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Student perceptions and learning approaches of using blogs in IT education for reflection and knowledge construction

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ABSTRACT

Student perceptions and learning approaches of using blogs in IT education for reflection and knowledge construction

By

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Blogging is a commonly-used tool in supporting reflection in student learning. The present research explored the possibility of using blogs as an assessment tool for promoting self-reflection and knowledge construction to the associate-degree students from four different cohorts who were taught by the researcher. Students were required to write reflective journals weekly in their blog as part of the course assessment.

The primary goal of the study was to explore any evidence of the student constructing knowledge via the blogging exercises and evaluate the blogging technology in promoting in-depth self-reflection. The research adopted a mixed research method which combines both quantitative and qualitative methods. The study included a questionnaire which is composed of two previously developed questionnaires, the Reflection Questionnaire (RQ) (Kember, 2000) and the Revised Study Process Questionnaire (R-SPQ-2F) (Biggs et al., 2001) for exploring the relationships between students' perceptions of blogging and their learning approaches and their level of reflective thinking. The results would then triangulate with the findings of content analysis of blog posts and student interviews.

The study showed that deep approach scores and scores of reflective thinking scales have been found as a significant contribution to the explanation of the portfolio and total course marks. It also showed that there is strong relationship between the learning approach and the students' habit of reflective thinking. By comparing the pre-teaching with post-teaching scores, it is found that a positive change in the total scores of deep approach in particular in deep strategy subscale and a positive change in the total scores of higher levels of reflective thinking (reflection and critical reflection). Furthermore, the results showed that a negative change in the total scores of the lowest level of reflective thinking – habitual action. These implied that blogging may motivate students to learn deeper and drive them to think reflectively.

School of Education

University of Durham

Student perceptions and learning approaches of using blogs in information technology

education for reflection and knowledge construction

by

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TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

STATEMENT OF COPYRIGHT

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This is dedicated to my beloved husband, Eric and my amazing daughter, Pascale, 3.5,

who patiently spent many hours at home, doing all the housework and playing alone,

as I worked with the computer.

CHAPTER 1   INTRODUCTION

The emerging of Web 2.0 changes the ways people communicate and share information among each other. This allows a new form of interactivity through this electronic social media. With traditional World Wide Web, students are usually limited to view and retrieve information from the content of their learning website. In Web 2.0 site, students can interact, collaborate and construct knowledge with each other easily by using the tools in Web 2.0 site such as blogs, wikis, YouTube and Facebook, in other words, social networks.

Blogging is an important part of the lives of the young generation. This has attracted educational researchers to investigate the possibility of using blogs for educational purposes. Studies have been carried out on the uses of emerging Web 2.0 tools (Barrett & Garrett, 2009) such as blogs (Williams & Jacobs, 2004) and wikis (Augar, Raitman & Zhou, 2004; Chen et. al., 2005) to support varied student-centred approaches in a variety of educational settings.

This study aimed at investigating the feasibility of using blog as an assessment tool for self-reflection and knowledge construction purposes. The study attempted to explore how well the students use blogs in their studies and to what extent the actual use of blogs enhance the student to learn better. The present research examined the possibility of using a blog as an assessment tool for promoting self-reflection and knowledge construction

from the viewpoint of students who study in the Division of Computer Studies (DCO) of

the Community College of City University (CCCU). The study also investigated the

associations between the level of reflective thinking and the students' learning approaches.

The study used both quantitative and qualitative approaches in the collection of data.

