs. The designers looked into our designs more critically."

[Case study B: group interview: group 3]

Zelda: "We referred to our designer friend who specialises in children's design."

Dane: "It is important to refer to the right people who can advise us on children's design."

Nicole: "We also referred to a sample of designs which related to our target audience, secondary students."

[Case study B: group interview: group 3]

Students in case study C mentioned that they referred to samples of design templates. Students explained that the tutor had assisted their group by making unclear feedback delivered by the designers understandable. This was done face-to-face. Students acknowledged the value of the designers' feedback and also the designers' role as critics. The tutor's role was perceived to be as a mediator.

Kate: "We referred to a number of existing design templates."

[Case study C: group interview: group 4]

Nancy: "Although we received lots of comments from the designers, we still found the tutor helped us the most because we were be able to communicate face-to-face. The tutor helped clarify any unclear feedback delivered by the designers. We were given clear examples."

[Case study C: group interview: group 4]

Kate: "After both designs at phase one and two were criticised terribly by the designers, we decided to seek help from the tutor and we arranged for a number of face-to-face meetings with the tutor."

Kate: "Although harsh, the designers' feedback actually made lots of sense."

[Case study C: group interview: group 4]

Students in case study D clarified the designers' role in providing design information. They also used samples of educational courseware as references. Students recognised the three phases of coaching and scaffolding during the design process as useful as they gave room for improvement.

Zea: "Designers have helped us the most in making improvement."

Jade: "The designers point out areas that need improvement. Designer L gave us a step-by-step explanation and we looked into it passionately. For the rest, we made a number of references to samples of educational courseware."

[Case study D: group interview: group 5]

Zea: "We are very pleased with the three phases of assessment. We were given a chance to improve."

[Case study D: group interview: group 5]

For all case studies the feedback (tool) and the three phases of coaching and scaffolding (rule) were factors that contributed to the development of their design creativity. The three phases of coaching and scaffolding are part of the CASA4SBL components, structured to intensify the reflection process between tutors, peers and designers (see section 3.2.4). In addition, every case was influenced by other factors that also play a role. Students used more than one type of tool, role and even community to accomplish activities.

For case study A, Facebook as the tool and the role played by tutor and designers were the other factors that contributed to their creativity development. Students were amazed with the thought of using Facebook to achieve practitioners' participation in learning. Their perception of Facebook as a typical social networking tool to make friends changed. Figure 5.13 shows the factors within the activity system that contributed to the development of creativity for case study A.

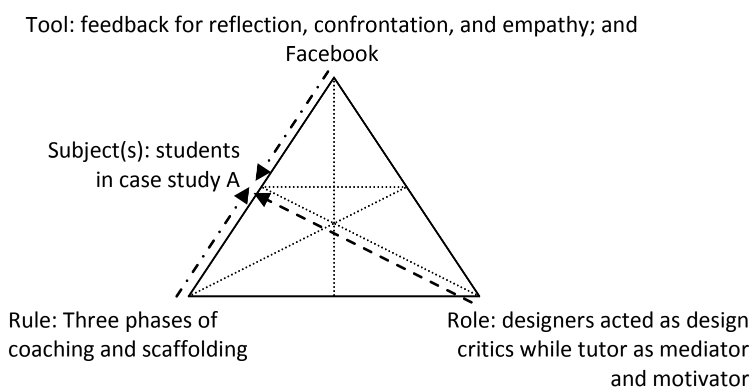


Figure 5.13: Factors that contributed to the development of creativity for case study A

Students in case study B referred to samples of designs as tools to help develop their understanding. They sought advice from another designer with whom they had personal and professional connections (community). They also recognised the different role of designers and the tutor in helping them improve. Figure 5.14 shows the factors within the activity system that contributed to the development of creativity for case study B.

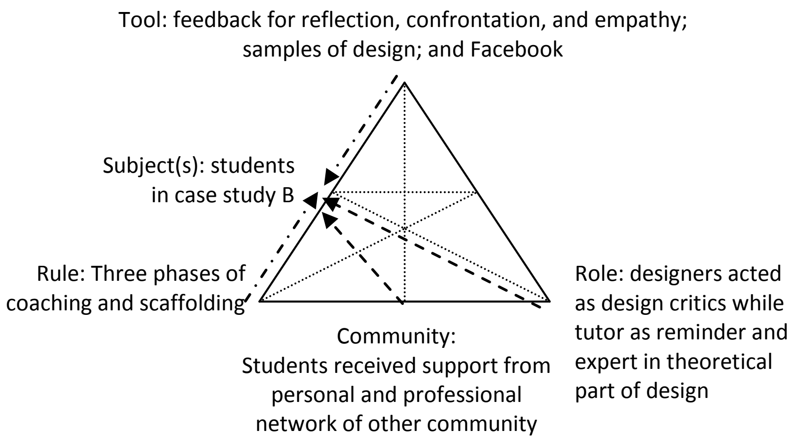


Figure 5.14: Factors that contributed to the development of creativity for case study B

Students in case study C used samples of designs as tools, and acknowledged the designers' and the tutor's roles in helping them improve. Figure 5.15 shows the factors within the activity system that contributed to the development of creativity for case study C.

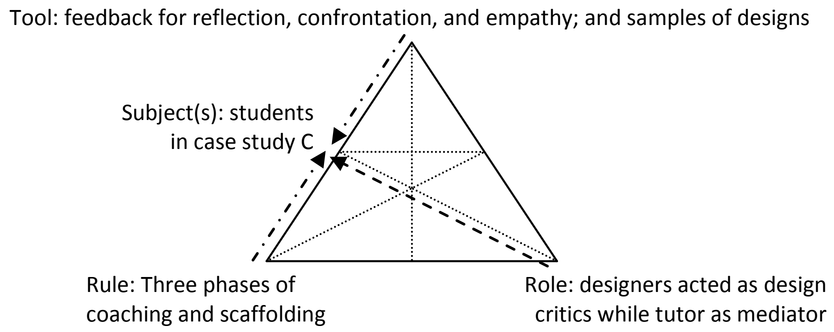


Figure 5.15: Factors that contributed to the development of creativity for case study C

Students in case study D acknowledged the designers' role as information providers; and they used samples of educational courseware as tools. Figure 5.16 shows the factors within the activity system that contributed to the development of creativity for case study D.

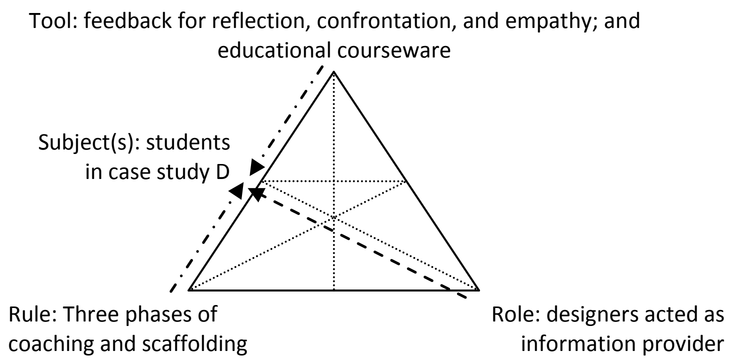


Figure 5.16: Factors that contributed to the development of creativity for case study D

(5.1.2.7) Activity system analysis for research question 3.1:

How did the factors support students to develop an understanding of effective website or courseware design?

Students in case study A found Facebook a tool that connected learning to professional practices in the design industry. Students were exposed to the designers' way of working and this helped them develop knowledge of different professional practices and settings.

> Emma: "We prefer Facebook to e-learning because it gave us many inputs and let us share knowledge of professional practice in the design industry."
>
> [Case study A: group interview: group 2]

Students in case study B clarified that making connections with a community other than the designers and the tutor made her group more independent in their learning. The association also helped increase awareness of different styles of design used by individual designers.

> Zelda: "We did seek advice from a friend who is a designer. Not just any type of designer but one who is involved with children's design. We are aware that every designer has a different style. Some are minimalist, futuristic, Windows Vista kinds of look [laugh], but we wanted to make sure that we referred to the right one"
>
> [Case study B: group interview: group 3]

According to students in case study C, the collaboration increased students' awareness of how to produce designs with a purpose and focus. Students also described that they learned to refine their composition of designs.

> Nancy: "Students will normally produce a design without considering its purpose for its real target audience – more about self-pleasing. But with this collaboration, we became more alert. We learned to relate every element in our design to target audience."

Kate: “Although there was no consistency in our design throughout the process, we have learned to produce a neat design and know how to avoid messy layouts.”

[Case study C: group interview: group 4]

Students in case study D stated that their group became focused on producing the design when focusing on only referring to resources that related to their design brief. They added that referring to the right samples of designs helped eliminate confusion.

Jade: “We are more focused than before and we only refer to resources that relate to our target audience.”

Zea: “We looked at a number of examples of courseware for our precise target audience (primary one)...we would advise groups with problems to have more focus. Referring to excessive unrelated designs will only lead to more confusion.”

[Case study D: group interview: group 5]

The factors outlined earlier transformed the students’ outcome for design learning. According to Nardi (1996) the outcome can be another activity or artefact. In this study, the outcomes varied for the students in every case study. Students in case study A described that they managed to develop knowledge of different professional practices, and their understanding of effective websites or courseware was influenced by the exposure to this practice. Figure 5.17 shows how the factors supported students to develop an understanding of effective website or courseware design for case study A.

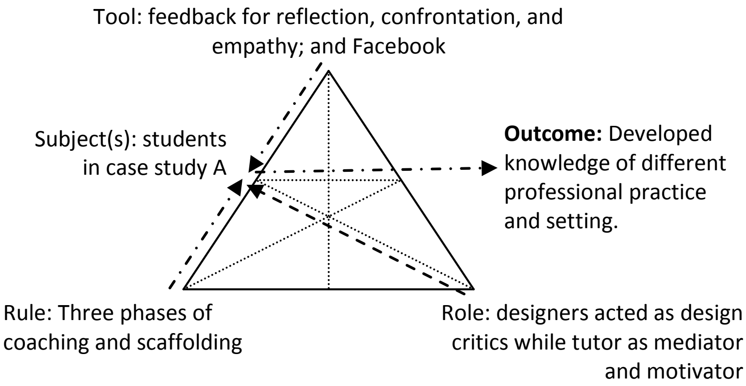


Figure 5.17: Students' understanding of the development of an effective website or courseware for case study A

Students in case study B thought that connection with other community members helped increase their awareness of different styles of design. They realised that the style of design influenced the production of an effective website or courseware. Figure 5.18 shows how the factors supported students to develop an understanding of effective website or courseware design for case study B.

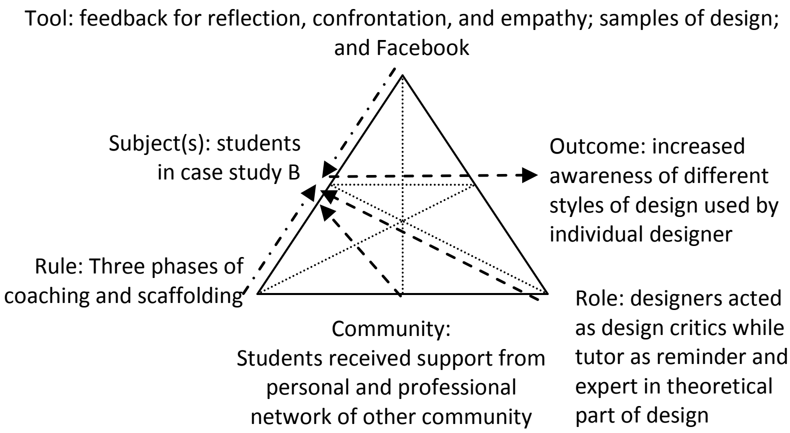


Figure 5.18: Students' understanding of the development of an effective website or courseware for case study B

Students in case study C stated that the factors made them realise the importance of producing a design that was purposeful and which focused on the target audience. Figure 5.19 shows how the factors supported students to develop an understanding of effective website or courseware design for case study C.

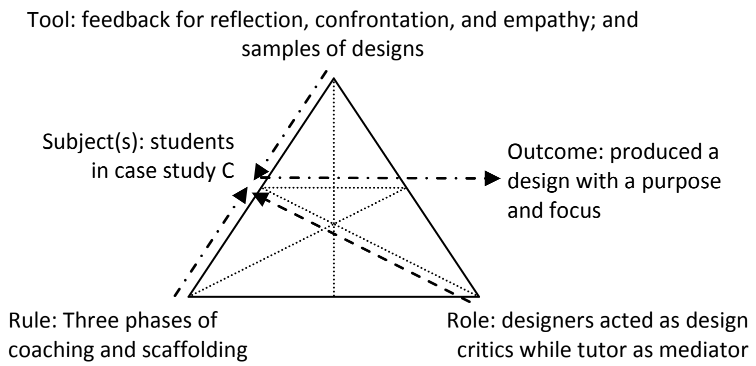


Figure 5.19: Students' understanding of the development of an effective website or courseware for case study C

Students in case study D identified that effective design could be achieved by referring to the right samples of design and emphasising the right target audience. Figure 5.20 shows how the factors supported students to develop an understanding of effective website or courseware design for case study D.

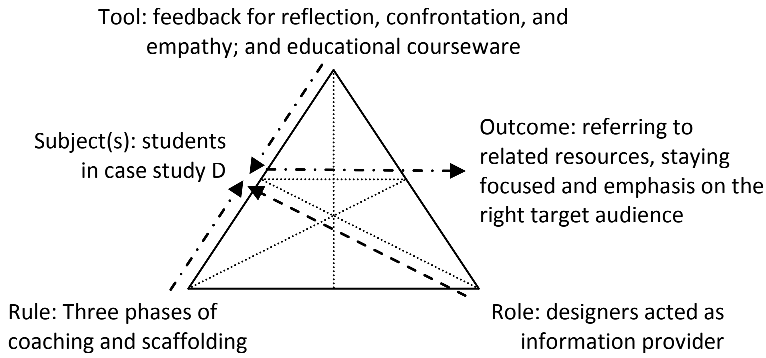


Figure 5.20: Students' understanding of the development of an effective website or courseware for case study D

(5.2) Summary

In this chapter I have explained the method of analysis (thematic, comprehensive data treatment and activity system) and the phases of analysis (initial and substantive) involved in this study. I have also described how the initial and substantive phases of analysis were connected to each other in obtaining answers to the research questions. An Activity framework applied to four case studies was used to answer each research question. In summary, the analysis of this study has identified contradictions that occurred as a result of the implementation of new components (rule, role, communities and tool) in an activity system of design learning among student teachers. Activity Theory facilitated the understanding of how students were affected by the contradictions and how they reconciled them. The contradictions brought about some benefits and also drawbacks to the development of students' understanding of website and courseware design. The contradictions identified were feedback for confrontation, the timing of the feedback for confrontation, and the establishment of designers' feedback as being from an authoritative source.

I will further discuss the impact of these contradictions on students' design learning experiences in the next chapter, Chapter Six. In addition, I will also discuss in greater depth the answers to each research question and look at the relationship between the findings and the literature.

Chapter Six: Discussion of findings

(6.0) Chapter overview

I discuss the findings in this chapter according to themes. Every theme is associated with a research question. I will discuss the extent to which the themes illuminate the questions raised in this study. I also aim to look at the relationship between the findings of the study and the literature, identifying if the findings support the literature, whether they raise new questions in relation to the literature and whether the research uncovers phenomena not explored in the literature.

(6.1) Social creativity: extending beyond the boundaries of semester-based classes

Research question 1: What was the nature of the learning experience and how did this promote understanding of the creative design of websites or courseware?

The findings in Chapter Five described that the nature of the learning experience in this study was dynamic and constructed in a social manner. Design knowledge was first developed in a social context and was then appropriated by students in each group. Students in all case studies examined the feedback delivered by the tutor, peers and designers throughout the design process. However, as opposed to case studies A, C and D; students in case study B somewhat extended their learning through support from their own personal and professional network. Interactions from inside and outside the classrooms have proven to have an impact on students' learning. This complements the study of West and Hannafin (2010) emphasising that wider collaboration has the potential to enhance the reported experience of learning (see section 2.4.2). The findings of this study also emphasised the importance of language as a tool (Vygotsky 1962, 1978) in developing creativity.

Students reported that as compared to previous learning (VLE-based), the new learning (Facebook-based) with the integration of the CASA4SBL (Cognitive apprenticeship and social apprenticeship for studio-based learning) pedagogical approach (see section 3.2.4) promoted wider social understanding of the creative design of websites and courseware. Meaning, although situated in the context of a university course, students' understanding of design extended beyond the boundaries of semester-based classes. Through participation in the Facebook exchanges with the design practitioners, students learnt to include a sense of community into their learning where they negotiated and constructed the meaning of creative design in relation to the design practitioners' expectations who also represented the wider consumer.

Through the process of negotiation with the communities of learners and practitioners, students expanded what they knew and were able to do, as well as learning from others' actions and feedback. The growth of their design knowledge is represented not only in the production of their design but also in the shared values, relationships, networks and knowledge produced when interacting with others from communities of learners and practitioners (see section 5.1.2.6, figures 5.13 - 5.16 and figures 5.17 -

5.20). A community of practice (Wenger, 1998) contributed to the negotiation of new views that promoted an understanding of the creative design of websites and courseware. Students were able to experience and responded to the norms, behaviours, skills, beliefs, language and attitudes of the practitioners (Lave and Wenger, 1991; Rogoff, 1990). The findings in Chapter Five describe the value of social creativity: the students' sense of creativity was enhanced through interactions with social groups/communities (Csikszentmihalyi and Wolfe, 2000; Fischer, 2004). Nonetheless, there were some issues with this learning approach which had a negative impact, particularly on students in case study C: I discuss this further in section 6.3 in answering research question 2.1.

(6.2) The collision of two communities: feedback practice, timing, and qualification

Research question 2: What were the contradictions caused by this new pedagogic approach?

There occurred three categories of contradiction (contradictions I, II and III). Contradiction I represents feedback for confrontation delivered by designers, while contradiction II is the result of the timing of the feedback for confrontation. Another contradiction (contradiction III) was found for students in case study B that related to the establishment of designers' feedback as being from an authoritative source. In Activity Theory terms, contradiction occurred when a new practice, in this case Facebook-based learning was introduced into the students' activity system that clashed with an old element (Murphy and Manzanares, 2008b). I now discuss these three contradictions.

Students emphasised feedback for confrontation (contradiction I) although the percentages of feedback for confrontation delivered were lower than feedback for reflection and feedback for empathy put together - 7.75% of feedback for confrontation; 62.25% of feedback for reflection; and 30% of feedback for empathy (see table 5.4). Students emphasised feedback for confrontation more than feedback for reflection and feedback for empathy due to its unfamiliar attributes: the feedback for confrontation used by the three designers (A, L and F) was direct, filled with emotions and lacked empathy. Students had never encountered such feedback in their previous learning.

In section 2.3 of Chapter Two, I discussed the nature of the designers' interactions. Their interactions involved critical reflection which ranged from casual comments to formal critiques (Oak, 2000). Lawson (1997) describes the fact that designers adopt character roles while discussing design ideas: the roles of leader, clown, critic, lawyer and dunce. Feedback for confrontation identified in the findings of this study has revealed the nature of interactions played by the role of a lawyer, also known as the devil's advocate (Nemeth, et al., 2001; Nemeth, et al., 2003). Louro et al. (2007) explain that the role of a lawyer helps eliminate bias, makes designers question their own judgements more critically, help them discover and explore alternative ideas and reframe design problems. Although students in all case studies described the designers' feedback for confrontation as harsh, they mentioned that useful messages were contained in the feedback. Tutors A and B even described designers' feedback for confrontation as a real life lesson for students to get exposure to the world of work. This indicates that the designers' feedback was not entirely negative (Stahl, 2006).

Unlike previous research, I chose not to classify the feedback for confrontation as negative or positive (Guzzo et al., 1986; Pino and Edwin, 2003), or constructive or destructive (Baron, 1988; Baron, 1990; London, 1995) because the feedback could potentially function as both: more elaboration on this is given in section 6.3. Due to this I decided to borrow the term 'confrontation' from clinical psychology studies (Knight, 1966) to replace the word 'negative'. Knight suggests that confrontation helps increase an individuals' self-consciousness which can be generated by an inner desire (internal force) or an external challenge. Knight adds that confrontation brings an individuals' emotional assimilation to a more professional level. The shock of the confrontation can 'cause a state of disequilibrium that results in the construction of new knowledge in order to reach a state of equilibrium again' (Gijlers, 2005, p. 10). Confrontation has been accepted as a form of social support and feedback (Miller et al., 1993; Polcin, 2003). Confrontation used in defeating substance abuse is defined as an individual being told about the terrible impact affecting them if they do not make changes (Polcin, 2003; Polcin et al., 2006). A similar approach was used by designers in my study to create awareness about the importance of design to students in higher education. Students were challenged to develop their interests, abilities, and make design improvements.

As for the contradiction with the timing of the feedback for confrontation (contradiction II), students were again not familiar with the idea of receiving critique at the early stages of learning. A studio-based learning (SBL) approach was applied in this study and the approach is not common in the School of Education courses, but has been successfully used to teach skills in art, design and architecture education for over a hundred years (Agrawal and Hundhausen, 2008). However, students in the School of Education are more familiar with problem-based learning (PBL) which originated from medical schools (Savin-Baden and Major, 2004).

> PBL and SBL are similar in that they both are case driven; both require a master-apprentice relationship between teacher and learner; both entice learners to lead their own inquiry; and both allow for a proposal, critique, iterate again procedure before adequate solutions can be offered. As generally practiced, however, significant differences in PBL and SBL centre around the places where learning occurs; the iteration timeframe; and the nature of the propose-critique-iterate-process.PBL functions in much the same way as SBL but with fewer and less frequent instances of proposal making and critique – the key difference is that while early and multiple iterations by students are possible with PBL, they are necessary in SBL. (Burroughs, et al., 2009, pp. 3-4)

Similar to the model of professional practice (see section 2.4), critique in studio-based learning is delivered as early as possible to minimise design flaws; however the procedure was not favoured by the education students in this study. Students thought that feedback for confrontation should only be delivered towards the end of learning. Designers (particularly A and B) however felt the procedure was appropriate and, according to them; the designers themselves had been trained and were exposed to the same model of education ever since design school. The designers believed the prompt delivery of feedback for confrontation could provoke change in attitude where students can be encouraged to work harder, and became more focus and vigilant in producing purposeful design.

Critiques/complaints have become part of design practice in the creative industries (Dormann and Zapf, 2004) and are commonly found in studio-based learning (see section 2.4). Designers use feedback for confrontation to focus on identifying the flaws and strengths of a design (Kasof, et al., 2007) and to reach the expectations of their target customer (Bevan, 2005). As the saying goes 'it's not creative unless it sells'; this is a common expression used by designers which can also be used to reflect the gap between education and the creative industries. This means that, compared to students who have to deal with task completion, designers in the creative industries have to work closely with the client and strive to satisfy them (Cross, 2008) in order to gain recognition. This explains why feedback for confrontation is more accepted by the community of designers than by the student teachers in the School of Education. Furthermore, the accepted academic position in higher education is that feedback to students should always be constructive, kind and helpful (Edmondson, 1999; Flowerdew, 1998; Montuori and Purser, 1999; Schein, 1993; Wiley, 1998). Confrontational feedback can appear, but in summative assessment which takes place upon completion of the learning activities (Barnett, 2007). Within university culture, formative feedback is generally structured to be supportive and constructive (Irons, 2008). Formative feedback is the type of feedback that is continuously carried out as the learning activities progress (Inoue, 2005). Contradiction II arose when students received formative feedback that uses confrontational at the very beginning of collaboration.