1.1 Background of Study

With increasing opportunities of studying at university in the world, many universities

across the globe have changed their focus of teaching context from teacher-centred to

student-centred, process-oriented to outcome-oriented and discipline-specific to

all-rounded development in order to meet the needs of students with diversified

backgrounds. These changes in Hong Kong education sector were linked to several

government reports that emerged in the early 2000's. These reports identified that student

learning in Hong Kong was still examination-oriented and less attention was paid on

giving students autonomy to learn. To make up for these weaknesses, the Hong Kong

Education Commission (2000) proposed a new education system which was more

student-centered. The same report recommended that undergraduate education "*strike the*

right balance between the breadth and the depth" and "*in addition to helping students*

master the necessary knowledge and skills for specific professions/disciplines, give them

exposure to other learning areas and help them develop a sense of integrity, positive

attitude, a broad vision and important generic skills" (Hong Kong Education

Commission, 2000, p 9). The University Grants Committee (UGC), the central body governing higher education in Hong Kong, echoed the same themes of the need of student-centered learning environment and all-rounded development of skills in one of their reports (2002). In order to narrow the gap between the intentions of policy maker and the real implementation of the universities, UGC advised all the universities to be internationally competitive and the implementation of outcome based teaching and learning (OBTL) is worth pursuing (UGC, 2006). This approach calls for the articulation of what the teachers expect the students to learn, and the gathering of evidence to determine whether they have learned it. Clear understanding and articulation of intended learning outcomes facilitate the design of an effective curriculum and appropriate assessments to measure achievements, and to plan the learning process for individual students. CCCU, followed her parent institution - City University of Hong Kong (CityU), has implemented OBTL in all its academic programmes based on the concept of constructive alignment and Bloom's taxonomy of educational objectives since year 2006 (CityU, 2010).

One of the key elements of OBTL was to show evidence of student learning, particularly how students can reflect on what they have learned, applied the knowledge and skills to solve problems, and in the process, improve themselves. CityU adopted e-portfolio to help students to document and record their effort and progress at the university (CityU,

2005). Being a teaching faculty in DCO, the researcher was assigned to teach a new course in creative thinking for a group of sub-degree students studying in computing in year 2006. One of the course objectives was to enable the students to reflect their self-change in creative thinking throughout their study. The introduction of e-portfolio by CityU attracted the researcher to explore the possibility of using blogs in promoting student reflection in learning creative thinking course.

1.2 Purpose and Significance of the Study

This study investigates the effectiveness of using blogs in teaching and learning activities for reflection and knowledge construction purposes. It also serves as a proposal of research which starts with a preliminary literature analysis on blogging for reflection and knowledge construction purposes in education. The research methodology consists of content analysis and quantitative analyses are also proposed. The proposed research explores how students use blog as an assessment tool and how blogging affects their learning. The aim of the study is to gain an insight into how students actually use blog in their studies. It also investigates how blogging affects the students' learning approaches and the extent to which it improves their critical thinking skills. A number of authors (Zubizarreta, 2009; Moon, 2006, Bartlett-Bragg, 2003) claim that reflection in learning promotes the higher order cognitive skills of analysis, synthesis, and evaluation that constitute the concept of critical thinking. The proposed study also explores whether there

is any resultant evidence of student critical thinking and a subsequent evaluation of the blogging technology in providing a mechanism for reflection.

The proposed study examines sub-degree students' actual usages of blog in their learning, and their changes in learning approaches and critical thinking skills in information technology (IT) education. As many tertiary students now have more exposure to the use of blogs in personal life, their opinions on the topic becomes more useful in providing guidance to teachers who intend to embark on the route of using blogs in their teaching, particularly in information technology (IT) education. These students are a particularly interesting group because they are very capable of using the advanced technologies in the daily life. The training of reflective thinking was used commonly in in-service teacher education as reflection in learning how to teach. The expected results from this study may have important implications for inspiring the IT education practitioners the importance of reflective thinking in IT professional education. Students' suggestions on improving the applications of blogs in teaching IT were also sought from the research. It is hoped that the findings of the proposed study addressed the following questions:

RQ1.   How well do the students use blog in their studies?

RQ2.   Students with which learning approach reflect deeper with the blog?

RQ3.   Are there any significant changes in students' learning approaches and level of reflective thinking before and after blogging?

RQ4.   To what extent does the actual use of blogging enhance the student's reflective thinking and knowledge construction?