There has been a large amount of research on the timing of feedback that focuses on immediate and delayed feedback. The results in the literature however are conflicting and show no consistency. Some researchers (Corbett and Anderson, 2001; Dihoff et al., 2003) have argued that immediate feedback is more effective than delayed feedback, while some others (Schroth, 1992) reveal the situation to be more complex. These researchers claim that delayed feedback was found beneficial if the task is easy but if the task is difficult, immediate feedback may be preferable. Other researchers (Mathan and Koedinger, 2002; Narciss and Huth, 2004) argue that the effectiveness of feedback is not supposed to rely only on its timing but also the other aspects such as the nature of the feedback, the task, and the learner's capability. These aspects can potentially cause either positive or negative effects on learning (Shute, 2008). In agreement with the researchers (Mathan and Koedinger, 2002; Narciss and Huth, 2004; Shute, 2008), this study has shown that immediate feedback can caused disequilibrium that has the potential to support learning but can also lead to a negative effect if not properly managed. It seems important to receive immediate feedback on comprehension of the design task; yet immediate feedback that is confrontational in nature was not in favoured by the student teachers.

Figure 6.1 summarises and illustrates the contradictions in feedback practice that occurred between the communities in the School of Education and the creative industries.

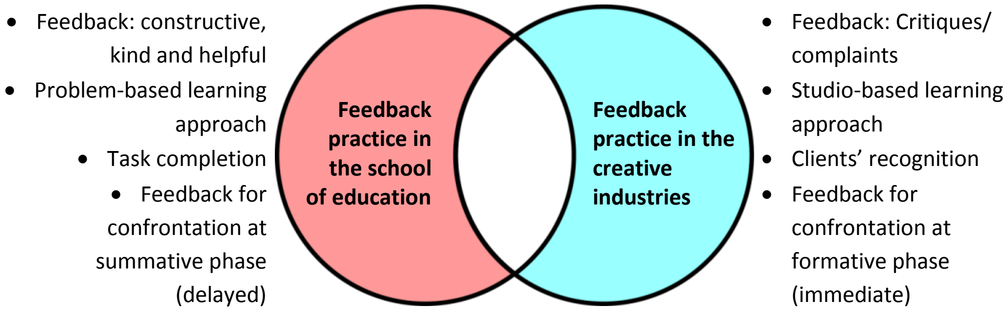


Figure 6.1: Gap in feedback practice

As for the tertiary contradiction III, students in case study B emphasise the issue of establishing the designers' feedback as being from an authoritative source: a source that 'dominates, that holds weight' (Millard and Kingfisher, 1998, p. 450). Students in case study B acknowledged other sources as more authoritative than the designers' feedback, e.g., advice from their friend who was a designer and the use of design samples. Researchers (Zhang et al., 2007) suggest there requires a level of trust or legitimisation for a source to be established as authoritative. The authoritative source has to also be produced and used repeatedly and regularly until it becomes recognised as authoritative (Gee, 1999). In this study, students had more trust in a designer who was a friend to the group than the designers who were assigned to participate in the collaboration as their designer friend had the expertise that the group required: a design for children. This study has indicated that just because other students, e.g., in case study A, C and D accepted the designers' feedback as authoritative, it does not mean that this is the case for all, e.g., students in case study B. This also raises the importance of the need to involve designers with a broad range of appropriate skills and also to allow students paths to reach help from other experts.

Although the designers' feedback was not recognised as authoritative by students in case study B, it somehow encouraged them to make the decision to find other sources to solve the design problem. The learning approach and setting that was structured in this study led students in case study B to create an alternative way of knowing. Students should be given the freedom to exercise their own judgements and make their own decisions in order to respond to a changing and challenging world. This will help them become more motivated (Bassey, 2001).

(6.3) The double-edged sword of disequilibrium:

Research question 2.1: How did the students respond to the contradictions?

There was a mixture of responses described by the students. Students were in a state of disequilibrium (shocked, pressured, surprised and sad) at the beginning of the collaboration. Contradictions caused by feedback for confrontation and the timing of the feedback for confrontation affected students' objectives in Case Studies A, C and D. Obtaining good grades was no longer the students' main concern. Their objectives changed from achieving good grades to making improvements, becoming one of the best groups and producing purposeful designs (see section 5.1.2.4, figure 5.5 - 5.8). These changed objectives can be related to the 'hacker ethic' (West and Hannafin, 2010). West and Hannafin describe that students who practice the hacker ethic strive for quality rather than for grades. They insert determination and motivation into an experience (see section 2.4.2). This scenario can also be related to what Deci and Ryan (1995) describe as the shift from introjected regulation to integrated regulation: individuals feel motivated to perform because of self-determination instead of enjoyment or interest due to the pressure they received (see section 2.2.1).

For case study B, the contradictions caused them to become self-directed learners. This again relates to the study of West and Hannafin (2010), which found that when students received support from their own personal and professional network they became more in control of their own learning. Furthermore, designers' feedback was less recognised by the students in case study B. Students had some issues of trust (Rohde, et al., 2005) in the designers. They preferred to refer to a qualified designer who specialises in a specific type of design: in this case, a design for children. Audia and Locke (2003) identify trust as another influence on readiness to accept feedback from others, meaning that students only accept feedback for confrontation from those they trust to be credible, unbiased and concerned about their improvement.

Students in case study C received the highest amount of feedback for confrontation and it affected their production of designs. In order to avoid getting more feedback for confrontation, students in case study C produced a different design at every submission stage which resulted in inconsistency (see figure 5.4). This clearly demonstrates that high delivery of feedback for confrontation has the potential to cause negative emotions which may be unpleasant for some students (Boud and Falchikov, 2007). Uncomfortable feelings such as anxiety, embarrassment and disappointment can have the undesirable consequence of impaired performance (Boud and Falchikov, 2007). Audia and Locke (2003) explain that students respond to feedback in three different ways: they accept the feedback and make changes; they pay no attention to the feedback and remain with the same course of action; or they seek additional feedback to resolve uncertainty. Students in case study C however tended not to seek clarification about the changes needed and they continued to make the same mistakes. This is the problem with feedback for confrontation where it can discourage the two way of conversation necessary for the message to be understood and for learning to occur. Not only that, students' action can also be linked to the issue of power relationship. As described by Audia and Locke (2003), individuals may refrain from seeking further feedback particularly from powerful sources or from those they do not have a favourable relationship with.

Students in case study D, on the other hand, had less issue with the contradictions. They recognised the designers' role as consultants and were grateful for the free consultations. Students accepted the contradictions in a positive manner and the students critically evaluated every critique delivered to them and to others. Chen, Lam and Zhong (2007) report that those who seek negative feedback are found to perform better in their work than people who are prone to accept only positive feedback. Students in case study D viewed feedback for confrontation as a challenge that drove improvement.

Students in each case study responded differently to the contradictions. The contradictions could be destructive or constructive depending on the recipients' acceptance, which is influenced by factors such as students' self-esteem and trust, and also how the feedback can be presented (London, 1995). For instance, feedback for confrontation delivered by designers to students with high self-esteem can be a source of motivation; students feel challenged to do better (Hurley, 1997; Johnson, et al., 2000; Leat and Chandler, 2001; Yoon et al., 2008). However, the same feedback for confrontation can have a different impact on students with low self-esteem. Students with low self-esteem are more vulnerable, react emotionally, are sensitive and intolerant of barriers (London, 1995, p.173). This also means that feedback for confrontation can either enhance or hinder creativity depending on an individual's acceptance of it (Parnell, et al., 2007).

The findings show that the contradictions (designers' feedback for confrontation and the timing of the feedback for confrontation) have the potential to function as a double-edged sword: for one case (case study C), they resulted in the least improvement, while for others it seems that the contradictions were more fruitful, and contributed to being valuable for learning design. This leads to the next question of how students dealt with the contradictions and continued with the study.

(6.4) Reconciling disequilibrium:

Research question 2.2: How were the contradictions reconciled, if at all?

There were number of approaches used by the students to deal with their state of disequilibrium, i.e., a new experience conflicting with previous experience (Piaget, 1964). I have described the categories of approach used by students in every case study (see figures 5.9 - 5.12) which consisted of emotional and cognitive support from their tutor and their personal and professional networks; self-coping mechanisms; acknowledging the different roles played by the designers; and utilising previous experiences.

Students in all case studies recognised the importance of emotional and cognitive support in reconciling their disequilibrium. This also means that emotional and cognitive support plays a crucial role in a students' ZPD. The notion of support which emphasises empathic communication as introduced here was not made clear in Vygotsky's discussion of the ZPD, and this seems important in creativity design as well as more widely. As suggested by Reiman (1999), learning should not only be built on challenge but also on trust, caring, respect, sensitivity and responsiveness. Support in the form of empathic communication from educators can allow students to have positive attitudes and a determination to succeed regardless of receiving negative feedback (Kilgour and Koslow, 2009). Empathy is recognised as the ability to understand and respond to another person's affective experiences (Heckman and Snyder, 2008). Empathetic communication helps restore students' confidence (Vygotsky, 1981), enhances students' motivation (Barrett, 1999), develops students' coping mechanisms (Kilgour and Koslow, 2009), promotes better thinking and strengthens individual ability, enhances memory and concentration, reinforces moral and ethical minds, and helps individuals adapt to the social environment (Goldin, 2008). Cognitive support additionally 'consists of those elements which serve to support the students in building their understandings of, and competence in, the subject matter' (Reigeluth and Moore, 1999, p. 64).

In this study, as noted in the literature (Chen et al, 2005) notes that cognitive support through brainstorming, discussion and information sharing can stimulate creativity and this study has provided further evidence for this.

As well as receiving cognitive and emotional support from the tutor, students in case study A acknowledged that designers essentially took turns to provide different styles of feedback to their group, e.g., when designer L delivered feedback for confrontation, designer A offered mediating feedback (feedback for empathy). This helped to alleviate their stage of disequilibrium. Students in Case Studies B and D on the other hand used their previous experiences: students in case study B utilised their previous experience of attending an elective graphic design course, while students in case study D made full use of their teaching practice experiences. Students in case study C reconciled their stage of disequilibrium by acknowledging the fact that they were not the only group to have received feedback for confrontation: by witnessing other groups being criticised the same way, students in case study C later learnt to accept feedback for confrontation as part of the learning process.

The findings show that developing creativity is not only about developing students' cognitive skills but also about managing the emotional aspects which are often neglected. Developing control over fear and giving the students personal authority to decide how to act in response to confrontation partly helps to generate better understandings of the field of work.

(6.5) Factors that influence the development of design creativity

Research question 3: What are the factors within the learning experience that contributed to the development of design creativity?

Every case study recognised different as well as similar factors contributing to their development of design creativity.

Role: Within all the case studies the role of the designers and the tutor played a crucial part in providing support and challenges to students. Designers focused more on increasing students' design understanding and awareness by challenging and critiquing students' designs. The tutor, on the other hand, dealt more with students' emotional and cognitive conflicts. Students in all four case studies acknowledged the role of their tutor and designers more than their peers as they found that feedback for reflection particularly provided by their peers were not critical enough if compared to the feedback for reflection delivered by their tutor and designers.

Community: Students in case study B viewed advice from another community member (their designer friend) as a factor contributing to their development.

Tool: Students in all four case studies also highlighted the use of tools. Other than feedback as a psychological tool, they also recognised other types of tool: material tools. They found Facebook useful as a tool to communicate and share knowledge (case study A); they also found samples of design templates (Case Studies B and C) and samples of educational courseware (case study D) as tools that helped generate ideas.

Rule: Students in all case studies found the rule of three phases of coaching and scaffolding on Facebook helpful. The rule exposed students to early identification of design flaws (case study D); allowed students to make mistakes and learn from those mistakes (all four case studies), encouraged idea construction (all four case studies) and provided time for students to cope with the new learning setting (case study A).

(6.6) Transformation and improvement of design

Research question 3.1: How did the factors support students to develop an understanding of effective website and courseware design?

The factors described in section 6.5 - role of the designers and the tutor; advice from another community member; feedback, Facebook, samples of design templates and educational courseware; and the rule of three phases of coaching and scaffolding - had an influential impact on students' performance. Students in all case studies became more alert and thoughtful in producing a design. They critically applied appropriate elements of design, e.g., images, colour, font and layout composition based on the needs of the target audience. Students' understanding no longer depended only on fulfilling the requirements of the course (objective 1) but expanded to producing an appropriate design that could be recognised in a wider social context (objective 2): see figure 6.2.

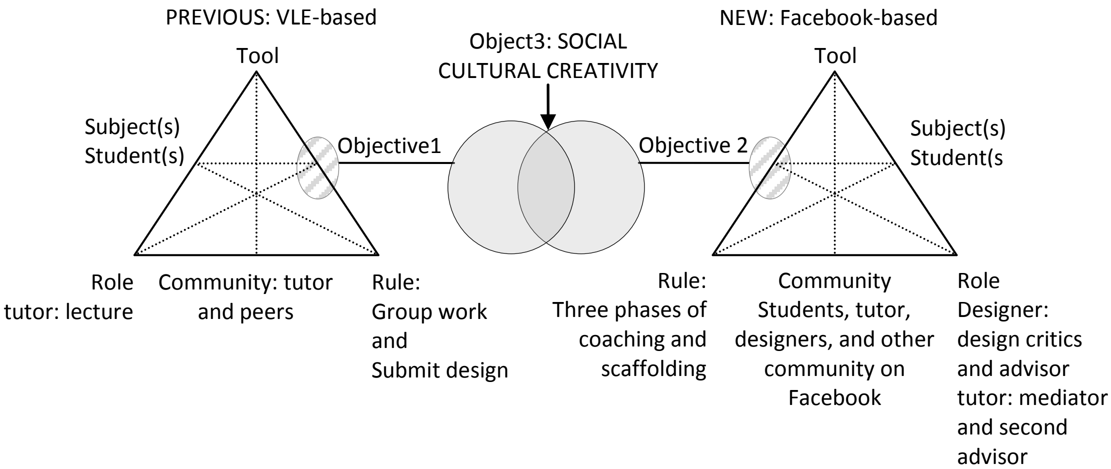


Figure 6.2: Transformation in design learning

From the perspective of Activity Theory, 'transformation is understood as changing of object' (Davydov, 1999, p. 42). The transformation of objective as illustrated in figure 6.2 allowed students in case study A to develop knowledge of different professional practices, and their understanding of effective websites or courseware was influenced by their exposure to the practice (see figure 5.17). Through wider connections, students in case study B managed to increase their awareness of different styles of design. They realised that the style of design influenced the production of an effective website or courseware (see figure 5.18). In the interview, students in case study C stated that the transformation made them realise the importance of producing a design that was purposeful and focused on a specific target audience (see figure 5.19). Finally, students in case study D identified that effective design could be achieved by referring to the right sample of designs and emphasising the right target audience (see figure 5.20). Students' objectives transformed from producing a design based on what they had learnt in class (objective 1) to producing a design for an appropriate target audience and gaining acceptance from the communities involved (objective 2). This led to the new transformation of objective 3 which emphasised the socio-cultural process of creativity (Csíkszentmihályi, 1996). This also indicates that the new transformation of objective 3 provides the potential to develop analytical, contextual and synthetic thinking (see section 2.2.2) among students. However, it is important to acknowledge that the transformation of objective 3 can only be achieved when conflicts are resolved within the new activity system.

Students' development can be seen in their production of designs, and this was confirmed by Tutors A and B. Tutors A and B, from different classes - cohorts 02 and 03, witnessed the improvement made by the cohort 01 students. Tutor A stated that their designs were found to be better than designs produced by students in another class (cohort 02): see section 5.1.1.3 of sub-theme 3.3 (4). Although students in one case study (case study C) were found to have made the least improvement, they still managed to make their final design more organised than before: see section 5.1.2.7 [Kate: group interview: group 4] and figure 5.4. There was evidence that students showed improvements after reconciling their disequilibrium (see section 5.1.1.3 in sub-theme 3.3). They were making improvement with their social communication, developing knowledge of different professional practices and settings, and, in one case, this led to the consideration of a different profession: one student in case study D was interested in becoming a designer instead of a teacher.

The process of reconciling disequilibrium (see section 6.4) and developing design creativity through complex interactions in this study reflects what Engeström (2004) described as co-configuration effort. Co-configuration emphasises the development of a product or idea 'that adapt to the changing needs of users' (Engeström, 2004, p. 11). The co-configuration procedure requires students to renegotiate and reorganise their 'collaborative relations and practices, tools, rules, and entire infrastructures' (Engeström, 2004, p. 16) within an activity system (see figure 6.2). Under co-configuration, the students become, in a sense, co-creators with the community of designers in developing appropriate and purposeful interface designs for targeted users.

(6.7) Summary

In this chapter, I began by discussing the strong connection between students' development of design and social interactions. This led to the recognition of the difference in use of feedback practices and feedback procedures between the learning community in the School of Education and the community of practitioners in the creative industries. These differences, the use of feedback for confrontation and its timing, became the source of contradictions that caused cognitive and emotional conflicts (disequilibrium) among students. It was argued that these contradictions impacted on improving students' performance and creativity development when they are effectively managed with cognitive and emotional support.

Through the process of comprehending the contradictions, students learnt to achieve not only the design standard set by the university but also by the professionals. Students experienced the process of social-cultural creativity in which their design productions communicated with the community surrounding them. Meaning, they were not producing a design based solely on their own interpretation but they considered others' views and responded to those views. As a result their learning objective shifted to a focus on a 'real' target audience than simply achieving course objectives (see figure 6.2).

In Chapter Seven, I review the study findings and offer some pedagogical implications for the development of design creativity. Recommendations for future research are also provided.

Chapter Seven: Conclusion and Recommendations

(7.0) Chapter overview

This study explores the practice and potential of an online community in developing creativity for student teachers undertaking educational technology courses in Malaysian universities. The idea for the study originated, and the fieldwork was conducted at a time of high interest in the new concept of using social network sites in learning; Facebook became the platform of choice to bring together two different communities together for collaboration: the community of higher education and a community of designers from the creative industries. This study has provided a number of valuable insights into understanding the development of design creativity through the online collaborative activity within the pedagogic model of 'cognitive apprenticeship and social apprenticeship for studio-based learning' (CASA4SBL) initiated between these two communities on Facebook. This chapter outlines the main findings, implications and, therefore, the value of the research in promoting a socio-cultural perspective on creativity for the design of educational environments. A description of the research limitations is also provided, followed by recommendations for future research and practice.

(7.1) Summary of findings

This research has addressed three main research questions and three sub-questions:

(1) What is the nature of the learning experience, and how does this promote an understanding of the creative design of websites or courseware?

(2) What are the contradictions caused by this new pedagogic approach?

    (2.5) How did the students respond to the contradictions?

    (2.6) How were the contradictions reconciled, if at all?

(3) What are the factors within the learning experience that contribute to the development of design creativity?

    (3.3) How did the factors support students to develop an understanding of effective website or courseware design?

Case study research was implemented to address these questions. A case study was chosen because this method has been used and generally favoured in the study of contradictions, particularly in contexts of technology use (Murphy and Manzanares, 2008b). Furthermore, researchers (Yamagata-Lynch, 2010; Yin, 2008) have clarified that case studies are suitable for research investigating contradictions in an activity system. This is discussed in detail in section 4.8.

Regarding the research questions, I shall summarise the answers, which also represent the findings, in the following sections, under sub-topics 7.1.1 – 7.1.3.

(7.1.1) Development of design creativity in a social context with confrontational dialogue and studio-based assessment approach

Research question 1: What is the nature of the learning experience, and how does this promote an understanding of the creative design of websites or courseware?

Research question 2: What are the contradictions caused by this new pedagogic approach?

The implementation in this study of the CASA4SBL pedagogic model (see section 3.2.4), which captures the principles of cognitive apprenticeship, social apprenticeship and the studio-based approach (see section 3.2.4) promoted social understanding of developing the design of websites and courseware. Meaning, the model's main component of coaching and scaffolding allowed students to incorporate a sense of community into their learning: students negotiated and constructed the meaning of creative design in relation to the community's expectations - expectations that relate to higher design thinking - instead of aiming for convention-based thinking (following the 'rules of the game'), the community of designers encouraged students to achieve higher design thinking in situation-based (applying unique characteristics to the design) and strategy-based (providing added value for customers and society) approaches: see Lawson and Dorst (2009) in section 2.2.2 and figure 2.5. Designers possess all three strategies of design thinking and through the collaboration; designers shared their knowledge and experiences with the students through the delivery of feedback. This feedback reflected the meaning of creativity for them as designers.

However, as with all things, there is a price to pay for obtaining designers' valuable knowledge and experience. Learning alongside practitioners is not a neat transfer of information, but involves complex and messy interactions. Students must somehow be prepared to explore the designers' nature of practice, which can be challenging at times. Designers' practice is strongly related to confrontational feedback and the studio-based assessment approach, which can be different from traditional methods of learning, e.g., teacher-centred learning.

Most studies tend to emphasise harmony and the elimination of evaluation apprehension for creative idea generation (Diehl and Stroebe, 1987; Paulus and Dzindolet, 1993). In contrast, this study highlights the value of conflict and confrontation in stimulating creativity in design. While acknowledging the importance of harmony and equilibrium for creativity, challenge in the form of confrontation has an important role in triggering individuals' efforts and commitment in support of the creative process. Pressure through confrontational dialogue can be an effective motivator and can enhance the generation of creative design when it is properly harnessed. Students in the study learned to understand that conflict and confrontation are unavoidable and that they must deal with these encounters to produce appropriate designs and fulfil the expectations of the target audience. This study suggests that conflict and confrontation caused by disagreements and critiques can stimulate individuals to excavate their assumptions more deeply, and can prevent premature decisions.

To a certain extent, this approach invites the education community to view confrontational feedback from a different perspective. Confrontational feedback as a tool can encourage students to question, reflect upon and rise above their assumptions about design, and, most importantly, to expand their awareness of the importance of producing appropriate and purposeful designs. The findings of this study shows that feedback is context dependent and 'determined by the demands of the dominant purpose, the primary niche of education, within that environment'(Loi and Dillon, 2006, p. 366).

Confrontational dialogue and studio-based assessment has long been part of the design practice in the creative industries (see section 2.3), and the higher education community, such as in the UTM School of Education, needs to prepare students to take on challenges from the community of designers if they want to make changes to the system and keep up with the current demands of design. As stated by creativity researchers (Sawyer, et al., 2003), students need to be taught that uncertainty and discomfort are part of living a creative life. This also means that the student/designer relationship may be difficult at the early stages of collaboration, but has the potential to become more accommodating as the collaboration progresses. In order to implement designers' practice, which involves confrontational dialogue and studio-based assessment in the learning system, there are, however, some important issues that require attention: issues regarding addressing conflicts caused by the practice. I discuss this issue in the following section.