The proposed research aims at exploring whether blogging can help students to reflect deeper and motivate them to learn deeper; to look for any specific relationships among student performance, learning approach and level of reflective thinking. It helped the researcher to better understand the strategies of using web 2.0 tools in teaching and learning activities in social constructivist learning environments. This understanding could enable teaching staff in DCO to enhance teaching and learning strategies in correspondence with learners' needs and characteristics. Therefore, this results in motivating students to learn better.

This study also attempts to investigate whether appropriately-designed blogging activities can be an effective instructional method in the classroom, and that the educational applications of appropriately-designed blogging activities in higher education have the potential to be successful. There have been few attempts previously to analyse the blog contents by text mining in educational researches. The research extended any blogging application in teaching and learning area to a new direction by using text mining for assessing students' usage of blog in reflective thinking purposes in higher education. Hopefully, this study would serve as a catalyst for further researches into the use of text mining analysis in educational research.

1.3   Overview of Dissertation

The introductory chapter provides the purposes, background and the objectives of this study. Chapter two contains a review of literature relating blog usages in education, reflective thinking and knowledge construction. In addition, it also covers an overview of the instruments developed for these two areas (reflective thinking and student learning approaches), past researches in university domain as well as reviews aspects of relationships between reflective thinking and learning approach in blogging activities.

Chapter three covers the methodology and sample used in the study. Chapter four provides a review of the pilot testing result. The validity and reliability of the questionnaires and content analysis for the pilot study are also discussed.

Chapter five discusses the main study application of the questionnaire. Four research questions for studying students' usage of blog in reflective thinking and knowledge construction are also discussed in this chapter. Chapter six also covers the results of qualitative data analysis.

The conclusion, implications and limitation of this study, and suggestions for future study are covered in Chapter seven.

CHAPTER 2   LITERATURE REVIEWS

There is a rich body of educational research that deals with reflective thinking and blogging. This chapter reviews four distinct bodies of literature for the purposes of exploring the usage of blogging technology in promoting reflective thinking skills and knowledge construction among the students. First, the characteristics of blogging technology and its influence on teaching and learning are explored; then, literatures regarding reflection as a mean of critical thinking and knowledge construction in learning are also reviewed. This part starts with the details of social constructivism paradigm. The theories of reflective thinking and student learning approaches are covered in order to provide the basic information of the two selected instruments – the reflective questionnaire (RQ) and the study process questionnaire (SPQ). Related research findings are included to support the need of the current study. Finally, different research methods for blog content such as content analysis and text mining are reviewed.   It is hoped that a solid grounding for exploring the blogging technology that currently used in DCO at CCCU would be constructed in this chapter.

2.1   Introduction to Blogging Technology

According to Blood (2000), the term "weblog" was first used by Barger (1997). The commonly shortened form, "blog," was used by Merholz in 1999 (Williams & Jacobs,

2004). Thereafter, the term "blogger" and all other related terms became popular after the release of Blogger product (www.blogger.com) by Pyra Labs (Wikipedia, 2011). Blogs are web sites that contain frequently updated pages with the most recent entry at the top of the page and the previous ones displayed reverse-chronologically (Du & Wagner, 2005). Since blogs are web sites, they are controlled and navigated using hyperlinks, and posts typically incorporate hyperlinks to other blogs or news sources, together with related comments and discussions. Such behaviour of delivering information via the web came to known as "blogging". The types of information contained within a blog vary greatly from individual to individual. Authors of blogs (also known as bloggers) can describe day-to-day observations in their lives, or more specific topics of interest to them, such as web design or cycling. Some frequently visited blogs are topic related while others mix this with personal events in the author's life. When blogs start linking to each other and commenting on what have been said, huge and distributed discussions can erupt that include many different bloggers, and concern many different topics. For example, the blog of Huffington Post (http://www.huffingtonpost.com/) was ranked as the most popular blog ranked by Technorati Authority[1], had over 900 authors involved in writing new critiques over the blogs (Technorati, 2011b).