(7.1.2) The crucial role of cognitive and emotional support

Research question 2.1: How did the students respond to the contradictions?

Research question 2.2: How were the contradictions reconciled, if at all?

Referring back to Vygotsky's ZPD (see section 2.4.1), the findings of this study indicate the need for cognitive and emotional support to be made explicit in the ZPD. Cognitive support in this study was offered through coaching and scaffolding (based on the CASA4SBL model: see section 3.2.4), which included brainstorming, discussion, information sharing and also challenge. The challenge was focused on feedback for confrontation and the studio-based assessment approach delivered by the community of designers from the very beginning and throughout the collaboration. The challenge, which included constant critiques and provocation, caused conflicts among the students. This, however, became an important finding: students' creativity was influenced by the challenge. This study has illustrated how the designers' nature of practice can be shared within the environment of social network sites and its potential to become a valuable method for enhancing design creativity.

Nevertheless, designers' feedback for confrontation and the studio-based assessment approach alone do not guarantee the effective development of creativity, because the findings of this study show that feedback for confrontation and the studio-based assessment approach can also be painful and confusing for students. Similar findings were found in the study of Dannels (2005): see section 2.4. Dannels (2005) argues that critiques delivered by practitioners through studio-based assessment in design education can be problematic. Practitioners have the tendency to unconsciously treat the students in the same way that they treat their junior staff in the design office. This can distract them from recognising the learning needs of, and the support required by the students. Students can be affected by ‘vicious critiques’ (Cox, et al., 2009, p. 150) with ‘sadistic overtones’ (Stead, 2003, p. 10) directed at their work. Student teachers in this study faced the same difficulties when some designers treated them more as junior employees than as students. Then again, the nature of such incidents is hard to avoid because designers who belong to different contexts (creative industries) cannot help imposing their usual practices.

In dealing with conflicts caused by the challenge created by some practitioners, this study has suggested how feedback for reflection and feedback for empathy can be delivered conjointly to students. The affective and aggressive roles played by the tutor and the designers were found to be particularly crucial in encouraging dialogues for design improvement. Without the balance of delivery of feedback for confrontation, feedback for reflection, and feedback for empathy creativity can be hindered, as happened to students in one group in this study (case study C).

Indeed, developing design creativity requires more than encouraging confrontation, but also the management of the emotional aspect, which is often neglected (Dannels, 2005; Krogh, et al., 2000): see section 2.4. It has been argued by number of researchers (Mayer and Salovey, 1997; Picard et al., 2004) that emotional upsets can hinder cognitive development. Developing control over fear and giving the students personal authority to decide how to act in response to the confrontation partly helps to generate better understanding in solving design problems. Since there is little research that identifies cognitive and emotional conflict in computer-supported collaborative learning (Yoon, et al., 2008), the findings of this study begin to fill this gap and contribute towards the field of study.

Because feedback for confrontation can cause cognitive and emotional conflicts, students need to be provided with the necessary support. Genuine caring support from tutors is especially important in high anxiety activities such as collaborating with a community of practitioners (see Rohde, et al., 2005). Tutors need to be aware of different aspects of social learning which not only include learning about the context of study but also learning to get along with others and maintain reasonable assertiveness (Salomon and Perkins, 1998). Tutors can play a role in ensuring that designers provide different types of feedback other than feedback for confrontation. Different approaches to confrontational feedback which is more subtle and provided in a teasing manner can also be used (see data in section 5.1.1.2, sub-theme 2.1), where tutor C delivered feedback to group 8, and peers from group 10 delivered feedback to group 14. Different types of feedback and different approaches to confrontational feedback were shown to promote and also help resolve the students' stage of disequilibrium in this study in order to enhance learning.

In brief, the current findings add to our understanding that the social-cultural process (Csíkszentmihályi, 1996) of design between the community of higher education and practitioners can be nurtured in the learning system of higher education, provided that the procedure of studio-based assessment and confrontational feedback delivered by practitioner designers is properly managed with cognitive and emotional support.

(7.1.3) Factors contributing to design creativity: students' experiences

Research question 3: What were the factors within the learning experience that contributed to the development of design creativity?

Research question 3.1: How did the factors support students to develop an understanding of effective website or courseware design?

Individual students valued different aspects of the rules, tools, roles and community in assisting them with their development. However there was evidence that all the students in the case studies agreed that the feedback for confrontation, feedback for reflection and feedback for empathy had functioned as valuable tools (see section 5.1.1.3 in sub-theme 3.2 (4) and section 5.1.2.5), which helped increase their understanding and awareness of design. The feedback included experiences and design facts from MKOs, i.e., designers; thus, this is what made it important.

There was a need for time for reflection and action on the feedback in order for the group to make meaning and develop insights. This is where they found the rules of the collaboration (the three phases of coaching and scaffolding) to be useful. The three phases of coaching and scaffolding are a main component within the CASA4SBL model, structured to intensify the social reflection process. The CASA4SBL model was constructed based on the principles of cognitive apprenticeship, social apprenticeship and the studio-based approach. There have been limited studies that venture to combine cognitive and social apprenticeship (see Ding, 2008). This study importantly combined not only cognitive and social apprenticeship but also the studio-based approach to help develop design creativity (see the CASA4SBL model in section 3.2.4).

As explained in section 2.4, the studio-based approach has been successfully used to teach design courses in the fields of art, design and architecture, but this study has shown that the studio-based approach can also be successfully implemented in the field of educational technology. It is important to note that the sample involved in this study were not students from a school of design, computer science or architecture, as found in other related studies (Baird, 2004; Craig and Zimring, 2000; Hertfield, 1992; Rohde, et al., 2005; West and Hannafin, 2010); instead, they were education students. This study indicates the potential for the studio-based approach or the CASA4SBL (Cognitive apprenticeship and social apprenticeship for studio-based learning) model to be implemented more widely. The rule of the three phases of coaching and scaffolding in the CASA4SBL model allowed students to analyse and discuss their design mistakes among themselves and with others. This is important because learning to recognise mistakes is part of the critical process in creativity (Sternberg and Williams, 1996). The rule applied in this study adds to the value of the study by Dickey (2008), which emphasises developing methods and techniques in applying effective scaffolding within web-based learning environments. However, in contrast to the study of Dickey (2008), this study involved the delivery of scaffolding from more than one instructor and from a different community.

Facebook has proven to be practical in initiating collaboration with more than one instructor from a different community. Students in this study developed a new understanding of using Facebook for learning and the community of higher education in this study was able to make use of Facebook as a platform to expand learning, thus exposing students to the practice of a community of practitioners. In another words, this study has illustrated the potential for social network sites such as Facebook to be used to reduce the gap between learning in educational settings and in real practice, and to inspire students with different levels of design thinking. Through Facebook, students managed also to stay connected with their own personal and professional networks. This has the potential, as in this research, to provide opportunities for students to gain help from a wider audience or from another community when they find learning with their tutor, peers or other experts in class problematic. Furthermore, there is evidence that students tend to respond differently to the same teacher (Mercer, 2000). Bassey (2001) states that students can become more enthusiastic when given the freedom to explore, exercise their own judgement and make their own decisions. Students in this study experienced an exploratory phase (Zubrowski, 2009) at some points during the collaboration. There was not only evidence of one group asking for advice from another community but they also performed revisions on examples of various tools, e.g., samples of design templates and educational software. Nevertheless, as suggested by Zubrowski (2009), the students' exploratory phase was accompanied by close observation from the tutor and designers in order to avoid replication of design production and misinformation.

This study also emphasises that having more than one instructor or tutor can be an important factor in design learning. The affective and confrontational roles played by the tutor and the designers were found to be crucial in encouraging dialogues for design improvement. They also helped to cater for the diverse needs of students. When compared to the practice in the creative industries, designers themselves routinely adopt affective and confrontational character roles when discussing design ideas (see Lawson, 1997); this helps eliminate bias, makes designers question their own judgement more critically, helps them to be ready to discover and explore alternative ideas, and reframes design problems (Louro, et al., 2007). In addition, this study also highlights the importance of having appropriate instructors as advisers. For example, students preferred to receive feedback from qualified designers who specialised in specific kinds of design (see section 5.1.1.2, sub-theme 2.3). This also raises the importance of the need to involve designers with a broad range of appropriate skills.

From students' experiences, these factors of tools (feedback, Facebook, samples of design templates and educational software), rules (three phases of coaching and scaffolding), roles (confrontational and assertive communication by the tutor and designers) and community (consultation from another community) led them to develop an understanding of effective design. Students experienced a transformation in their learning: from producing a design based on what they had learned in class to producing a design for an appropriate target audience and gaining acceptance from the communities involved. Overall, this supported the transformation of design learning which emphasises the socio-cultural process of creativity (Csíkszentmihályi, 1996): the type of creativity that seeks to frame and solve design problems through interactions with communities and tools rather than individuals.

(7.2) The significance of this research

The value of this research is that it addresses several gaps identified in the literature. First, it provides an in-depth analysis and understanding of the role of design practitioners' confrontational interactions with students in developing design creativity on Facebook. This has not been attempted before. Secondly, this study contributes to the knowledge of cognitive and social apprenticeship by considering it within different higher education settings, such as in-class and on Facebook. Thirdly, it also contributes to the existing body of literature by applying activity system analysis to understanding contradictions in developing design creativity in higher education. Although activity system analysis has been applied to different learning settings, to date no research was found to have applied it in this context. In addition, the findings of this study are centred on contradictions unlike other related studies (Barab, et al., 2002; Basharina, 2007; Dippe, 2006; Fåhræus, 2004; Hardman, 2005; Murphy and Manzanares, 2008a; Peruski, 2003; Russell and Schneiderheinze, 2005).

The use of triangulation methods (field documentation on Facebook, online semi-structured questionnaires, face-to-face interviews and Facebook chat) and the use of two stages of analysis (thematic, comprehensive data treatment and activity system analysis) confirmed the previous findings and also provided new findings as discussed in section 7.1; which furthers understanding of developing design creativity through social-cultural processes in higher education. In particular, it has provided a rich description of two communities' (a learning community and a community of designers) interactions and perceptions particularly on different discourse practices around feedback, an area little explored in the literature.

The value of this thesis is not limited to research but it also contributes to practice; in particular, it highlights some of the challenges in integrating designers' confrontational feedback during collaborative learning activities. This is important as the trend in higher education is for the student experience to involve an increasing engagement with the workplace as a means of addressing the employability agenda in higher education (Yorke, 2006). I further develop the main recommendations for practice derived from the study findings in section 7.5.

(7.3) Research limitations

The methodological limitations of this study have already been addressed in section 4.10. Here I would like to restate that this study was undertaken with purposeful sampling from a single learning institution and was limited to a single course environment and needs to be seen as exploratory. It is also important to note that this study was conducted in a particular cultural setting. However, the findings may serve to alert fellow practitioners and researchers to some of the issues involved in incorporating online collaboration with a community of designers into formal teaching and learning (see sections 6.2 and 7.1.2).

Time was another limiting factor for this study. Time is needed to create and nurture a sense of online community and the skills of collaboration for students (Alexander, 2000); however, due to the syllabus topics that have to be completed within a limited timeframe (see section 4.2, table 4.1), the introductory session between the designers and students had to be done quickly on Facebook. This may have affected their relationship as there was no time for the students and designers to develop this beyond the feedback interactions; however it is clear from this research that the designers' position of authority and status, and their use of feedback for confrontation would serve to create distance between them and the students.

The distance between designers and students can also create a radical transformation in pedagogy. For instance, students in this study (case study B) invited an outsider who was a friend to them to assist with their design improvement. Although their action has helped them advance towards self-direction, issue with misperceptions can occur (Conlan et al., 2003). This indicates that tutor has to take an additional responsibility in making sure students received trusted learning resources from trusted parties (Pilling-Cormick, 1997).

(7.4) Recommendations for future research

The findings of the present study lend support for the integration of feedback for confrontation and the studio-based assessment approach in developing design creativity. More research studies will be beneficial in exploring the effectiveness of this method; for example, future research of this nature conducted with larger groups of participants across other educational contexts with tools other than Facebook would help determine if the results of this study can be replicated and how far they can be generalised and are applicable to other learners. Design discussion requires a different set of tools and approaches, e.g., video conferencing, image editing and pointing options. These were limitations identified in Facebook at the time when this study was conducted and call for the need to explore further online tools to support the design learning process.

In addition, longitudinal studies are clearly needed to examine the instructional effects of longer durations of CASA4SBL (cognitive apprenticeship and social apprenticeship for studio-based learning) strategy instruction. Studies using longitudinal designs may provide better opportunity to nurture a sense of community (Alexander, 2000) among participants. Online communities often require time to develop: the tutor/moderator could provide the members with the time and encouragement to build a sense of trust and openness (Goodyear et al., 2004) towards each other. Also, it is important to note that time could facilitate the process of adapting to the use of different language of expression; jargon and colloquial language. As found in this research, the issue with expression of language is likely to occur in informal interactions on social network sites such as Facebook, particularly when it involves different communities. This study suggests that it is important for students to cope with different expression of language use by another community in order to achieve an effective collaboration.

(7.5) Recommendations for practice

The findings of this study suggest some possible implications with regards to the issue of developing employability in higher education (Yorke, 2006). Employability is defined as:

> a set of achievements – skills, understandings and personal attributes – that makes graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy (Yorke, 2006, p. 8).

Employability is an issue of concern for universities around the world. This is because every university aims to produce quality students and maintain its position in the global market (Yorke, 2006). Various initiatives have been undertaken to ensure that programmes provided by the universities meet the needs of the economy and employer requirements (Hesketh, 2000). Programmes, e.g., career development modules, internships and mentoring have been implemented in the curriculum to reduce gaps between universities and the world of work (Harvey et al., 2002; Thomas and Jones, 2007); and with the aid of technologies, online collaboration with practitioners in the industries can also be done to foster employability skills, e.g., the study by Craig and Zimring (2000) in section 2.4.2 and the study by Rohde et al. (2005) in section 3.2.3.

Employability skills as described by Knight and Yorke (2002, 2004) cited in Yorke (2006) consist of four components:

- understanding (understanding of the subject discipline, and matters relevant to employability);
- skilful practices in context (the manifestation of academic and practical intelligence/ street smarts);
- efficacy beliefs (they way students see themselves, whether or not they are able to learn from new opportunities);
- metacognition (reflection, awareness of the processes of learning)

Students in this study were exposed to these four components of employability; they were trained with the ability to work towards fulfilling users' expectation by learning to produce purposeful and appropriate design (see section 6.6 and 7.1.1). This is an important employability skill in producing the 'teacher-developer' (CEMCA, 2003) who could develop effective technology-based learning applications for learners from all varieties of backgrounds in schools, as desired by the Ministry of Higher Education in Malaysia (see section 1.2). In addition, students managed to also work on their ability to reflect on experience, where they were encouraged by their tutor and designers through the process of coaching and scaffolding to continuously question their own judgement, discover and explore alternative ideas, reframe design problems and not to make premature decisions: see section 5.1.1.3, sub-theme 3.3 (4). Also, students were exposed to different types of interactions which were more direct and less empathetic than those they were familiar with: see section 5.1.1.3, sub-theme 3.3 (2); this helps prepare students deal with different types of interaction while working with people at all levels.

Although this study has the potential to promote employability skills, it also highlights some issue and challenges involved in the process. The process of collaborating and integrating practitioners' confrontational feedback into courses can be problematic. The findings of this study have shown that students can be emotionally affected by practitioners' confrontational feedback (see section 5.1.1.3). For that reason, some precautions need to be taken in order to successfully integrate practitioners' input into higher education curriculum and courses. This could have considerable implications on tutor's responsibilities and rules of collaboration for practitioners.

(7.5.1) Recommendations for tutors' responsibilities

Involving practitioners/ designers and their practice in the learning system can cause contradictions which generate disturbances and conflicts, but can also bring improvements to support the employability agenda in higher education. This also means that tutors have to take on extra responsibilities in making sure the collaborative activity runs smoothly. Most suggestions are in line with those made by others, e.g., Salmon (2004); Brockbank and McGill (2007); and Sharpe and Pawlyn (2009), but this study in particular emphasised the issues to be addressed by tutors in dealing with two different communities: students and practitioner designers. There is a need for the tutor to:

- build a good rapport with designers and agree upon common goals. Once an understanding is reached and a common goal is shared, misunderstandings can be avoided. Managing the relationship and keeping it positive would be a challenge;
- alert students to the nature of studio-based learning and the nature of the feedback that is used: how to manage and understand the benefits that can arise from it. By educating students with this knowledge, they can be prepared and better able to comprehend the confrontational dialogue;
- help students understand how to focus on critiques that are directed towards issues and not to see these as personal. Harsh critiques from some designers can arouse aggression and anger, which may prompt a personal counterattack. Once aroused, this wave of emotional conflict may damage the chances of reaching any sort of solution that would satisfy both parties. Therefore, playing the role of peacemaker during the collaboration would be useful;
- continuously exhibit behaviour that shows support for the students, emotionally and cognitively; ensure that students' views and worries are being heard and acted upon, e.g., responding promptly to their ideas or uncertainties;
- encourage students to communicate with their personal and professional networks, as this helps to shape their knowledge and allows them to gain the support that they need;

- facilitate the collaboration in face-to-face settings to eliminate misunderstandings and confusion and to resolve conflicts when they happen on Facebook. This study has shown that students prefer and benefit from both face-to-face and online support;
- advocate self-regulated learning so that students are more responsible for their own learning (refer to the components of CASA4SBL pedagogy model in section 3.2.4 for a suggestion to advocate self-regulated learning, e.g., second phase of exploration);
- encourage student agency in that students have control over their own actions (refer to the components of CASA4SBL pedagogy model in section 3.2.4 for a suggestion to encourage student agency, e.g., third phase of final articulation and reflection).

(7.5.2) Recommendations for designers' rules of engagement

Feedback given by designers can sometimes be confrontational not only for the students but for the tutor as well. Some designers may unexpectedly criticise the course structure, the tutor's method of teaching and the institutional practice. Optimistically, this may help the tutor reflect upon their practice. However, it is suggested that designers are reminded to discuss other issues, e.g., improving the course structure and the tutor's method of teaching separately; not during the process of collaboration as this can be disruptive to the learning activity.

Rules need to be established to that designers disclose their expertise and style of design at the start of the course. Students need to access a designers' brief statement of expertise and some samples of their design work. This can support students in choosing appropriate designers as advisers. Problems caused by different designers providing different advice can be avoided or at least comprehended.

Designers should also be advised to provide not only confrontational feedback to students but conjointly use other type of feedback, e.g., feedback for reflection and feedback for empathy when necessary. The fact is that all three styles of feedback have conjointly functioned to mediate learning for this study (see section 5.1.2.5).

(7.5.3) Recommendations for sustaining collaborations with the community of practitioners

This research has generated some critical questions in need of further investigation. Practitioners and researchers need to consider these issues if they wish to sustain collaborations through social network sites with a community of designers:

- There is a need to improve social participation: how to sustain close relationships with experts from the creative industries through social network site collaborations. In order to expand research networks and advance careers, how can collaborations between students and designers be prolonged beyond task completion?
- There is a need for those in higher education to work with professionals within the world of work to create meaningful learning environments: how can we further encourage an open culture where students can work together with groups of educators and designers in building knowledge for the benefit of communities.

(7.6) Conclusion

This research started with a search for a method to support student teachers in being more creative in designing an interface for a website or courseware. After careful analysis of the issues, I began to understand that creativity in design needs to be validated by a qualified group of people or community in the related field. Bearing this in mind, a group of designers were selected as participants in this study, other than student teachers and tutors in the School of Education. Instead of placing students in a workplace environment or inviting experts from the creative industries to give lectures at the university, I organised for both groups of participants to collaborate on Facebook as an online community.

The community of designers, however, was found to use a different discourse which was more confrontational than the discourse used by the learning community in the School of Education. This had an impact on students' understanding of design. The cognitive and emotional disequilibrium that resulted led to the students realising that producing a design was not all about completing a task or achieving good grades but about producing appropriate designs that had credibility within the design community and their target audience. Nevertheless, this study proposes that the designers' and tutor's role in mediating conflicts so they are perceived as constructive is essential and needs to be actively engaged in as part of the teaching process.

Other than that, this study has identified differences in feedback practices and assessment approaches between the communities involved. These differences in the nature of feedback, i.e., the use of feedback for confrontation and the studio-based approach appeared to have a strong interrelationship with the quality of design creativity fostered.

Although the student teachers in this study were not recognised as insiders in the community of practitioners, there is evidence that they managed to expand and enrich their design understanding through the interactions facilitated by the pedagogic model that included the use of Facebook. The potential for such an approach in other subject areas is clear, though the contradictions highlighted in this study suggests that a careful analysis of the nature of the practitioner community and its modes of discourse in particular feedback needs to be undertaken and accommodated within the learning design.

This research has highlighted the value and issue of social interactions in developing design creativity and at the same time, preparing students to enter the labour market. It has provided for me an amazing journey in raising my awareness of how to create a supportive and challenging learning environment alongside practitioners from the creative industries. At the beginning of this study I was concerned with looking for the best learning approach to develop creativity, but by the end I realised that it is not so much the approach, although that is important, but the dialogue taking place between participants is what matters most. Dialogue across different communities has the potential to expand awareness in ways that can help increase creative thought processes.

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Appendices

Appendix A: Malaysian universities offering undergraduate programmes in educational technology

(Source: MOHE http://jpt.mohe.gov.my/menuipt.php)

	University	Programme establishment
1	**Universiti Pendidikan Sultan Idris (UPSI)** http://www.upsi.edu.my	1998
2	**Universiti Putra Malaysia (UPM)** http://www.upm.edu.my	No record of certification / Still in the process of approval
3	**Universiti Teknologi Malaysia (UTM)** http://www.utm.my	1988
4	**Tun Hussein Onn University of Malaysia (UTHM)** http://www.uthm.edu.my	No record of certification / Still in the process of approval
5	**Universiti Utara Malaysia (UUM)** http://www.uum.edu.my	2006 and 2007
6	**Universiti Kebangsaan Malaysia (UKM)** http://www.ukm.my	No record of certification / Still in the process of approval
7	**Universiti Teknologi MARA (UiTM)** 40450 Shah Alam, Selangor http://www.uitm.edu.mys	No record of certification / Still in the process of approval
8	**Universiti Sains Malaysia (USM)** http://www.usm.my	only for postgraduate programmes
9	**Universiti Islam Antarabangsa Malaysia (UIAM)** http://www.iiu.edu.my	only for postgraduate programmes

10	**Universiti Sultan Zainal Abidin** http://www.unisza.edu.my	The course is not offered
11	**Universiti Malaysia Perlis (UniMAP)** http://www.unimap.edu.my	The course is not offered
12	**Universiti Malaysia Pahang (UMP)** http://www.ump.edu.my	The course is not offered
13	**Universiti Teknikal Malaysia Melaka (UTeM)** http://www.utem.edu.my	The course is not offered
14	**Universiti Malaysia Terengganu (UMT)** http://www.umt.edu.my	The course is not offered
15	**Universiti Sains Islam Malaysia(USIM)** http://www.usim.edu.my	The course is not offered
16	Universiti Malaysia Sabah (UMS) http://www.ums.edu.my	The course is not offered
17	Universiti Malaysia Sarawak (UNIMAS) http://www.unimas.my	The course is not offered
18	**Universiti Pertahanan Nasional Malaysia (UPNM)** http://www.upnm.edu.my/	The course is not offered
19	**Universiti Malaysia Kelantan (UMK)**	The course is not offered

	http://www.umk.edu.my	
20	**Universiti Malaya (UM)** http://www.um.edu.my	The course is not offered

Appendix B: Designer's Profile

Designer A	Educational background: Bachelor in Art and Design (UiTM), Graphic Design; Master in Communications (unisa), Adelaide, Australia Current employer: Goldust valley group; Falcon eyes SDN. BHD.; Elite bonus SDN. BHD. Position: Special Project Director Job description: Advertising and promotion consulting, printing, design, media Past experience: publishing, advertising, broadcasting, multimedia, printing, education Years of experience in the design industry: More than ten years
Designer B	Educational background: Bachelor in Art and Design (UiTM), Product Design Current employer: Levi Strauss (M) Sdn Bhd Position: Product Executive Job description: Advertising and marketing for Dockers and Levi's products Past experience: Planning for Levi's jeans fabrication and accessories Years of experience in the industry: Ten years
Designer C	Educational background: Bachelor in Art and Design (UiTM), Advertising Current employer: Berita Harian, NSTP Position: Graphic Designer Job description: Graphic and publishing design Past experience: Multimedia, advertising, event management Years of experience in the design industry: Ten years
Designer D	Educational background: Bachelor in Art and Design (UiTM), Advertising Current employer: freelance Position: Graphic Designer Job Description: Graphics and photography for a variety of events Past experience: Graphic designer, senior audio/video media specialist, photographer Years of Experience in the design industry: Ten years
Designer E	Educational background: Bachelor in Art and Design (UiTM), Graphic Design Current employer: Iklan SDN. BHD. Position: Graphic Designer Job description: Graphic design Past experience: Graphic designer Years of experience in the design industry: Ten years

Designer F	Educational background: Bachelor in Art and Design (UiTM), Industrial Design Employer: Digital Age Position: Multimedia designer Job description: Montage, graphics, editing, photography Past experience: Montage, graphics, editing, photography, publishing Years of experience in the industry: Ten years
Designer G	Educational background: Bachelor in Art and Design (UiTM), Graphic Design Current employer: freelance Position: Graphic designer Job description: Graphic design Past experience: Graphic and packaging design Years of experience in the industry: Ten years
Designer H	Educational background: Bachelor in Art and Design (UiTM), Industrial Design Current employer: Hishani Peninsular Animation; VHQ Production; WorldSOL.com; Arythographix, Kotareka Design Solutions. Position: Founder/ Creative Director Job description: Branding, creative, print, new media, environmental design Past experience: Branding exercises, advertising, design, new media, environmental design, packaging. Years of experience in the industry: Ten years
Designer I	Educational background: Bachelor in Art and Design (UiTM), Graphic Design Current employer: Aljazeera International Broadcast Position: Graphic designer Job description: Montage, sting, graphics, editing Past experience: Animation, multimedia, publishing, broadcasting Years of experience in the industry: More than ten years
Designer J	Education background: Bachelor in Art and Design (UiTM), Advertising Current employer: freelance/ owner Position: Graphic and motion designer Job description: Graphic and multimedia interactive Past experience: Graphic designer Years of experience in the industry: More than ten years
Designer K	Educational background: Bachelor in Art and Design (UiTM), Graphic Design Current employer: Limkokwing University Of Creative

	Technology Position: Senior Lecturer Job Description: Advertising and digital media Past experience: Advertising, broadcasting and multimedia Years of experience in the industry: More than ten years
Designer L	Educational background: Bachelor in Art and Design (UiTM), Fine Art; Master in Multimedia Design, Swinburne University, Australia Current employer: Swinburne University of Tech, Melbourne, Australia. Position: Researcher (Interactive design and user experience) Job description: Research and prototype developer Past experience: Installation art, 3D animation, multimedia (interactive prototypes and web), publishing, broadcasting (music video), graphic designs, illustrations (digital and manual) Years of experience in the industry: More than ten years
Designer M	Educational background: Bachelor in Art and Design (UiTM), Illustration Design Current employer: Warung Magazine SDN.BHD. Position: Senior Illustrator Job description: Comics and illustrations for magazine and book publications Past experience: Publishing, advertising, printing Years of experience in the industry: More than ten years

Appendix C: Online semi-structured questionnaire

(Source: twinsystems, 2009)

1	Based on your opinion/ experience, what are the benefits and limitations of the collaboration initiated using Facebook?
2	Do you think the designer played a part in enhancing your interface design?
2.1	If yes, what method did the designers use in helping to improve your interface design? Was it through discussion, suggestions, criticisms, showing samples or giving useful links? Others?
2.2	What method worked best for you to improve your skills in producing interface design?
2.3	What method worked least well for you?
3	What are the positive and negative aspects of collaborating with designers or lecturers using Facebook? Please give examples.
4	Would you still want to collaborate with the designers using Facebook in the future?
4.1	Please state your reason if you choose to collaborate or not collaborate using Facebook in the future.
5	Who did you think helped you the most in improving your interface design? Was it the designers, peers, lecturers or other resources?
5.1	Please give an example of the type of help they offered.
6	What are the advantageous features of Facebook that enable the enhancement of the collaboration?
6.1	What are the disadvantageous features of Facebook that fail to enhance the collaboration?
7	Have you used any other social network sites before? (Friendster/ Myspace/etc.) Please list them.
7.1	Compared to Facebook, which social network sites would you prefer to use for having this type of collaboration?
7.2	Why would you choose the social network site you mentioned?
7.3	Do you think Facebook helped you in generating ideas? If yes, how did it help? If no, how could it be improved to help?
8	Were there any sources other than Facebook that you find helpful for you to expand your ideas? Please list them.
9	Did you find the rules provided in the DC useful?

9.1	How would you describe the usefulness of these rules?
9.2	How did the rules play a part in enhancing your interface design skills?
10	Do you have any suggestions for improving the rules? Any suggestions are highly appreciated.
11	Overall, what was the effect of the collaboration on you as a learner?
12	Do you think this type of collaboration can help you in the long run? How?
13	How can this type of collaboration offer you any benefits/ satisfaction?
14	Do you have any comments or suggestions? Feel free to list them.

Appendix D: Information sheet for prospective participants, consent form and ethics approval

Letter and Information (student/tutor/designer)

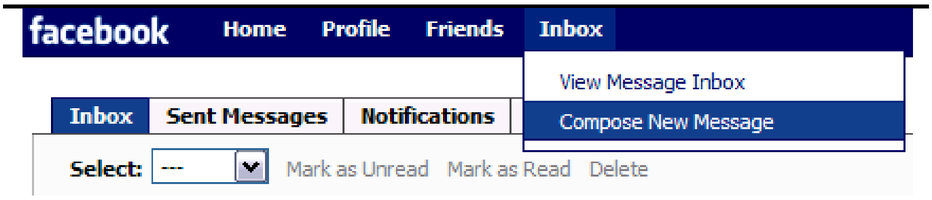
Hello!

I am researching the collaboration process between lecturers and students with designers from industry for improving interface design using a social network site. The research is in fulfilment of the requirements for my PhD studies and it will make a contribution to design courses in higher education in Malaysia.

Your participation in this research will not only help improve your design abilities but will also make a potentially major contribution to innovative learning and teaching in Malaysian higher education contexts. If you are interested in taking part in this study, and having confirmed this through your written consent, I will invite you to join a social network group on Facebook (www.facebook.com/). To protect your privacy and ensure the anonymity of your participation on Facebook, guidance is given in the attachments of this letter. As part of the Facebook collaboration you will contribute to discussions on sharing ideas and experiences for improving your design project. 'Design project' refers to an interface design of a website or a courseware. The online collaboration will take place for five weeks from19 February to 26 of March 2009.

During the eleventh week, I will be posting some questions on the Facebook discussion board to explore your thoughts and experiences concerning the collaboration process. If you prefer not to give feedback through the discussion board, you will be able to use alternative methods such as email or Facebook's inbox. The Facebook's inbox functions similarly to ordinary email (see figure 1).

Figure 1: Facebook's Inbox



In addition, I may ask you to take part in a face-to-face interview which will be audio-taped.

All data collected will be treated in the strictest confidence and will only be reported in an anonymous form. You have the right to contact me for any further information about the results obtained, and / or to withdraw from this research at any stage.

If you are interested in taking part or would like to have more information, then please do not hesitate to contact me using my contact details listed below. Together with this letter, I attach a consent form indicating your

rights as a research participant. Please add your signature after reading the consent form in order to indicate your consent to being part of this research. Both you and I will each keep a copy of the consent form.
I look forward to working with you.
Thank you for your kind cooperation.

Yours sincerely,
Zaleha ABDULLAH
University of Nottingham, School of Education,
Jubilee campus, Wollaton Road, NG8 1BB
Mobile: +447990543628
Email: ttxza2@Nottingham.ac.uk or zacutm@yahoo.com

CC: Supervisor 1:
Assoc. Prof Dr. Gordon Joyes
Tel: 0115 8467202
Fax: 0115 846 6777
Email: Gordon.Joyes@nottingham.ac.u

CC: Supervisor 2:
Dr. Rolf Wiesemes
Tel: 0115 846 6455
Fax: 0115 951 4475
Email: Rolf.Wiesemes@nottingham.ac.uk

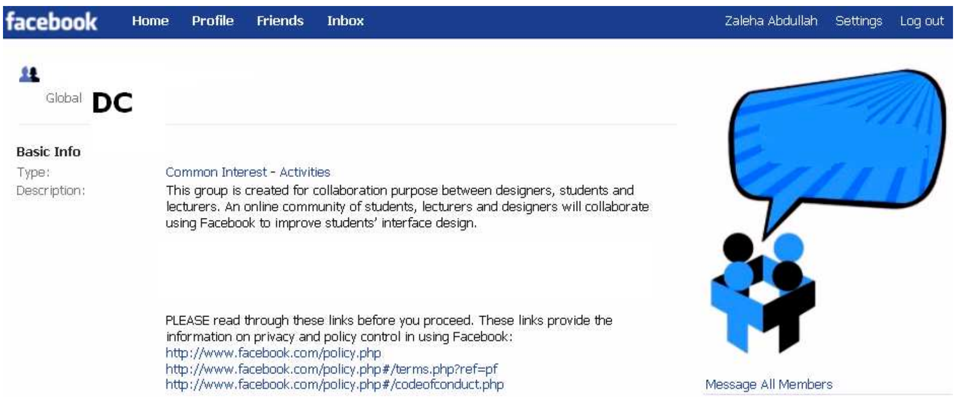
ATTACHMENT: Privacy and policy control in using Facebook

(1) Participants are advised to read through the links given before agreeing to be part of the research.
(2) The following links provide information on privacy and policy control in using Facebook. These links will also be posted on the collaboration board on Facebook (Figure 2).
http://www.facebook.com/policy.php

http://www.facebook.com/policy.php#/terms.php?ref=pf

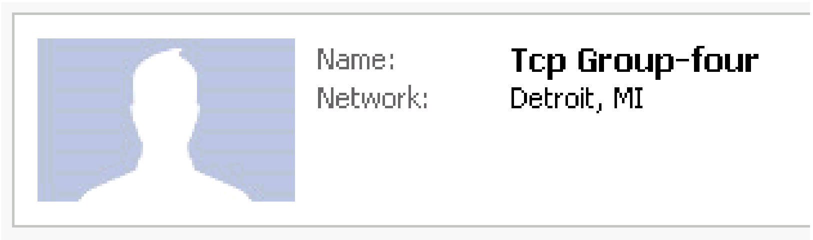
http://www.facebook.com/policy.php#/codeofconduct.php

Figure 2: Links posted in the group collaboration board



(3) You can choose to use an anonymous name and not to put a picture of yourself on to your Facebook profile during the collaboration, as shown in figure 3.

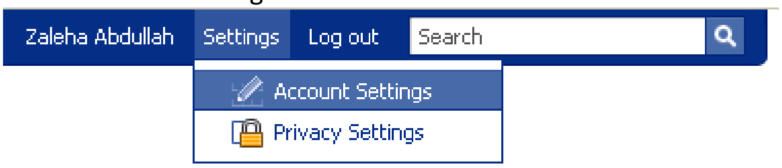
Figure 3: Use an anonymous name without a picture



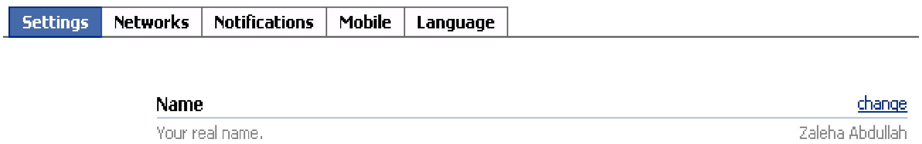
(4) Figure 4 shows the steps for ensuring your anonymity on Facebook

Figure 4: Steps to make your name anonymous

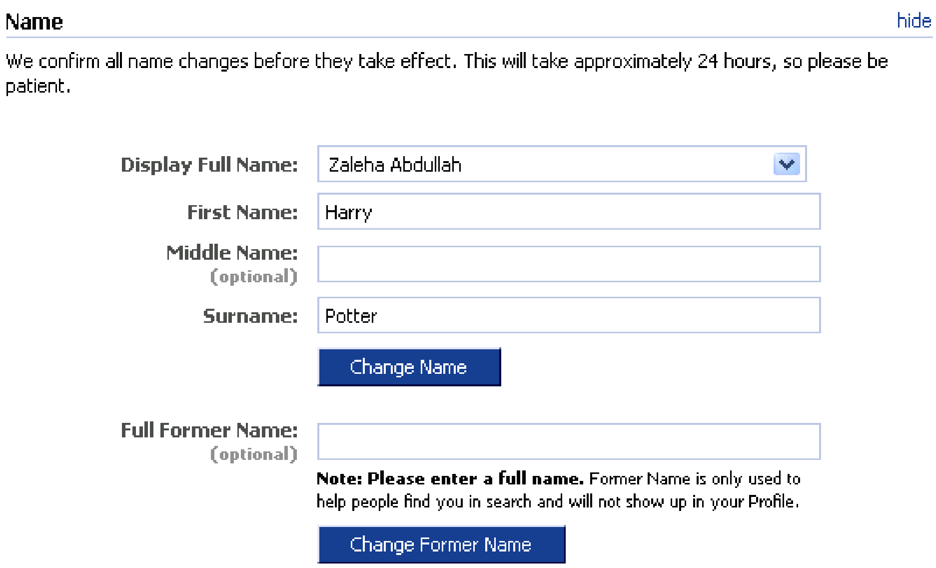
1. Go to Settings (on top of your screen menu), then click on Account Settings



2. Click on change name



3. Start typing an anonymous name in the space given



Please do not hesitate to ask any questions or for any guidance. I would be delighted to help.
Thank you for your participation.

Zaleha ABDULLAH
University of Nottingham, School of Education,
Jubilee campus, Wollaton Road, NG8 1BB
Mobile: +447990543628
Email: ttxza2@Nottingham.ac.uk or zacutm@yahoo.com

PARTICIPANT CONSENT FORM

Project title:
Enhancing Student's Design Creativity in one of Malaysia's Public Universities through a Social Networking Collaboration

Researcher's name: Zaleha Abdullah
(Supervisor 1) Name: Assoc. Prof Dr. Gordon Joyes
(Supervisor 2) Name: Dr. Rolf Wiesemes

- I have read the Participant Information Sheet and the nature and purpose of the research project has been explained to me. I understand and agree to take part.
- I understand the purpose of the research project and my involvement in it.
- I understand that I may withdraw from the research project at any stage and that this will not affect my status now or in the future.
- I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.
- I understand that I will be audio taped during the interview.
- I understand that data will be stored in the chosen social networking discussion board (Facebook). This data will be treated confidentially and will only be reported in anonymous form.
- I understand that I may contact the researcher or supervisors if I require further information about the research, and that I may contact the Research Ethics Coordinator of the School of Education, University of Nottingham, if I wish to make a complaint relating to my involvement in the research.

Signed.......................... (Research participant)
Print name................................ **Date..............................**

Contact details
Researcher:
Zaleha Abdullah: PhD student, School of Education
ttxza2@nottingham.ac.uk

Supervisor 1:
Assoc. Prof Dr. Gordon Joyes
Tel: 0115 8467202
Fax: 0115 846 6777
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Supervisor 2:
Dr. Rolf Wiesemes
Tel: 0115 846 6455
Fax: 0115 951 4475
Rolf.Wiesemes@nottingham.ac.uk

School of Education Research Ethics Coordinator:
andrew.hobson@nottingham.ac.uk
Nottingham University, School of Education, Jubilee Campus, Wollaton Road, NG8 1BB

APPROVAL LETTER TO CONDUCT RESEARCH IN MALAYSIA

FAKULTI PENDIDIKAN

Universiti Teknologi Malaysia • 81310 UTM, Skudai, Johor Darul Ta'zim, Malaysia

RUJUKAN KAMI (OUR REF.) : UTM.31/12.14/1/2/Jld. 35 (10)

RUJUKAN TUAN (YOUR REF.) :

20 November 2008

Ms. Zaleha Abdullah
School of Education
The Dearing Building
Jubilee Campus
Wollaton Road
Nottingham
NG 8 1BB

السلام عليكم ورحمة الله وبركاته

Permission to Conduct A PhD Research Work at The Faculty of Education, Universiti Technologi Malaysia (UTM)

I am writing to you in response to your letter dated 13th November 2008 which requested an official permission to conduct your PhD research in 'Enhancing Student's Design Creativity' at The Faculty of Education, UTM. After going through your research outline, we strongly feel that the research work is aptly appropriate with the nature of our students whom you intend to work with. Your proposed study on the use of social networking collaborative tools for learning such as Facebook collaboration is definitely an area of our research interest. Therefore, it is my pleasure to welcome you to conduct the proposed research work involving our students as your main sample of study.

Please feel free to contact Prof. Baharuddin Aris (The Deputy Dean) or Assoc. Prof. Mohamad Bilal Ali (The Head of EM) should you need further information or help.

Yours sincerely,

PROF. DR. MOHD SALLEH ABU
Dean
Faculty of Education,
Universiti Teknologi Malaysia
81310 UTM Skudai
Johor MALAYSIA
email: salleh@utm.my

Tel : 07-5534280 / 4169 / 4372 • **E-mel** : FP@utm.my • **Faks** : 07-5560542 / 5577351

ETHICS APPROVAL

The University of
Nottingham

0115 9514438
E-mail: jill.murray@nottingham.ac.uk

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Tel +44 (0)115 951 4543
Fax +44 (0)115 846 6600
www.nottingham.ac.uk/education
Head of School:
Professor Christine Hall

Zaleha Abdullah
c/o C Floor

28 November 2008

Dear Zaleha

I am enclosing your Ethics documentation. This has now been approved by the Ethics Coordinator. Please take note of any comments and advice given by Professor Murphy.

Best wishes

Jill

Jill Murray
Staff Research Administrator

→ Jill Murray RM

School of Education – Research Ethics Approval Form

Name	Zaleha Abdullah
Main Supervisor	Dr Gordon Joyes, Dr Rolf Wiesemes
Course of Study	PhD in Education
Title of Research Project:	Enhancing student's Design Creativity in one of M Networking Collaboration
Is this a resubmission?	N

Research starting January

Pilot study starts in Dec? Returns to Malaysia in Jan

Visual Learning Lab

Gordon Joyes is currently on study leave, but is aware of Zaleha handing in the research ethics forms (has seen the completed forms)

www.visuallearninglab.ac.uk

Date statement of research ethics received by PGR Office: 17.11.08

Research Ethics Coordinator Comments:

Dear Zaleha

This all seems to be very well thought through. Clearly using facebook raises some new ethical challenges, but I am happy that you have addressed them satisfactorily.

Good luck with your research.