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1 Technorati (www.technorati.com) is a popular internet search engine for searching blogs. It was founded to help bloggers succeed by collecting, highlighting, and distributing the global online conversation. It

Blogs have evolved along similar lines to journals or diaries, no matter in paper or electronic format, in which they are a product of convenience (Jacobs, 2003; Fun & Wagner, 2005). Before blogging became popular, people shared information and communicated by email, bulletin board systems or online discussion forums.   In late 1990s, people created their own so called "blog" by hosting as webpages in a website and all its contents would be manually updated by rewriting the computer code that defines the web pages. Furthermore, people had to upload the revised web pages to the web server again after modification. However, the evolution of blogging tools such as Blogger (www.blogger.com) allows one-click publishing function facilitating the production and maintenance of web articles. It made the publishing process feasible to a much larger and less technical population.   A 2005 Pew Internet survey reported that on a typical day 5 million Americans post or share some kind of material through blog (Pew Internet, 2005). 32 million Americans said they read blogs, with blog readers making up 27% of all internet users as shown in Figure 2-1. The survey also showed that between February 2004 and November 2004, the number of blog readers increased by 58%, while the number of posts on blog increased by a similar amount. Over 133,000,000 blogs have been indexed by Technorati since 2002 and on average 900,000 blog posts in a 24 hour

tracks not only the authority and influence of blogs, but also the most comprehensive and current index of who and what is most popular in the Blogosphere. (Technorati, 2011a)

period (Singer, 2009). Together with Facebook emerged almost the same period of time,

blogging have changed the ways that how people communicate and share information.
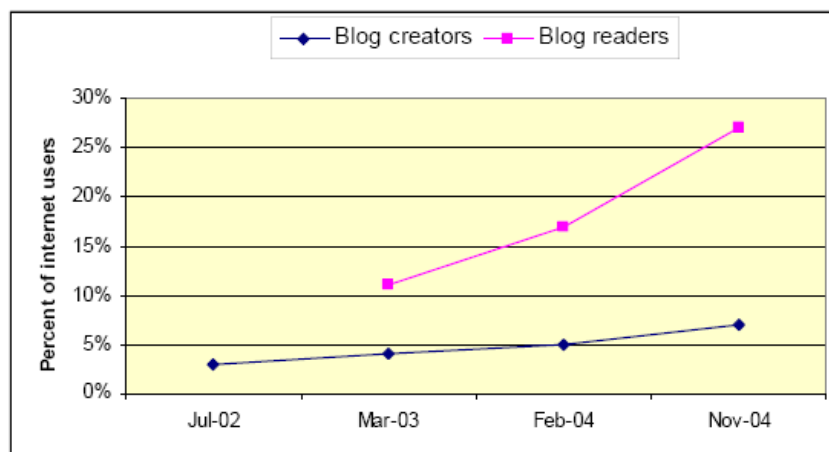
Figure 2-1 The growth of Blogosphere (Pew Internet, 2005)

The Hong Kong Blogger Survey Report showed that blog is commonly used by the

net-generation who is tertiary students and adults under 30 nowadays as an online diary

tool such as Xanga and Blogger (2005). The number of people involved in either reading

or writing blogs is large and growing. In June 2011, the online population reached

4,879,000, which represents an internet penetration of 68.5% for the Hong Kong

population (European Travel Commission). Bloggers in Hong Kong focus on maintaining

relationships and expressing themselves through their blogs (Singapore Management

University, 2012). With the emerging social media technologies such as Facebook and

Twitter, BBC (2006) reported on a prediction by analysts Gartner that blogging as an

activity is set to peak in 2007. However, Technorati's State of the Blogosphere (2010)

predicted that the growth of blogging would still continue, particularly in mobile

blogging. It also stated that bloggers' use of and engagement with various social media

tools is expanding and becoming more sophisticated. The prediction by Technorati was

aligned with the figures shown in the wiki of Singapore Management University (2012),

saying that there were 2.6 million social network users in Hong Kong as of June 2011 and

the online penetration of social networks at home and work locations increased from 68%

in Dec 2009 to 76% in Dec 2010 for people age 15 and above. 51.2% of the social

networkers in Hong Kong use the sites for staying in touch with friends. Because of the

heavily involvement in the internet and social network activities, the media has adopted

various terms such as "digital native", "the net generation" for the young people (HKU,

2011). This young generation is the first generation who has ubiquitous exposure to

internet and has used web 2.0 tools as their primary mechanism of communication,

education, information gathering and sharing. Such way of livings among the young

generation not only changed how the business marketed their products, it has also

changed the government in formulating policies and delivering their services to this

group of citizens (HKU, 2011).