Roger Murphy

Outcome:
Approved ☑ Revise and Resubmit ☐

Signed: R Murphy Name: PROF R MURPHY (Research Ethics Coordinator) Date: 27.11.08

Signed: Name: (2nd Reviewer) Date:

Appendix E: Example of the process of coding data

(Open coding: manually and also using NVivo 8)

Tutor C: [18 February at 13:15]

(1) I like the way how you organize your layout especially the one in the middle **[ACK]** BUT (2) your image are a bit distorted **[QC]** Careful when making transformation to an image – PRESS SHIFT [QC] (3) Font too small, making it hard to read **[QC]** – what is the size of your website? **[EQ]** Please refer and ask group 5 regarding this matter **[COBCOM]** (4) I think this design would look better without the Einstein cartoon BUT what do you think?? **[EDM]** (5) Why is there picture of kindergarten/ primary school children at the bottom left of your layout?? **[EQ]** I though this web is meant for secondary 4 and 5 students?). I can't see and read those texts in the box located next to the children... **[QC]** (6) Try remove that box with orange line (underneath Einstein cartoon) **[QC]** - Overall Good effort! **[MOT]**

Designer H: [19 February at 08:41]

Waa... guys..! You're getting there...! **[MOT]** don't forget to thank all of those who have spent their precious time to give feedbacks, kay! :)

Designer G - 19 February at 09:07

Ah improvement! **[ACK]**

but I do agree with your tutor, the fonts are a tad hard to read, too small **[QC].** Use a colour that is contrast to the background colour **[QC]** But I love the layout! **[ACK]** You can make some improvement here and there but for a student with no design background, this is good! **[MOT]** The picture of school kids represent as what? **[EQ]** use appropriate images, ok. Because people will question you later **[QC]**

Designer L: [19 February at 09:16]

Compose your text on main navigator nicely and give some space in

Group 1	0	0
Response	0	0
OBY	1	2
Peer_feedback	0	0
QC	1	1
Lecturer_feedb	0	0
QC	1	2
MOT	1	2
EQ	1	2
COBCOM	1	1
Designer_feed	0	0
QC	1	8
PR	1	1
MOT	1	7
MOK	1	1
EQC	1	1
EQ	1	3
EDM	1	1
Group 2	0	0
Response	0	0
OBY	0	0
LFM	1	1
DT	1	2
Peer_feedbac	0	0
QC	1	6
MOT	1	2
Lecturer_feed	0	0
QC	1	2
PM	1	1
MOT	1	3
Designer_fee	0	0
QC	1	17
PR	1	3
PA	1	3
MOT	1	10
MOK	1	1
EQC	1	3
EQ	1	6
COBCOM	1	1

Appendix F: Graphs indicating the style of feedback delivered by participants regarding different design submissions

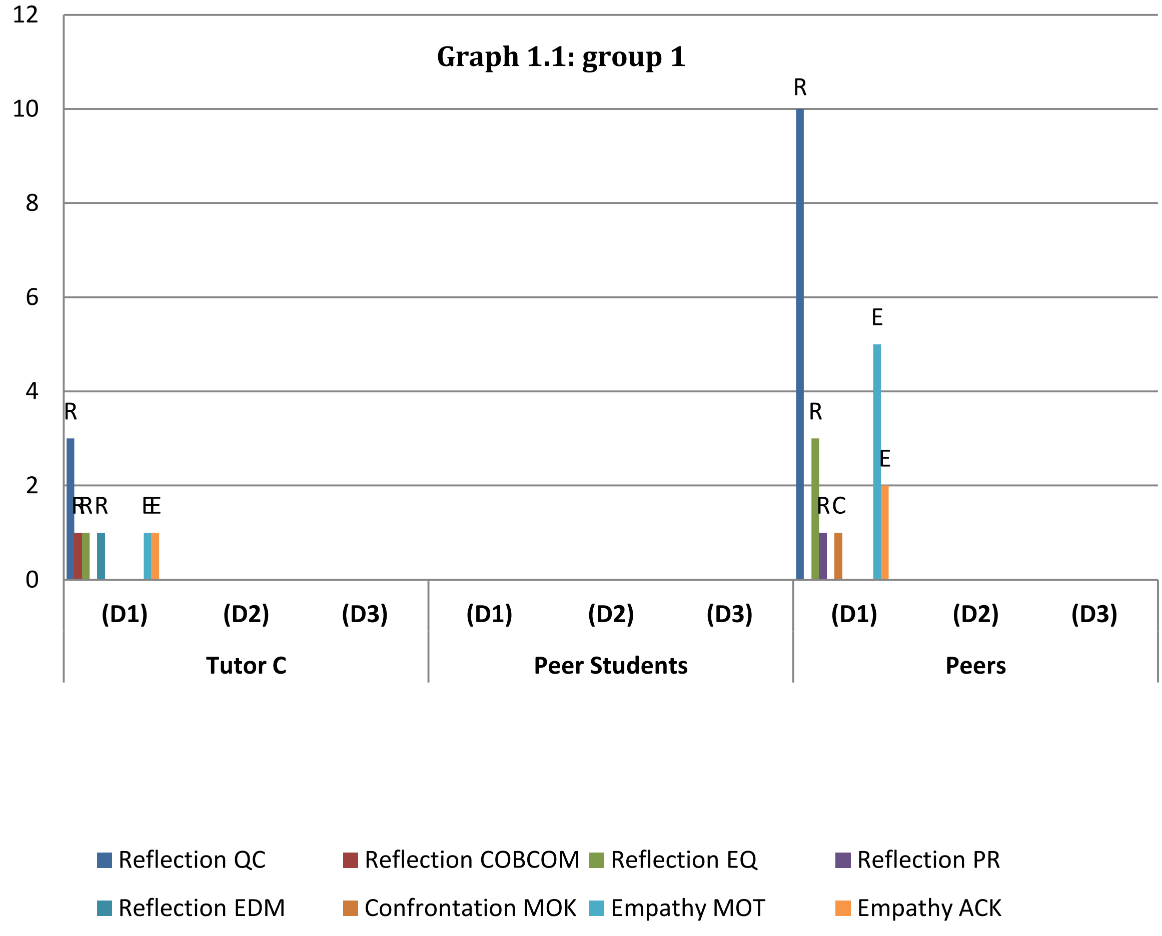
Graph Indications:

(1) Graphs 1.1 – 1.15 indicate the style of feedback delivered by participants (tutor, peer students and designers) at three different phases of the design (D1, D2 and D3) to each group.

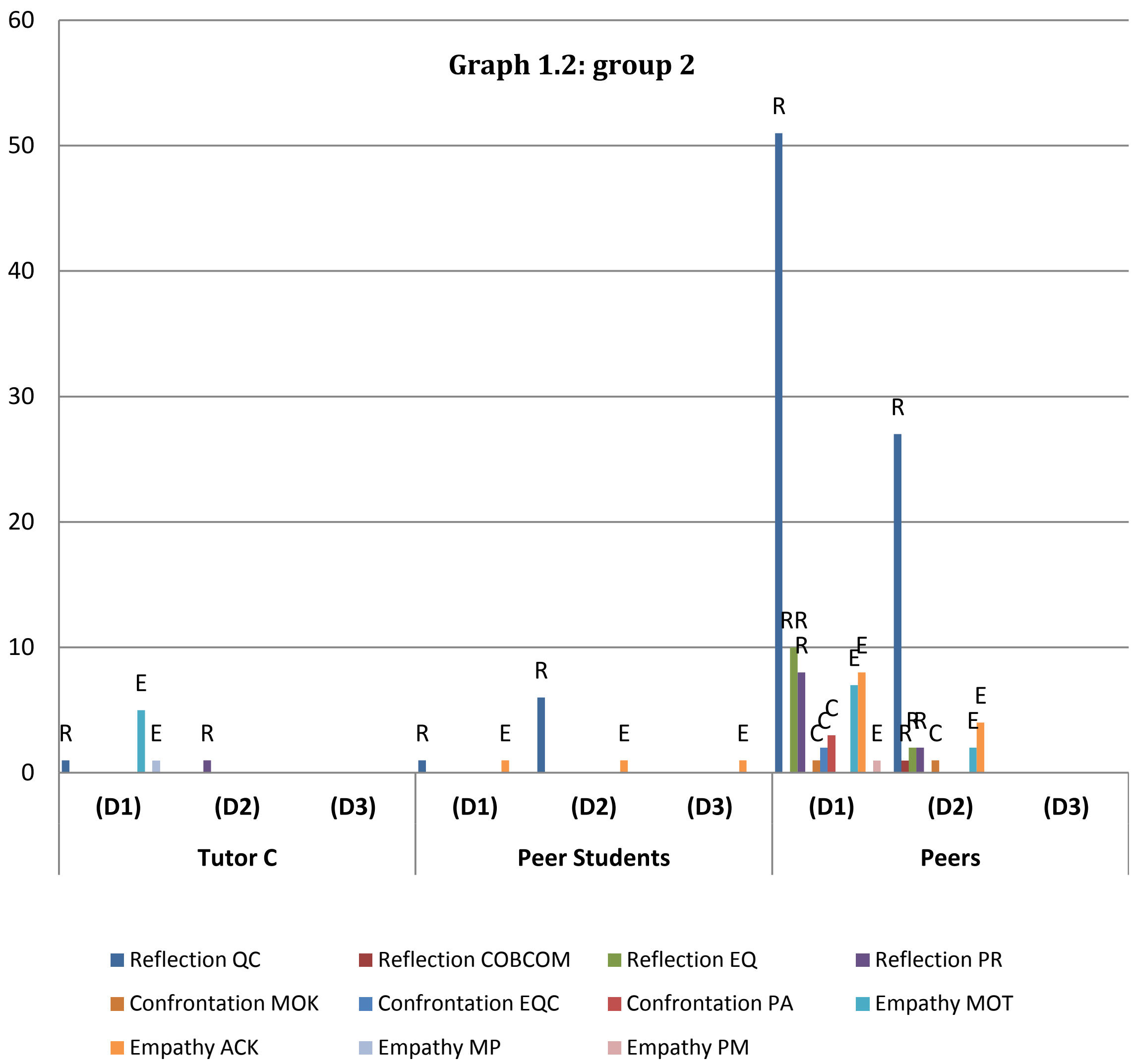
(2) R, C or E on top of each bar stand for the style of feedback: R for reflection, C for confrontation and E for empathy.

(3) Numbers on the left hand side of the graph represent the amount of feedback being delivered.

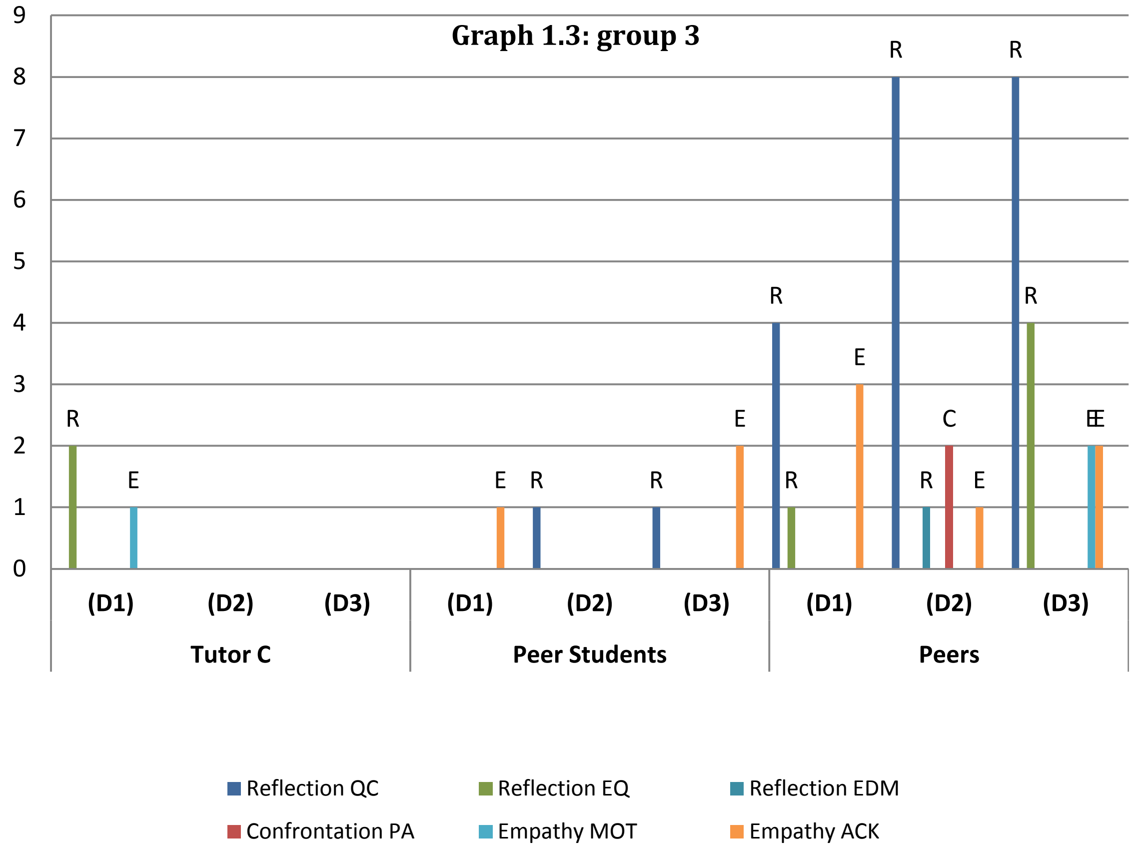
(4) Different colours on the chart represent different types of feedback. Colour indication is given below every chart.



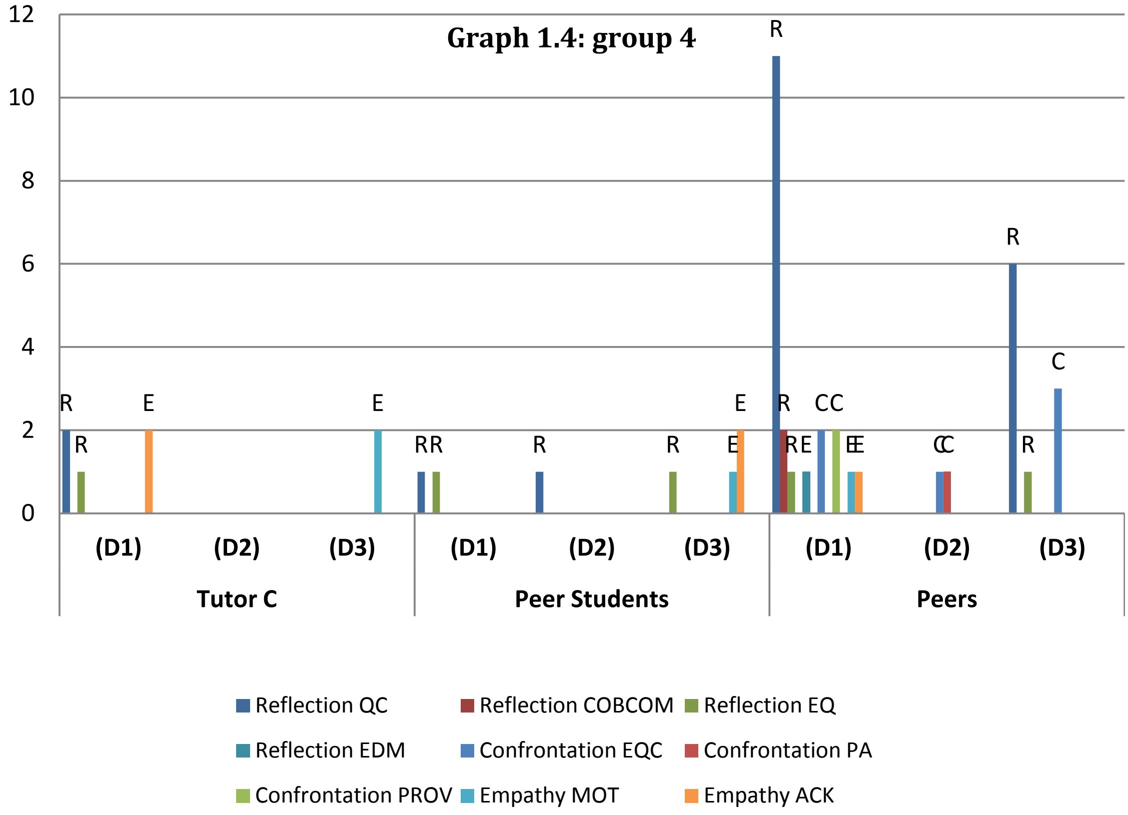
Graph 1.1 illustrates that the tutor delivered six feedback for reflection and two feedback for empathy on group 1's first design; however the tutor left no feedback on the second design. Peer students did not deliver any feedback on all of group 3' designs. Designers delivered fifteen feedback for reflection and seven feedback for empathy on group 1's first design but left no feedback on the second and third designs.



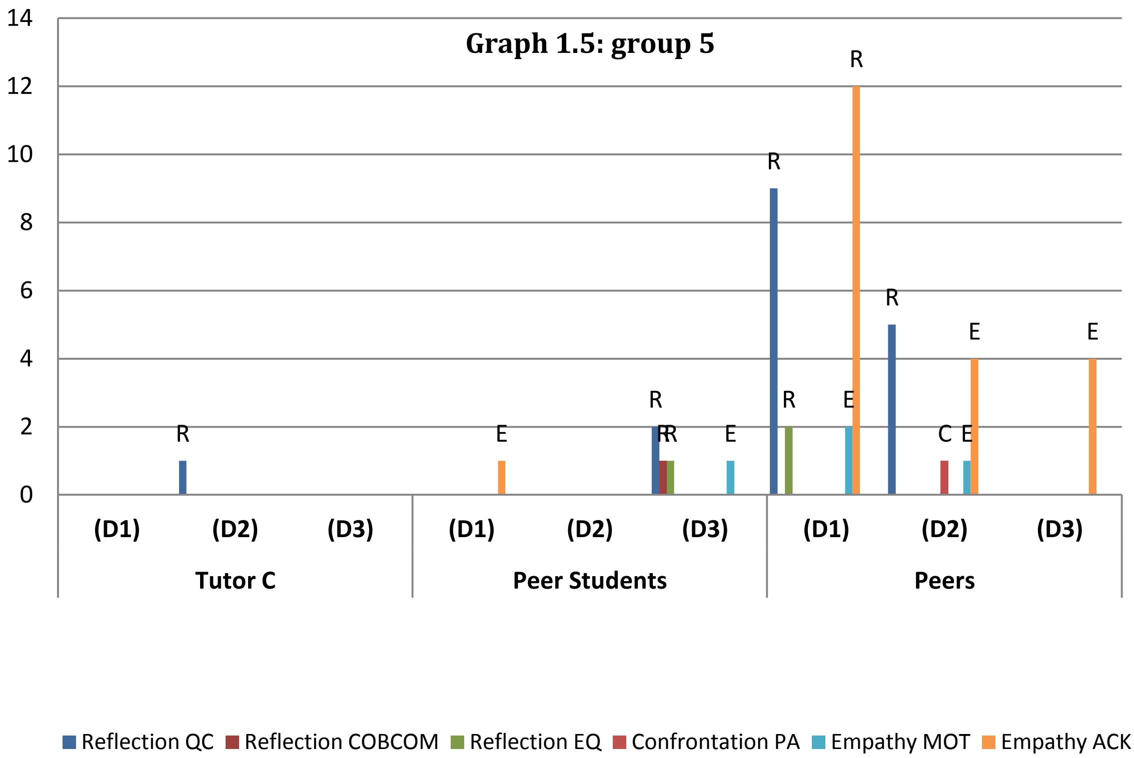
Graph 1.2 illustrates that the tutor delivered one feedback for reflection and six feedback for empathy on group 2's first design; and one feedback for reflection on the second design. The tutor however did not leave any feedback on the third design. Peer students delivered one feedback for reflection and one feedback for empathy on group 2' first design; six feedback for reflection and one feedback for empathy on the second design; and one feedback for empathy on the third design. Designers delivered sixty-nine feedback for reflection, six feedback for confrontation, and sixteen feedback for empathy on group 2's first design; thirty-two feedback for reflection, one feedback for confrontation and six feedback for empathy on the second design. Similar to the tutor, designers did not leave any feedback on group 2's third design.



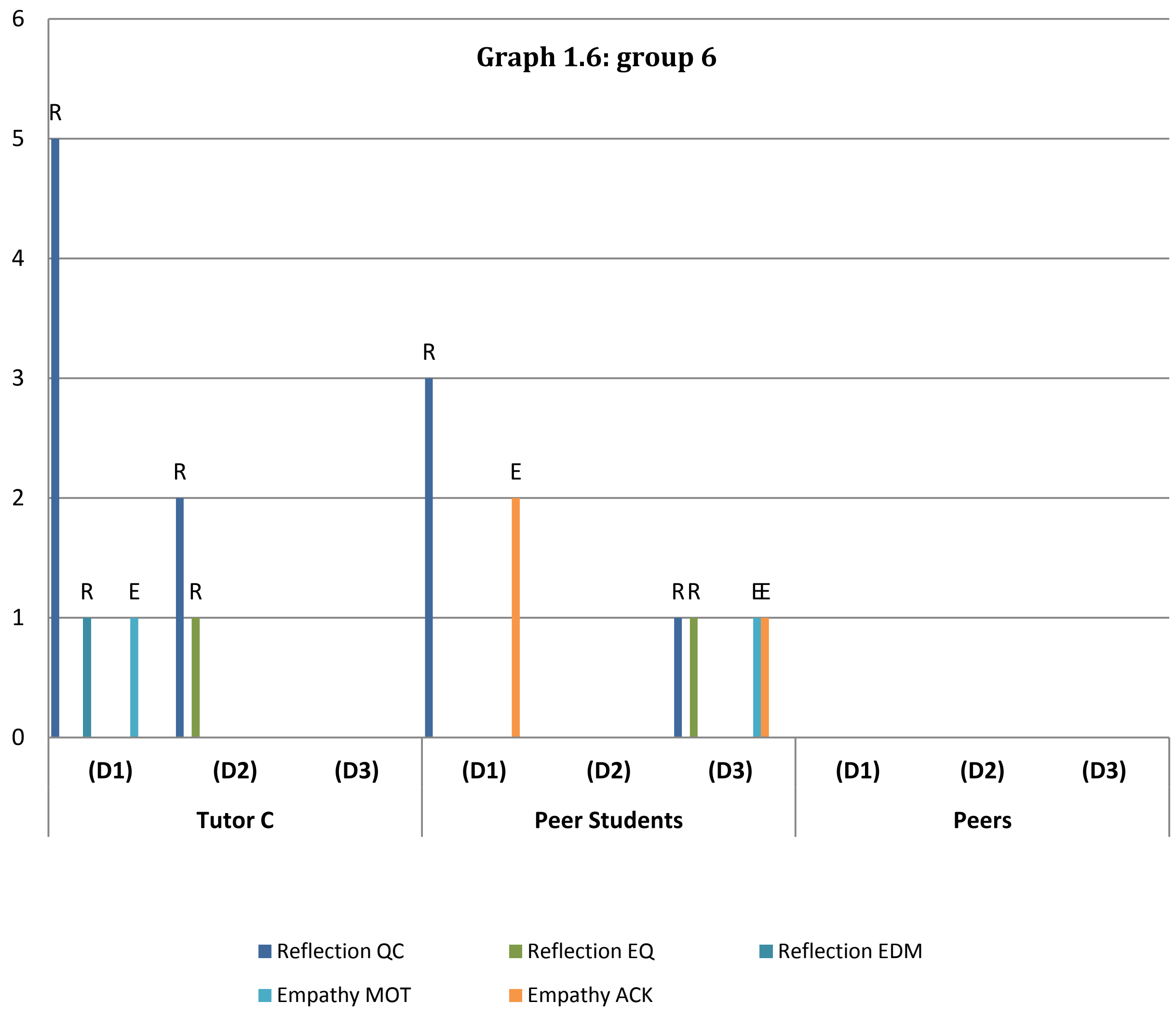
Graph 1.3 illustrates that the tutor delivered two feedback for reflection and one feedback for empathy on group 3's first design; however the tutor left no feedback on the second and third designs. Peer students delivered one feedback for empathy on group 3' first design; one feedback for reflection on the second design; and one feedback for reflection and two feedback for empathy on the third design. Designers delivered five feedback for reflection, and three feedback for empathy on group 3's first design; nine feedback for reflection, two feedback for confrontation and one feedback for empathy on the second design; and finally twelve feedback for reflection and four feedback for empathy on the third design.



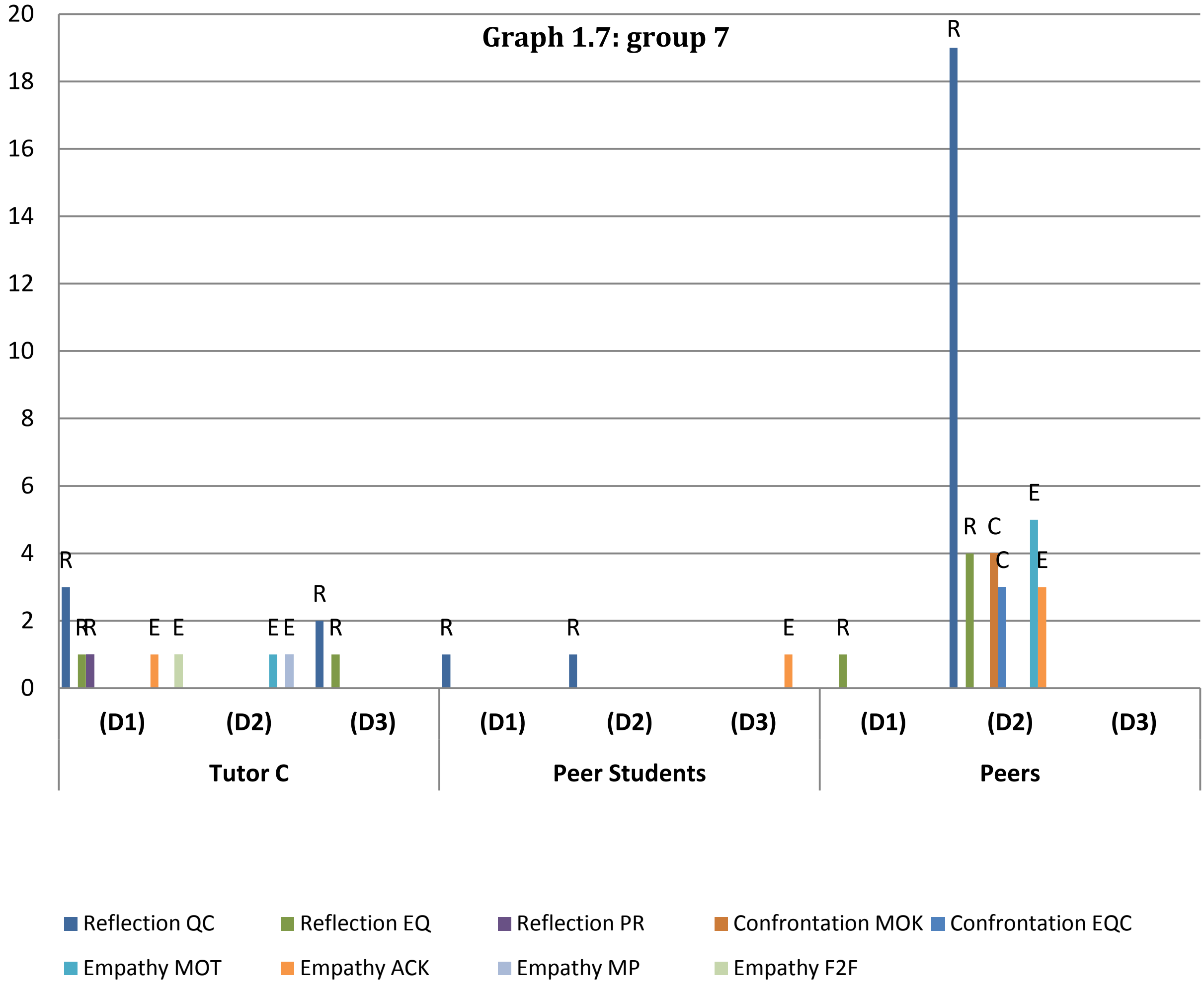
Graph 1.4 demonstrates that the tutor delivered three feedback for reflection and two feedback for empathy on group 4's first design; the tutor left no feedback on the second design but delivered two feedback for empathy on the third design. Peer students delivered two feedback for reflection on group 4' first design; one feedback for reflection on the second; and one feedback for reflection and three feedback for empathy on the third design. Designers delivered fifteen feedback for reflection, four feedback for confrontation and two feedback for empathy on group 4's first design; two feedback for confrontation on the second design; and finally seven feedback for reflection and three feedback for empathy on the third design.



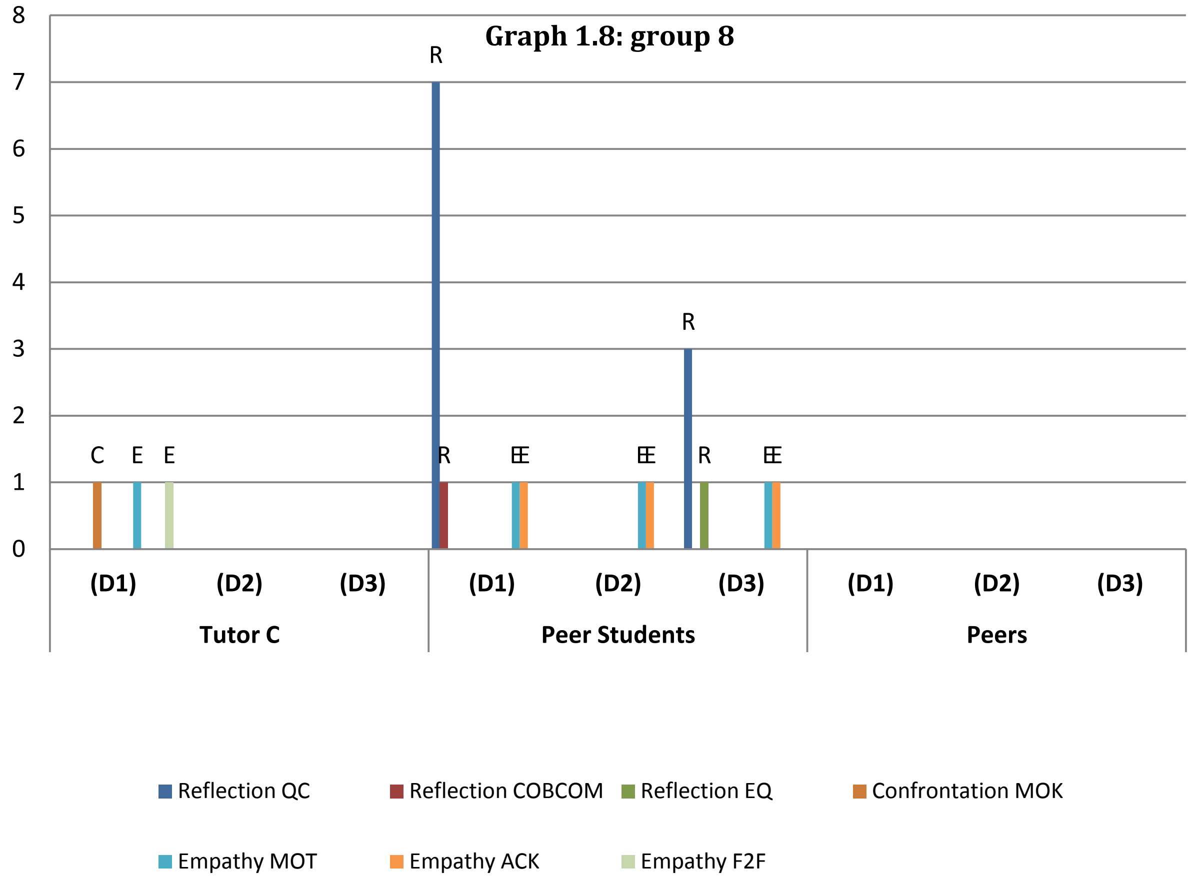
Graph 1.5 demonstrates that the tutor delivered only one feedback for reflection on group 5' first design but left no feedback on the second and third designs. Peer students delivered one feedback for empathy on group 5' first design; left no feedback on the second design but delivered four feedback for reflection and one feedback for empathy on the third design. Designers delivered eleven feedback for reflection and fourteen feedback for empathy on group 5's first design; five feedback for reflection, one feedback for confrontation and five feedback for empathy on the second design; and finally four feedback for empathy on the third design.



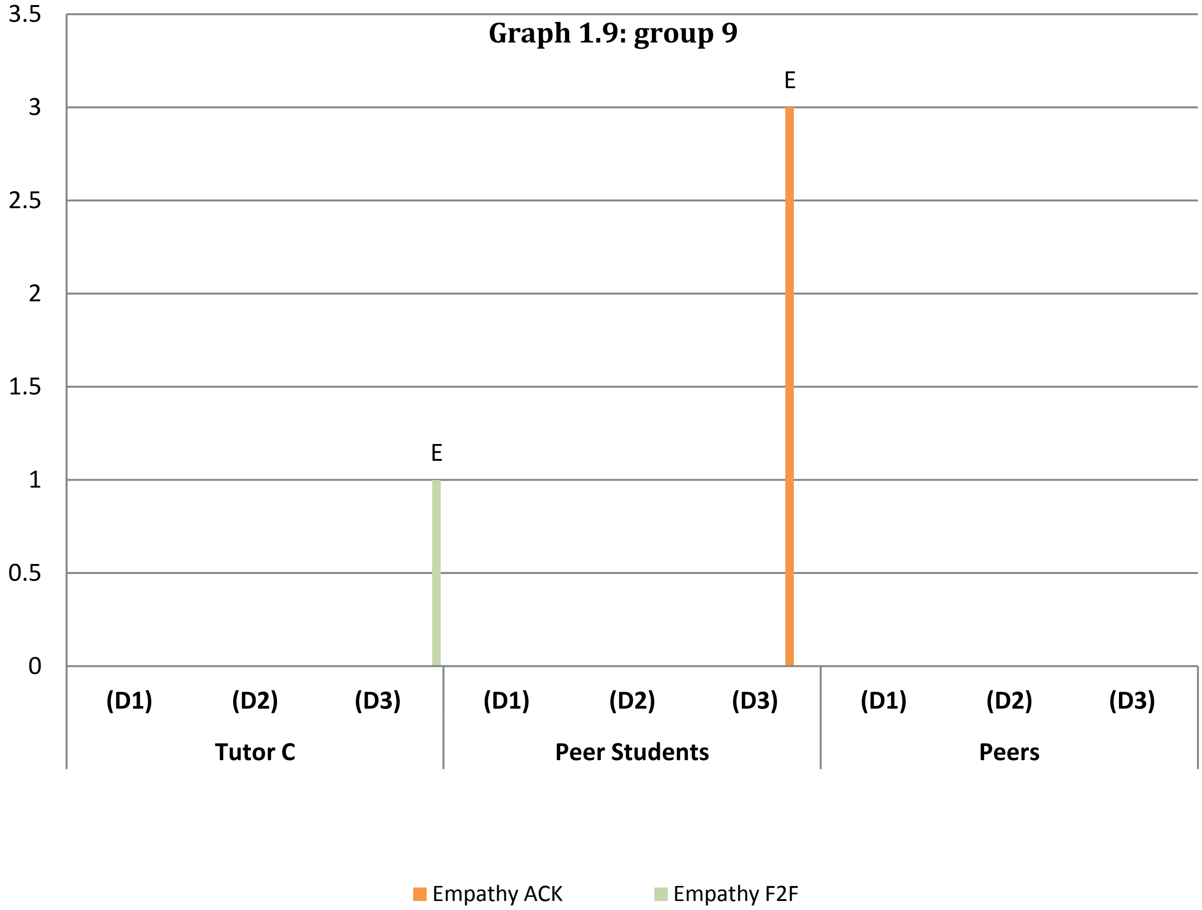
Graph 1.6 illustrates the tutor delivered six feedback for reflection and one feedback for empathy on group 6's first design; three feedback for reflection on the second design; but left no feedback on the third design. Peer students delivered three feedback for reflection and two feedback for empathy on the first design; left no feedback on the second design; but delivered two feedback for reflection and two feedback for empathy on group 6' third design. Designers did not leave any feedback on all of group 6's designs.



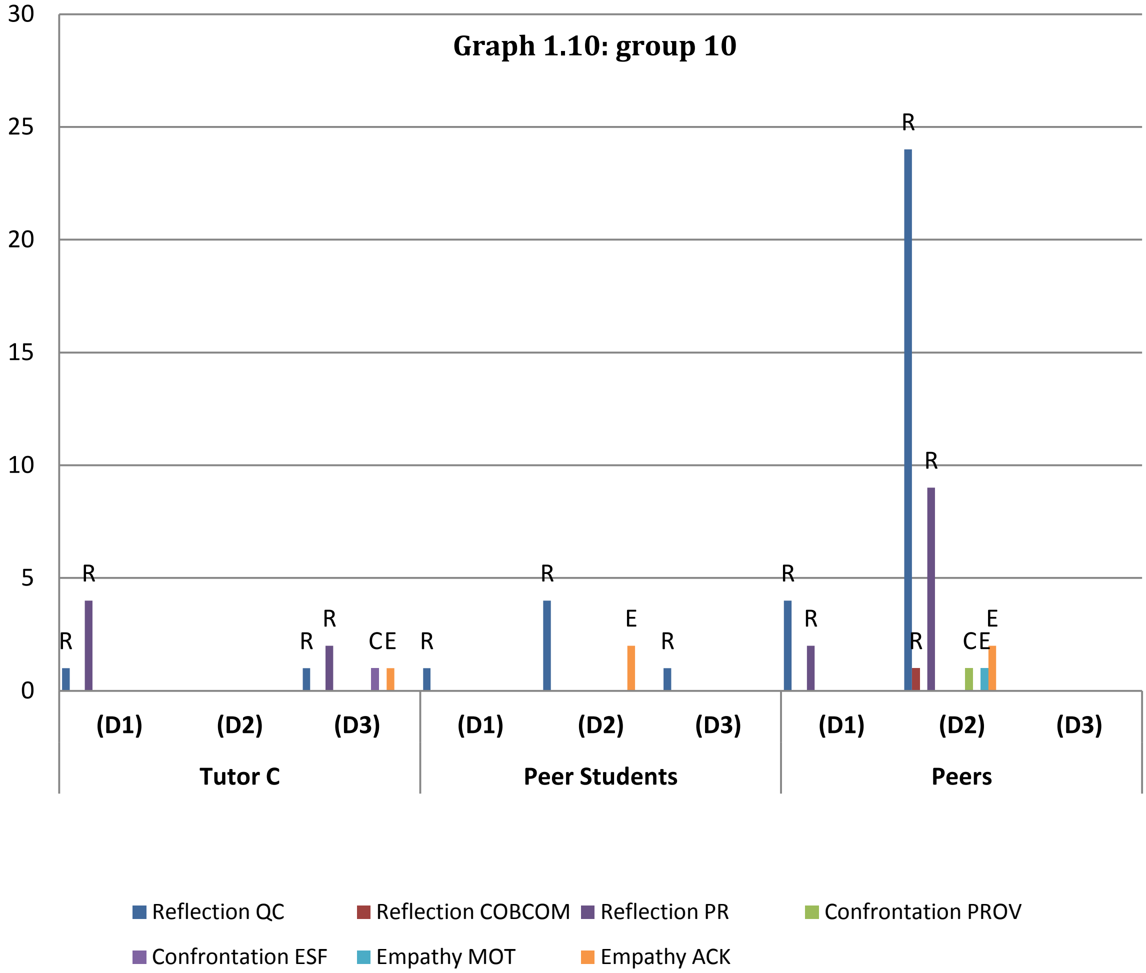
Graph 1.7 illustrates that the tutor delivered five feedback for reflection and two feedback for empathy on group 1's first design; two feedback for empathy on the second design; and three feedback for reflection on the third design. Peer students delivered one feedback for reflection on group 3' first design; one feedback for reflection on second design; and one feedback for empathy on the third design. Designers delivered one feedback for reflection on the first design; twenty-three feedback for reflection, seven feedback for confrontation and eight feedback for empathy on group 7's second design; but left no feedback on the third design.



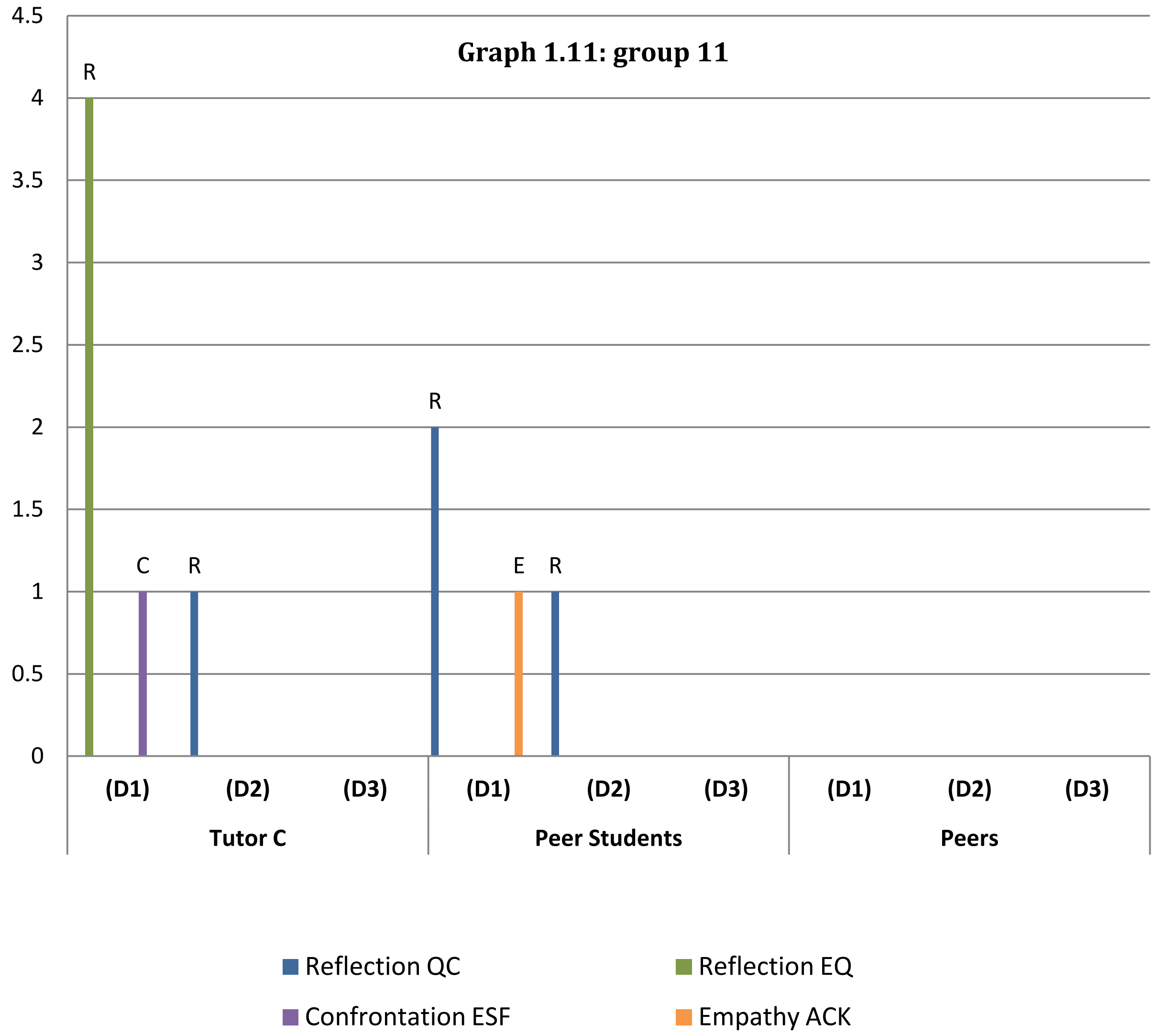
Graph 1.8 demonstrates that the tutor delivered one feedback for confrontation and two feedback for empathy on group 8' first design but left no feedback on the second and third designs. Peer students delivered eight feedback for reflection and two feedback for empathy on group 8' first design; two feedback for empathy on the second design; and four feedback for reflection and two feedback for empathy on the third design. Group 8 however received no feedback from designers for their first, second and third designs.



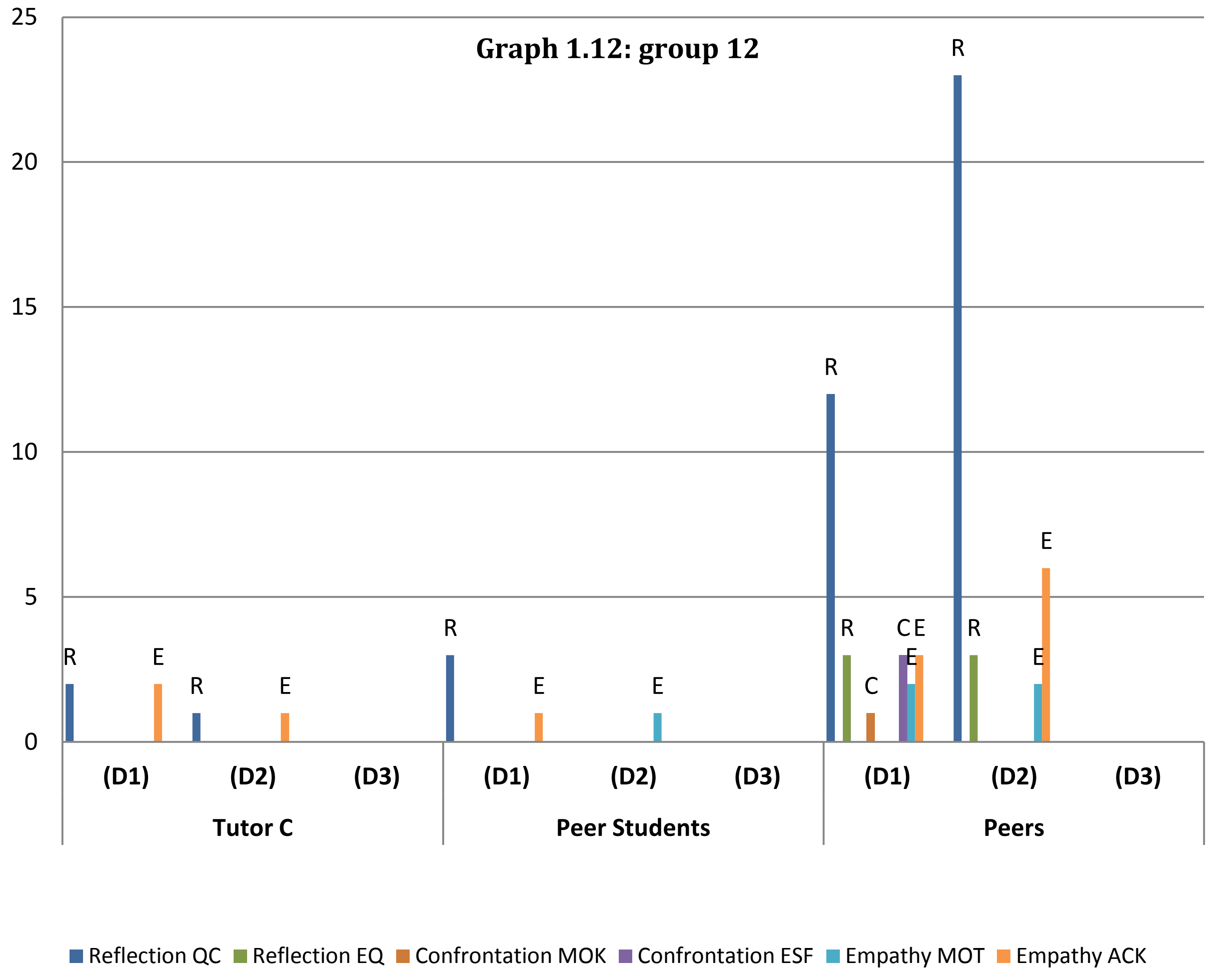
Graph 1.9 illustrates that the tutor did not deliver any feedback on group 9's first and second designs; but delivered one feedback for empathy on the third design; however the tutor left no feedback on the second design. Peer students also did not deliver any feedback on group 9' first and second design; but left three feedback for empathy on the third design. Designers did not leave any feedback on all of group 9's designs.