2.1.1 Blogging Tools for Education

The use of portfolio as a teaching and learning strategy has been adopted for

decades, especially in professional education. The internet technology has

enhanced the function of portfolio, in form of various web 2.0 tools such as

blogs, for the young generation in learning, social activities, and leisure (CityU,

2009; Jones & Fox, 2009; HKU, 2011). Nardi, Schiano, and Gumbrecht (2004) identified the four common characteristics of blogs as (1) personal editorship; (2) hyperlinked post structure; (3) strong archival features; and (4) public access to the content. The nature of blog provides the capacity to engage students in collaborative activities, knowledge sharing, self-reflection and debates. These attracted many educational researchers to investigate the possibility of using blogs for educational purposes. For instances, studies on blogging were found for looking at the use of reflective journals as a learning tool (Chen et al., 2005; Xie and Sharma, 2008; Fisher et al., 2010), particularly in the disciplines of teacher education (Chan & Ridgway, 2005; Sun, 2010) and language learning (Hourigan and Murray, 2010; Lee, 2010).

There are many free blogging platforms available in the web and people just need to create their own blogs with rich-media contents by a few clicks. WordPress (http://wordpress.org/) and Blogger (www.blogger.com) are some of the most popular blogging platforms for social blogging purposes. There are some blogging platforms for education sector such as EduBlogs (www.edublogs.org) and the blog products (e.g. Journal X) provided by the commonly used web-based learning environment in Hong Kong higher education sector – Blackboard® (Bb).

As the mobile devices are getting more and more popular in the young generation, young people are easily and willingly to share their information in terms of multimedia such as photo, video and audio in their blog via their mobile devices. Apart from text editor, some blogging platforms even allow their users to embed different forms of media in the blog contents. Even though the primary function of blogs is journaling, the expanding embedding widget[2] and mashup[3] functions provided by the blogging platforms make it more like an e-portfolio[4] in which users can embed different media in it. Table 2-1 exhibits the comparisons on the embedding features of different blogging platforms.

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[2] Widget is a software widget for the web. It is a small application that can be installed and executed within a web page by an end user. (Wikipedia, 2011a)

[3] Mashup is a Web page or application that uses and combines data, presentation or functionality from two or more sources to create new services. The term implies easy, fast integration, frequently using open APIs and data sources to produce enriched results that were not necessarily the original reason for producing the raw source data. (Wikipedia, 2011b)

[4] ePortfolio is a collection of electronic evidence assembled and managed by a user, usually on the Web. Such electronic evidence may include inputted text, electronic files, images, multimedia, blog entries, and hyperlinks. (Wikipedia, 2011c)

Blogging Platform	html code can be embedded	Widgets available	media can be added(video, audio, images)	Can comment to comments
Edublogs	√	More with Supporter but can add html code in text widget for any needed	Yes	With supporter status
Blackboard Blog	√	Only through pasting html code of widget	Yes some format restrictions	No, only comment to blog post
Blogger	√	Lots	Yes-very easy to add photos/video	No