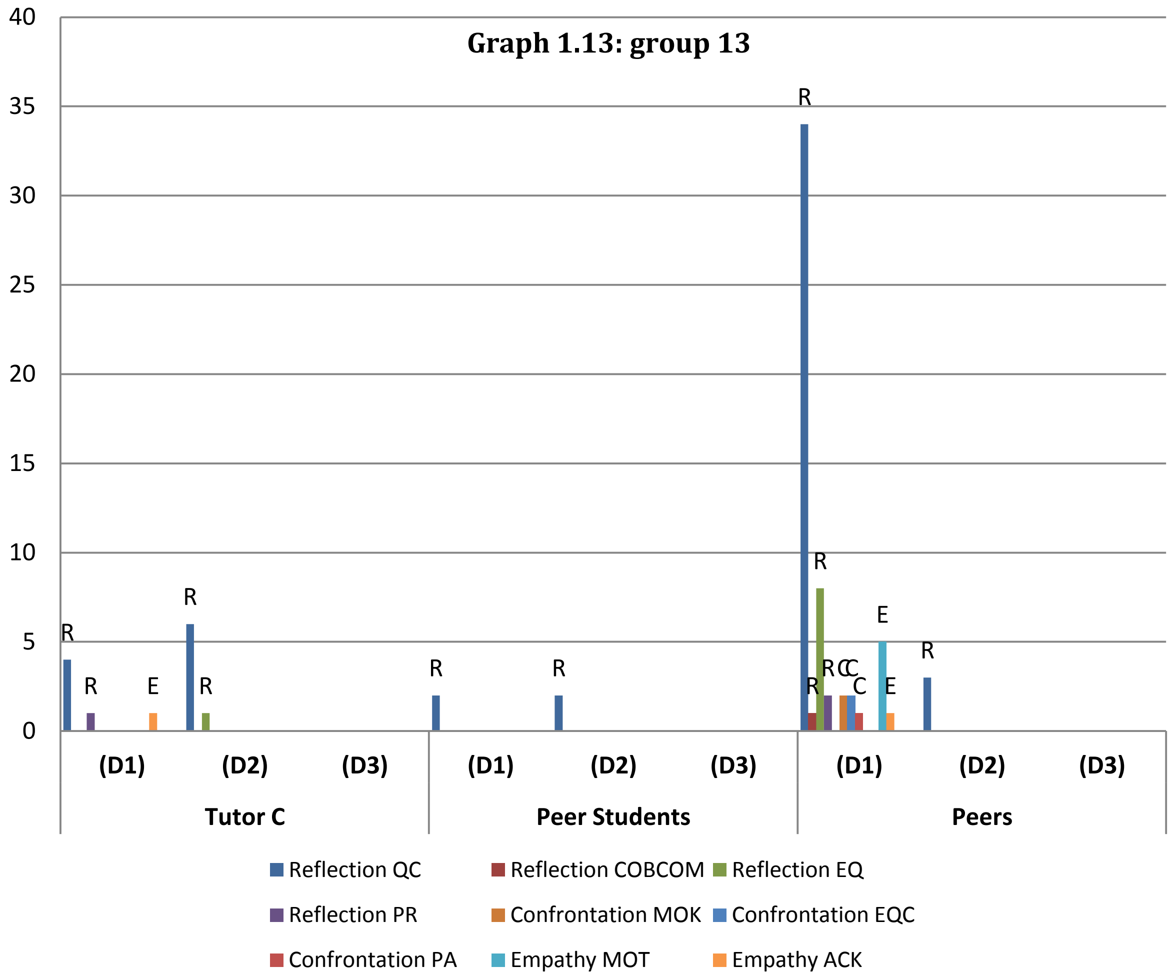
Graph 1.10 illustrates that the tutor delivered five feedback for reflection on group 10' first design; left no feedback on the second design; and delivered three feedback for reflection, one feedback for confrontation and one feedback for empathy on the third designs. Peer students delivered one feedback for reflection on group 10' first design; four feedback for reflection and two feedback for empathy on the second design; and one feedback for reflection on the third design. Designers delivered six feedback for reflection on group 10's first design; thirty-four feedback for reflection, one feedback for confrontation and three feedback for empathy on the second design; designers however did not leave any feedback the third design.



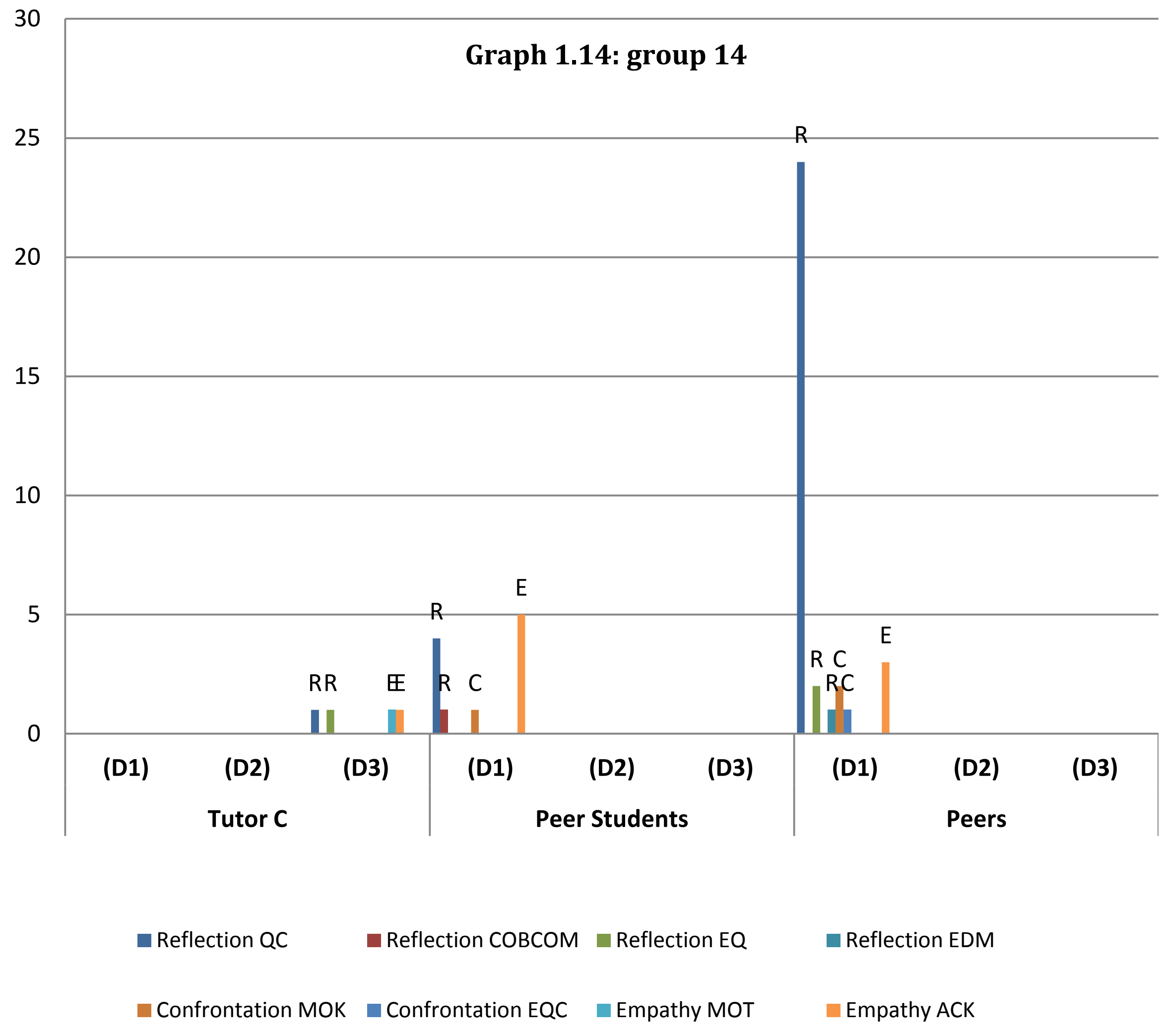
Graph 1.11 illustrates that the tutor delivered four feedback for reflection and one feedback for confrontation on group 11' first design; one feedback for reflection on the second design; but left no feedback on the third design. Peer students delivered two feedback for reflection and one feedback for empathy on group 11' first design; one feedback for reflection on the second design; and no feedback on the third design. Group 11 unfortunately received no feedback from designers on all of their designs.



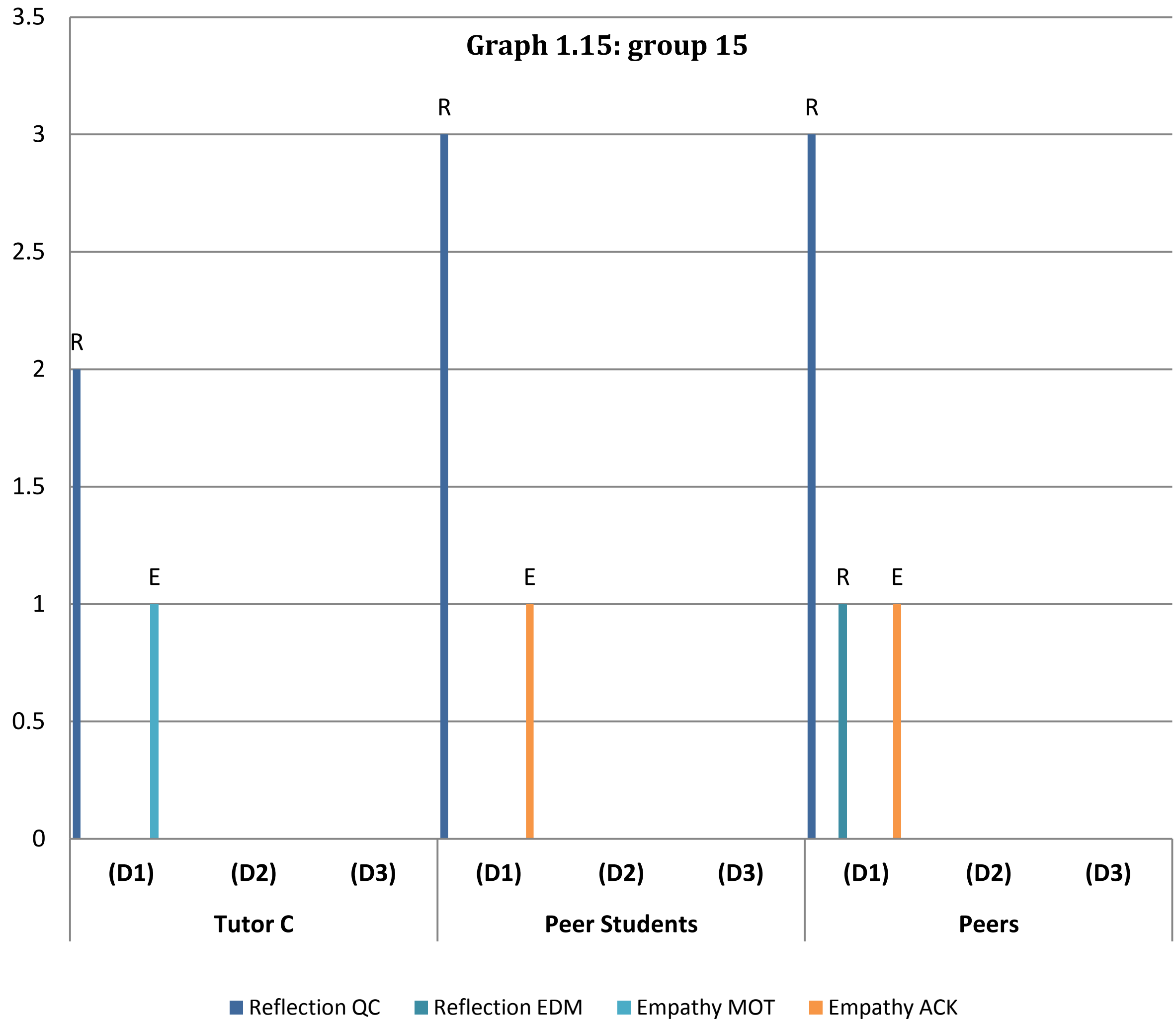
Graph 1.12 illustrates that the tutor delivered two feedback for reflection and two feedback for empathy on group 12's first design; one feedback for reflection and one feedback for empathy on the second design; and no feedback on the third design. Peer students delivered three feedback for reflection and one feedback for empathy on the first design; one feedback for empathy on the second; and no feedback was delivered on the third design. Designers delivered fifteen feedback for reflection, four feedback for confrontation and five feedback for empathy on group 12's first design; twenty-six feedback for reflection and eight feedback for empathy on second; but left no feedback on the third design.



Graph 1.13 illustrates that the tutor delivered five feedback for reflection and one feedback for empathy on group 13's first design; seven feedback for reflection on the second design; and no feedback on the third design. Peer students delivered two feedback for reflection on the first design; two feedback for reflection on the second design; and no feedback on the third. Designers delivered forty-five feedback for reflection, five feedback for confrontation, and six feedback for empathy on group 13's first design; three feedback for reflection on the second design; and no feedback was delivered on the third design.



Graph 1.14 illustrates that the tutor delivered no feedback on group 14' first and second designs but left two feedback for reflection and two feedback for empathy on the third design. Peer students delivered five feedback for reflection, one feedback for confrontation and five feedback for empathy on group 14' first design but left no feedback on the second and third designs. Designers did not delivered any feedback on group 14's second and third designs but left twenty-seven feedback for reflection, three feedback for confrontation and three feedback for empathy on their first design.



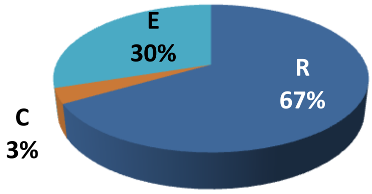
Graph 1.15 illustrates that the tutor delivered two feedback for reflection and one feedback for empathy on group 15's first design; however the tutor left no feedback on the second and third designs. Peer students delivered three feedback for reflection and one feedback for empathy on the first design; but left no feedback on group 15' second and third designs. Designers delivered four feedback for reflection and one feedback for empathy on group 15's first design but left no feedback on the second and third designs.

Appendix G: Percentage of style of feedback delivered to each group in the study

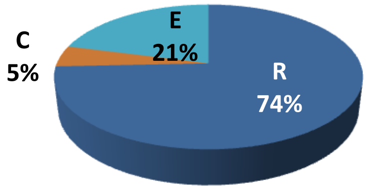
Pie chart indications:

R, C or E on the pie chart stand for the style of feedback: R for reflection, C for confrontation and E for empathy

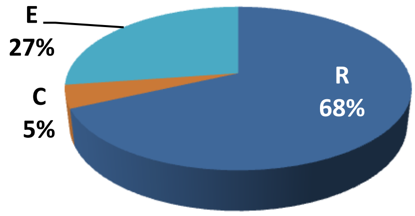
Group 1:



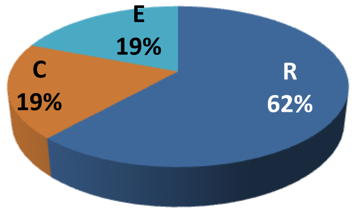
Group 2:



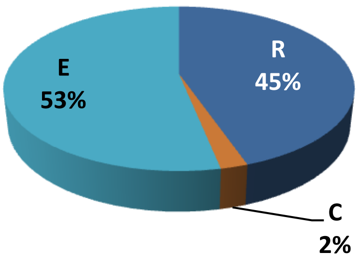
Group 3:



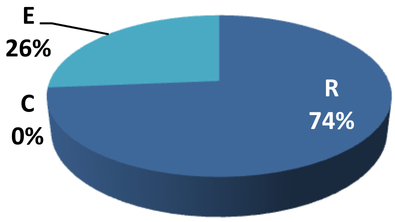
Group 4:



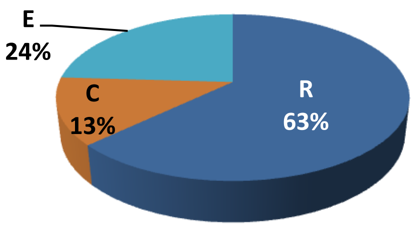
Group 5:



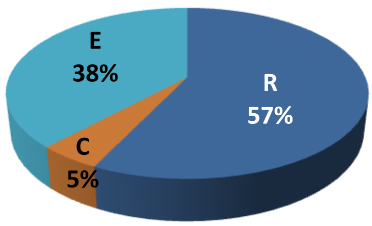
Group 6:



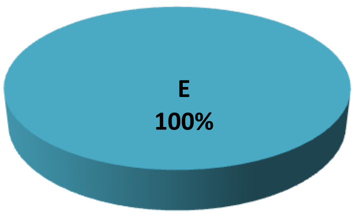
Group 7:



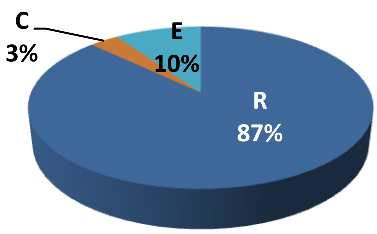
Group 8:



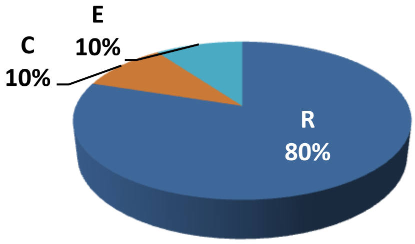
Group 9:



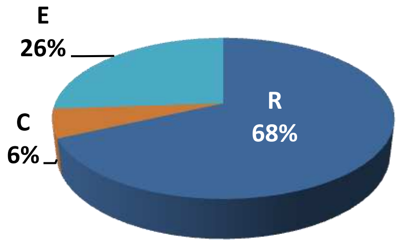
Group 10:



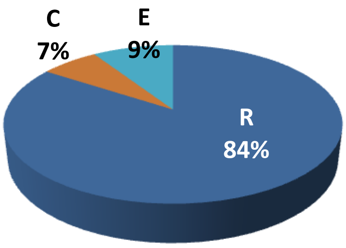
Group 11:



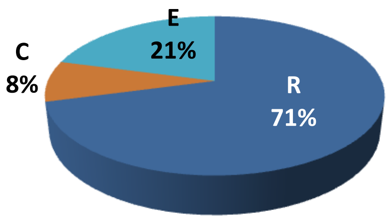
Group 12:



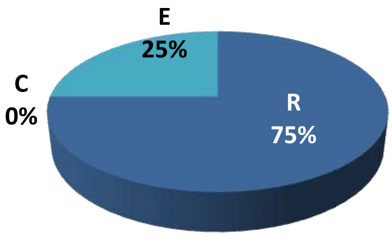
Group 13:



Group 14:

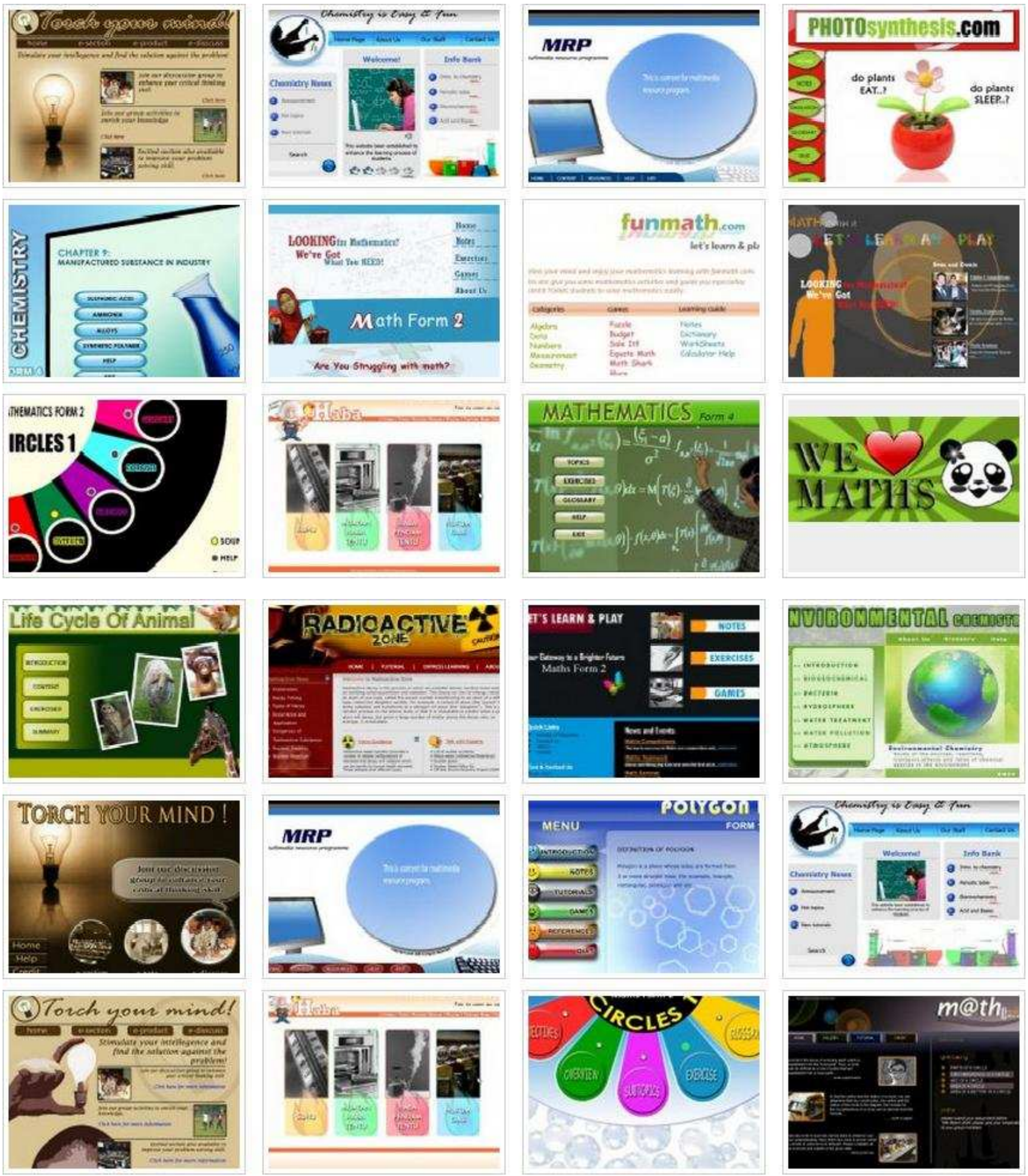


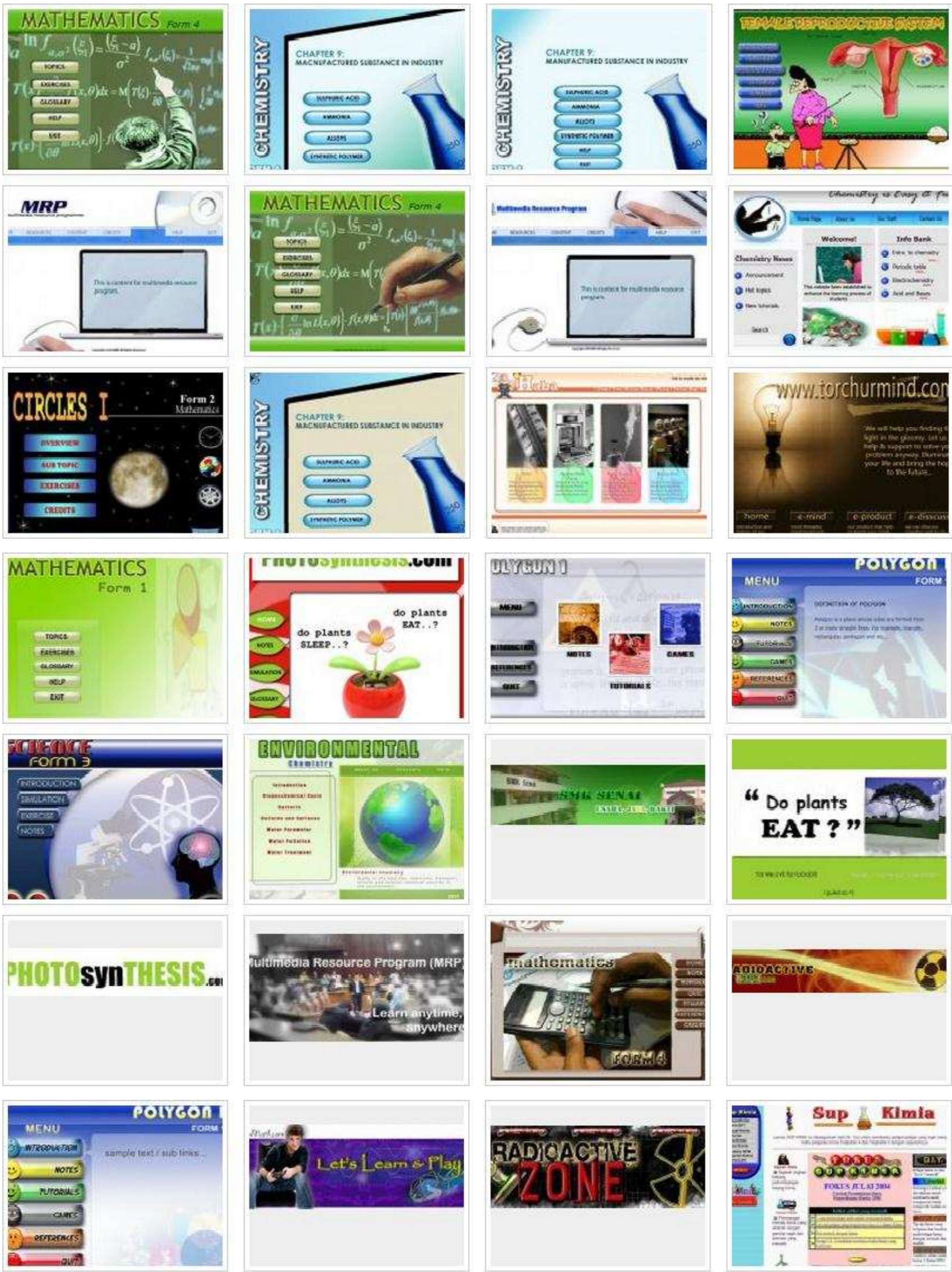
Group 15:



Appendix H: Examples of students' designs and interactions with other participants on Facebook

Examples of designs produced by students in this study:




MATHEMATICS Form 4
TOPICS
EXERCISES
GLOSSARY
HELP
EXIT
CHEMISTRY
CHAPTER 9:
MACNUFACTURED SUBSTANCE IN INDUSTRY
SULPHURIC ACID
AMMONIA
ALLOYS
SYNTHETIC POLYMER
CHAPTER 9:
MANUFACTURED SUBSTANCE IN INDUSTRY
FEMALE REPRODUCTIVE SYSTEM
MRP
Multimedia Resource Program
Welcome!
Info Bank
Chemistry News
CIRCLES I
Form 2
Mathematics
OVERVIEW
SUB TOPIC
EXERCISES
CREDITS
www.torchurmind.com
home
e-mind
e-product
MATHEMATICS
Form 1
do plants SLEEP..?
do plants EAT..?
HOME
NOTES
SIMULATION
GLOSSARY
MENU
NOTES
GAMES
TUTORIALS
INTRODUCTION
REFERENCES
QUIT
POLYGON
FORM
INTRODUCTION
TUTORIALS
GAMES
SCIENCE
Form 3
INTRODUCTION
SIMULATION
EXERCISE
NOTES
ENVIRONMENTAL
Chemistry
SMK SENAI
“ Do plants EAT ? ”
PHOTOsynTHESIS
Multimedia Resource Program (MRP)
Learn anytime, anywhere
mathematics
FORM 4
RADIOACTIVE
POLYGON
MENU
INTRODUCTION
NOTES
TUTORIALS
GAMES
REFERENCES
QUIT
sample text / sub links...
Let's Learn & Play
RADIOACTIVE
ZONE
Sup Kimia

Some examples of interactions between participants on Facebook:

[Facebook: first design by group 2]

Designer L: [30 January 2009 at 11:57]
"Can you provide us with a brief description? This banner is meant for what? a website? and for whom? "

Group 2: [30 January 2009 at 13:26]
"This banner is meant for educational website, for secondary five students undertaking physic, topic on radioactive".

Designer J: [30 January 2009 at 14:00]
"(1) Paper clip on the left hand side should not be there, should leave it out totally; (2) colour should be more acidic - try lime green or neon yellow colour on black background, stands out and gives the radioactivity kind of feel; (3) size of line for the grid, make it thinner, try 0.75 or 0.5 points; (4) the radioactive icon on the right hand side can be made better, try cleaner lines; (5) typeface is not too bad, it may look nicer if both Radioactive and Zone are the same size… considering this is a student's work, it's not too bad. I know that I would be doing the same thing back in the 90's [Laugh]. Good job though and can be improvised. One more thing, you need to have references no matter what".

Designer A: [31 January 2009 at 00:27]
"Frankly I think this design is bloody rubbish. There is no simplicity at all. This design looks like it is being produced by school kids not university students."

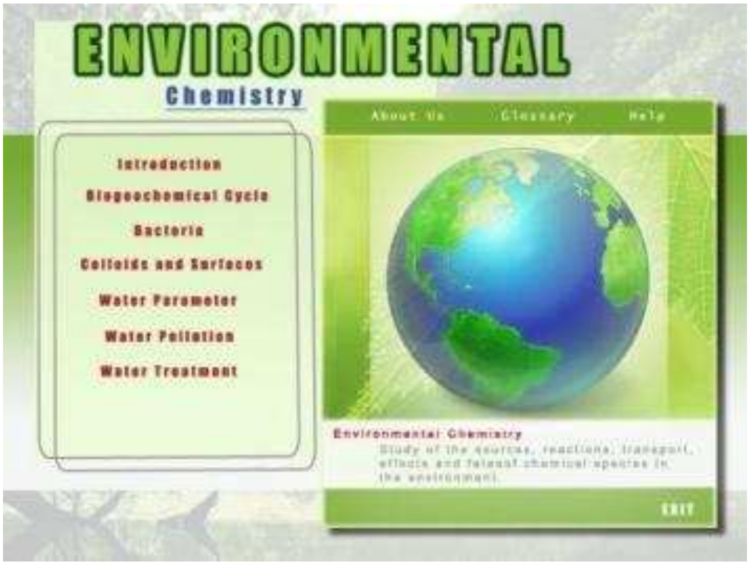
Designer E: [31 January 2009 at 02:19]
"Overall, this design is actually not too bad, considering it was produced by students. Just take out the paper clip and the thread on top and replace it with element of radioactive".

Designer L: [31 January 2009 at 06:02]

“First of all, let us look at the rule of presentation. You are submitting a work/project without providing us with any description and you expect us to give feedback. This is lame and unprofessional, especially when you are trained to be a teacher.”

Tutor C: [31 January 2009 at 09:07]
“Group 2, please do not get offended by designers’ comments. They are only trying to help you. Their words might be a bit harsh but they meant well. Take it positively. Dear designer friends, let us not forget that these students are not from a design background. They are mathematicians, physicists and science students. Your positive guidance will come in handy for them.”

Group 2: [31 January 2009 at 10:12]
“wow... never before we received this kind of feedback from our tutor... there is plenty of rational in what has been said which made us thinking... thank you all...”



[Facebook: first design by group 14]

Peers from group 10: [12 February 2009 at 03:48]
“(1) nice combination of colour; (2) the fonts look a bit small; (3) why is there green coloured box behind the word ‘ENVIRONMENTAL CHEMISTRY’? I think it will look better without it. (4) What is the function of that exit button? So that users can exit from the website? [Laugh].”

Group 14: [12 February 2009 at 04:50]

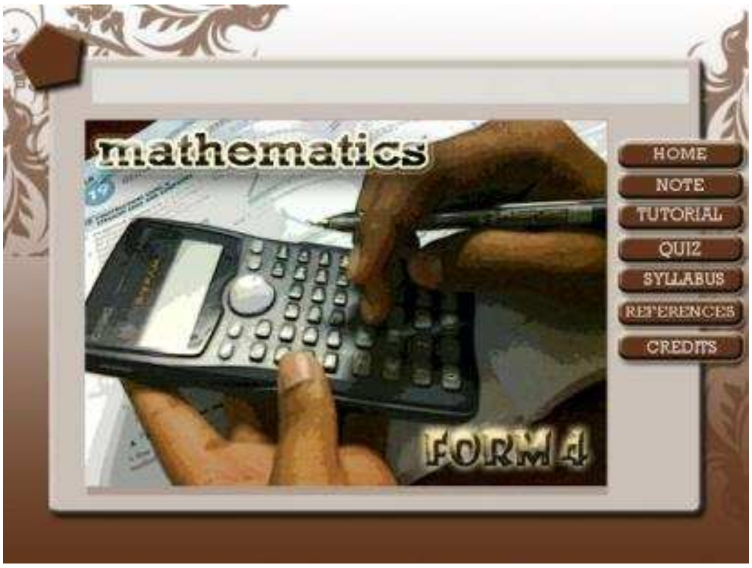
“To group 10, this is a design created for an educational courseware, not for a website. So, the exit button is there for user to exit from the courseware. Is the menu too small? You can’t see them? It looks fine to us”.

Designer L: [12 February 2009 at 06:10]
“This design is a bit problematic. You have to adjust your design alignment. I don’t think the grey lines matter. Adjust your font size to another 1 or 2 pt; always check the readability of your font”.

Designer A: [12 February 2009 at 06:13]
“Your design looks neat and clean at a glance. But when I look at it again….busted! It’s like looking at a transvestite. You thought it was a girl at a glance but it was not a girl after all....This is how I viewed your design...The reason why I say so is because your layout composition is still not in a proper structure.”

Designer C: [12 February 2009 at 06:44]
“Overall, the layout is nice but the only concern is the choice of font. (1) Does the ‘Environmental and Chemistry’ belong to one heading or two? Users may get confuse; (2) I can’t read those red buttons on the left, please change to another type of font.; (3) same goes with the button for your menu; (4) Please use one or two type of fonts… the less the better”.

Group 14: [12 March 2009 at 04:19]
“To all designers, we have taken all of your comments into consideration... thank you and we will try to improve this design...”



[Facebook: Second design by group 10]

Peers from group 5: 05 February 2009 at 03:18
"Your design reflects classical concept because we can see you are using the traditional floral pattern".

Group 10: [05 February 2009 at 03:20]
"We tried to combine the traditional element with mathematic element".

Peers from group 4: [05 February 2009 at 04:46]
"We would like to share our views… the type of font you used does not complement your design. Vibrant colour would look better on the word 'mathematic and form 4'".

Designer F: [05 February 2009 at 16:28]
"To me, you are trying to avoid getting negative feedback. This is a 'play safe' design – very bad choice of fonts and colour. There is nothing special about this design. NO PAIN NO GAIN."

Designer A: [06 February 2009 at 01:26]
"As this design is produced by premature designers, I would say not bad…. Your design is better that those design I have seen from the government's website. From an educator perspective, I would rate you with grade B. The reason is because; I prefer if the button is placed on the left hand side or on the top; background design should remain plain and you should use geometrical element. The flora pattern looks as if this is a website meant for craft instead of mathematic. Standardise your use of font, use only one type of font and play around with its size and character. Please view this site

for more ideas in choosing relevant images: www.inmagine.com.my, then search for mathematics.

Tutor C: [09 February 2009 at 03:43]
“Check out this sample:
http://www.inmagine.com/searchterms/mathematic.html”.

Group 10: [09 February 2009 at 06:40]
“Thank you all for your comments... Actually, we tried to come out with a new idea by placing the button on the right hand side instead of the left...anyway... thanks again”.

[Facebook: second design by group 3]

Designer L: [06 February 2009 at 05:49]
“Colour wise - very good but you have to make some adjustment with the button design; users need to know if the button is functional. Your choice of fonts is less interesting. Stay with 1 or 2 types of fonts. Why do you use 2 types of fonts in a wording "Do Plants EAT"? Also, why do you have a mix of capital and small letters in a word? This is not right….”

Peers from group 10: [06 February 2009 at 09:40]
“What are you trying to say from those words? It is not clear… the font size is also not suitable but your choice of graphic is not bad”.

Designer F: [06 February 2009 at 10:21]
“Can somebody please tell me what the #@%* this is? What is the function of those texts at the bottom? Are they supposed to change colour when we roll our mouse over? I don’t think

the effect matters when you are producing a nonsense design!!"

Designer H: [06 February 2009 at 14:00]
"Too many fonts! Enough said".

Designer L: [06 February 2009 at 22:46]
"I think, enough with all of the comments. I bet the students have failed to properly absorb what we have said. I don't think they get it. They can't differentiate which is right or wrong. I think, the best way to do now is for tutor to perform a discussion with the students by referring to all of the designers' comments…In order to not waste our time and effort, please analyse all of our comments and digest them properly. This is a common process in producing design - discuss > analyse > sketch ideas > amend > recreate > reproduce".

Designer L: [06 February at 22:57]
I can see that group 3 and others (especially group 5) have very good sense of design but I'm sure that they will get bored and confused at the end if they do not get the idea why we have to be very strict with our comments. We want you to learn from our mistakes; we also want you to understand the real value of design. Design is not only about making things colourful and fun but most importantly, design need to be created with a purpose".

Group 3: [12 February 2009 at 03:29]
"I beg to differ, to me, the capital 'EAT' is used with a purpose: to emphasise the importance of the topic of this website - photosynthesis".

[Facebook: second design by group 4]

Tutor C: [05 February 2009 at 01:22]
"Congratulation group 4! This design is better than your first design but (1) why are you using foreign image? I though this

website banner is meant for students in Malaysian schools? Why don't you use Malaysian faces; (2) please re-edit the edges of those images, make it neat; (3) what is that object on the right hand side? It is not clear; (4) using calculation symbols is a good idea but I can't hardly see the symbols..it is too bold".

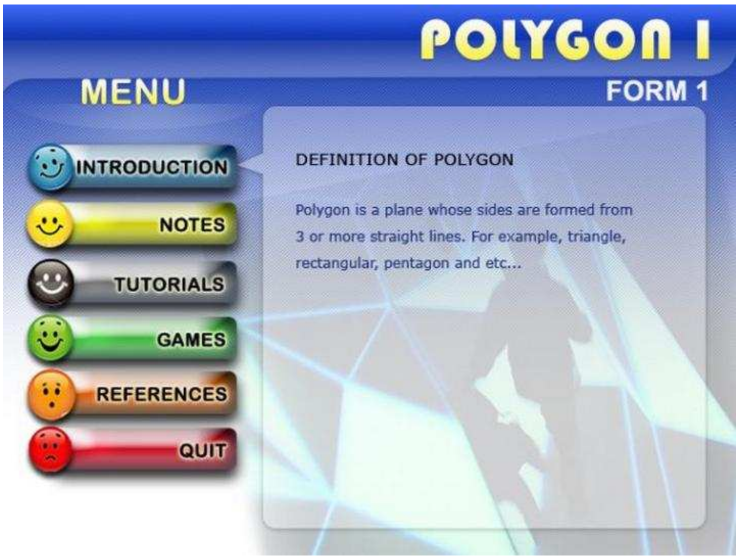
Designer L: [05 February 2009 at 02:28]
"I agree with all of your tutor's comments. Remove that foreign image. Besides, he is holding a console which I don't think appropriate; (1) your choice of fonts are not great, meaning you have to find other suitable fonts. Do make some research on website fonts; (2) combination of colour: OK but can do better; (3) background design: the blurry effect is not necessary but GOOD effort; (4) visual on the right: not interesting and did not send any message. Group 4, I honestly think your first design is better in term of colour and layout design. The problem was only with your choice of image..."

Designer F: [05 February 2009 at 13:24]
"This design is slightly better if compared to the first one. I repeat, slightly. Overall, visual appearance does not reflect/carry/convey the mathematic topic. Do ask yourself before you begin to develop this design... What is the purpose of this design? who is your target audience? how to get their attention? how to send the message?".

Group 4: [11 February 2009 at 02:37]
"Ok, we will try to improve the design but it is difficult to find suitable images. For example, when we search for 'Malaysian students' images in Google, we end up with unrelated images [Laugh]".

Designer L: [11 February 2009 at 03:27]
"Get your digital camera and snap your own photos. Also, please read about the copyright issue which I post on your friends' design".

Designer F: [12 February 2009 at 06:08]
"Be creative in solving your problem NOT in giving excuses. Come on guys. 'Not bad' is not in our dictionary. In this industry, you have to produce great / excellent designs. There are a lot of people like you out there. What makes you better than the rest?"



[Facebook: second design by group 2]

Designer A: [12 February 2009 at 05:38]
“Ok, this design looks clean but I don’t really agree with the choice of image (human silhouette) you used for your background design. Let see what others have to say”

Designer F: [12 February 2009 at 05:47]
“Yeah, I agree with designer A regarding the image. Something is not right. Overall, you design is smart, clean and pleasing; suitable for your target audience. Good work. Keep it up.

Designer B: [12 February 2009 at 06:14]
“Hi group 5, I've seen your previous design, and now this. I prefer this design. I have no issue with your choice of image or perhaps you should reduce its opacity”.

Group 5: [12 February 2009 at 07:20]
“Thank you for all your comments. Actually, that image is relevant to the topic of polygon - the human silhouette is walking on polygon shapes, showing connection between the shape and human daily life”.

Designer C: [12 February 2009 at 07:32]
“Still, I don’t think it is necessary”.

Designer A: [12 February 2009 at 07:55]
Group 5, I think I have said this before. You cannot simply add any images. You have to make sense out of it. Do you think your target audience can make sense of what you have just

said? This is not fine art where you need to have hidden metaphor! [Laugh]".

Group 5: [22 February 2009 at 02:57]
"Ok, I will think this through".

Appendix I: Marking criteria

EVALUATION FORM
The courseware and web-based multimedia design course

Design/Project Title:
Name of student/ students:

Please evaluate the product based on the rating score of 1 (poor) to 10 (Excellent)

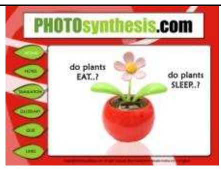
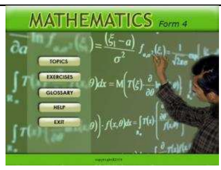
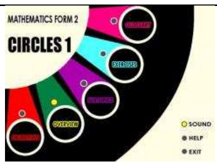
1) *Degree of originality /novelty* *(How novel is the idea or concept of the design? Is the design unique?)*	1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
2) *Degree of inventiveness* *(Is the design innovative or from a modification of the existing idea/ concept?)*	1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
3) *Design analysis* *(Is the idea or concept based on relevant analysis?)*	1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
4) *Extent of appropriateness* *(Is the design appropriate for the targeted audience?)*	1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
5) *Technical aspects* *(Is the design format and layout size applicable? e.g., 800x600, 72dpi, jpg.)*	1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
6) *Commercial value* *(Is the design comparable to the products in the market?)*	1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
7) *Display of design* *(Is the design well presented? Is there adequate information and suitable application of graphics?)*	1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
8) *Knowledge of the inventor* *(Final report: justification on the design strength and flaws)*	1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
9) *Initiative and engagement* *(Is the student willing to make improvement and engage in the learning process?)*	1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10
10) *Design problem-solving* *(The ability to solve and deal with design issues/ flaws)*	1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10

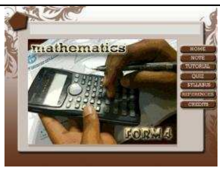
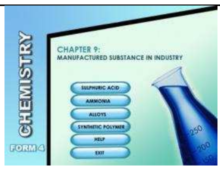
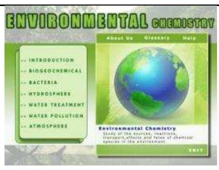
TOTAL: ______ / **100**

RANGE OF MARKS	COMMENTS
80-100	
70-79	
60-69	
50-59	
40-49	
30-39	
20-29	
0-19	

EVALUATOR'S NAME:
DATE : **SIGNED:**

SUMMARY OF EVALUATION

Group	Design	Range of Marks 100%	Comments
Group 1		**75**	*This group was inventive with their design. Their composition of layout was neat. Nevertheless, more improvisation on the technical aspect is required - graphics that they used were pixelated.*
Group 2		**85**	*This group showed the most effort, were very hardworking and critically analysed every piece of feedback given to them. Great sense of design and their design had commercial value.*
Group 3		**80**	*Group 3 was very independent and in control of their learning and in solving design problems. This group was able to argue with the designers and defended their design with reasonable explanations and references.*
Group 4		**65**	*This group produced entirely different designs at every phase. There was no consistency in their designs however they managed to make an improvement on their final design: neat composition of layout.*
Group 5		**90**	*This group was among the best and they managed to produce a quality design without much difficulty. They attentively analysed every piece of feedback given. Their design gained recognition from the designers: high commercial value.*
Group 6		**70**	*Design layout produced by group 6 was average. More improvisation is required on the composition of layout. However, there was adequate information placed in the design.*
Group 7		**65**	*This group actively engaged in the process of learning but they were not critical enough in solving design problems. They depend highly on tutor's guidance.*
Group 8		**60**	*Similar to group 7, this group was not able to solve design problems independently. Their sense of design was poor but they did show effort to improve.*

Group 9		**40**	*The design produced by this group has low commercial value: looks more like a PowerPoint slide presentation than a courseware. They were not engaged in the process of collaboration. They did not submit their designs on time; and they only submitted one design at the final phase.*
Group 10		**68**	*Group 10 took plenty of effort to produce their own graphics and positioned the layout structure in a different way. However, their choice of colours and graphics were less appealing.*
Group 11		**70**	*The design produced by group 11 was neat and simple. However, they need to diversify their selection of colours.*
Group 12		**75**	*Interesting choice of graphics and fonts. This group has made improvement and were actively engaged in the process of learning. There were some small issues with layout alignment.*
Group 13		**70**	*Similar to group 11, this group produced clean and simple design. They also need to improve on their composition of colours.*
Group 14		**78**	*The quality of technical aspect was good but they had small issue with the layout composition: text alignment.*
Group 15		**75**	*Inventive design except for less suitable choice of font and size of buttons.*