Table 2-1 Comparison of Blogging platforms

In year 2007, a new form of blogging called microblogging emerged and introduced a new way of communication via the internet by writing a short message restricted to 140 characters but is enhanced with social networking facilities (McFedries, 2007). According to the wiki of Singapore Management University, Sina Weibo (www.weibo.com), a Chinese microblogging platform, and Twitter (www.twitter.com), the first and the best known microblogging platform in the world, are the two commonly used platforms in Hong Kong (2012). Recent researches were found in supporting Twitter in educational context such as enhancing informal learning beyond the classroom (Skiba, 2008; Ebner et. al., 2010; Schroeder et al.; 2010). Skiba (2008) also suggested possible ways of using Twitter which can facilitate active, interactive and reflective learning: (1) communicating with students or teaching fellows by its instant messaging feature for important notice, (2) collaborative writing assignments, (3) information sharing among students, and (4) one-sentence summary at the end of lecture. As Twitter limits the number of characters used in each post to 140 characters, criticism of microblogging argued that a "tweet" (a

microblog) is meaningless and limited (McFedries, 2007). However, Wright (2010) carried out a small scale thematic content analysis on the tweets and found that the microblogging tool supported the development of reflective thinking practices.

2.1.2 Comparisons with Wiki and ePortfolio

Other two web 2.0 tools, wikis and e-portfolio, are also good for online collaborative activities, knowledge sharing, self-reflection and debates. A wiki is a collection of web pages that can be edited by anyone, at any time, and from anywhere. One of the best examples of a wiki is Wikipedia – the free encyclopaedia. It aims at providing a shared repository of knowledge with the knowledge base growing over time (Fountain, 2005). It is *"a freely expandable collection of interlinked web pages, a hypertext system for storing and modifying information - a database, where each page is easily edited by any user with a forms-capable Web browser client"* (cited in Fountain, 2005, p.1).

Using Wiki is often compared with blogging. Both support easy publishing. There are differences relating to the notification of new content, editing format and structure. Blog typically use RSS (Really Simple Syndication) feeds to sort information and alert users to new content. Wiki usually use e-mail notification (Mattison, 2003). Blogs are arranged chronologically, while wiki structure can be based on hierarchical subject divisions through new page creation and

internal and external hyperlinking. Blog readers are not allowed to edit the blog contents except leaving comments, while wikis are authored by communities, not individuals (Boulos, Maramba & Wheeler, 2006). Most wikis include a search feature; many blogs do not. Once a blog entry is published, it often cannot be edited. However, the open-editing feature of wiki raises concerns of misuse, abuse and reliability of information. As there is a lack of control over the content of the blogs or wikis, they are sometimes prone to vandalism. Anyone can edit the content of a wiki or leave comment to a specific blog entry; it is possible for a person to purposely damage or destroy the content of that wiki or blog. Furthermore, since there is also a lack of clear and complete authorship information attached to each wiki posting, it may cause very serious quality and copyright problems (Boulos, Marimba & Wheeler, 2006). By referring the unique features of these two web 2.0 tools (wikis and blogs), wikis are more suitable than blogs for collaborative writing and editing, and also as a content management tool, while blogs can be used as personal private journal or two-way conversations between an individual author and the readers.

An electronic portfolio (eportfolio), sometimes may be easily confused with a wiki or a blog, is an electronic collection of evidence of students' learning experience. The evidence may include writing articles or any artefact in the

form of multimedia. Zubizarreta (2004) proposed a model for the learning

portfolio consisting of three basic components which are (1) reflection, (2)

documentation, and (3) collaboration. This implied that an eportfolio is not

restricted in the form of any specific web 2.0 tools, but can be even

incorporated with a combination of blogs, wikis and others (Barrett, 2009). For

instances, Boulos, Maramba & Wheeler (2006) suggested that the combined

use of the web 2.0 tools (wikis, blogs and podcast) as "mind tools" might yield

the most powerful learning experience. In Hong Kong, universities adopted

eportfolio mainly as a career portfolio for employability (Fisher et al., 2010), a

learning portfolio for language learning (Chau, 2007) and reflection (Williams

et al., 2009; Kwok et al., 2010).

2.1.3 Pedagogical Uses of Blog in Higher Education

Blogs are being increasingly used in higher education sector. Some literatures

indicate that the blogs have the potential to promote deeper learning (Oravec,

2002; Bartlett-Bragg, 2003). Leslie and Murphy (2008) have identified two

main themes underlying blog research and practice in higher education, which

are (1) blogs can facilitate peer and group interaction, and (2) blogs can

promote social construction of knowledge, which happens by means of sharing

knowledge, asserting different perspectives and interpretations, and critiquing

viewpoints. Anderson (2005) considered blogs as educational social software which can give students a social presence that is correlated with student satisfaction and higher scores on learning outcomes. Prior research has identified the impact of peer blog commenting on students' blog contents. Ducate and Lomicka (2008) found that having an audience motivated students to be more accountable in completing their foreign language writing tasks. To be specific, another study indicates that students did not consider peer comments valuable for their learning. Instead, reading other students' blogs was found significantly more helpful (Ellison & Wu, 2008). Similarly, Xie and Sharma (2008) also found that peer feedback did not provide the expected support for learning. The participants who provided or received feedback registered consistently lower levels of reflection than those who blogged without feedback. However, they reported positive findings related to the effect of time on student level of reflection: as time elapsed, the reflective thinking scores of students who continued blogging, with or without feedback, increased.

Blogs have been associated with inspiring reflective writing and analytical skills, sustaining interest in a topic (Carraher, 2003) and *engag[ing] readers and audience in a sustained conversation which leads to further writing and*

thinking" (Richardson, 2004, para.3). Most blogging researches were traditionally done in the disciplines such as teacher education (Chan & Ridgway, 2005; Deng & Yuen, 2007; Sun, 2010) and medical education (Boulos et. al., 2006), and focused on self-reflecting their own professional practices.

There is also an increasing interest in studying blogging impacts on reflecting the learning experiences of the students in diversified disciplines (Schroeder et. al., 2010) such as language (Williams et. al., 2009; Hourigan & Murray, 2010; Lee, 2010), business studies (Williams, 2004), information technology (Law, 2004; Du and Wagner, 2005; Perschbach, 2006) and engineering (Chen et. al., 2005; Lin & Yuan; 2006). All these researches used blogs as a learning tool for assessment (CityU, 2009), presentation of student works (Fisher et. al., 2010) and supporting collaborative activities among peers in an individual course level. There were researches used blogs as a tool for recording personal development experiences and reflecting a learning path in a programme level or a particular extra-curricular activity such as exchange programme (Kwok et. al., 2010), for both undergraduate and postgraduate students (Xie & Sharma, 2008). Schroeder et al. (2010) found that the use of social software such as blog in teaching and learning provided incentives to the students to create high quality

works and contributed to employability as a result. Table 2-2 describes various

examples of using blogs in higher education sector.

Institution	Descriptions
City University of Hong Kong, HKG	Blog was used by undergraduate students in an English language learning course for presenting the academic achievements (Williams et al., 2009).
University of Leeds, UK	Blog was used by postgraduate students throughout a history course for ongoing self-reflection (Schroeder et. al., 2010).
London South Bank University, UK	Photo publishing website and blog were used as part of a BA photography programme to allow the students to publish their work and to provide opportunities for critiquing and self-reflection (Schroeder et. al., 2010).
City University of Hong Kong, HKG	Blog was used by undergraduate students studying in information system for recording and reflecting their experiences in a study tour (Kwok et al., 2010)
Polytechnic University, HKG	Blog embedded in an eportfolio system was used for all students on whole person development. It aimed to help students understand, reflect on and showcase their achievements, and make connections with experiences in developing their generic competencies through the university and extra-curricular activities (CityU, 2009)

Table 2-2 Lists of blog initiatives

2.2   Literature Reviews of Vygotsky's Social Constructivism of Knowledge

The pedagogical use of blogging is grounded in Vygotsky's theory of social constructivism (Sun, 2010). An American psychologist, John Dewey rejected the emphases on repetitive and rote memorization in education. He proposed the concept of experiential learning in which students would engage in practical teaching and learning activities in which they would demonstrate their knowledge through creativity and collaboration. Students should be provided with opportunities to think from themselves and articulate their thoughts. Constructivism is an alternative to traditional learning

theory that was founded in the 1950's by researchers including Piaget and Vygotsky. There are two major strands of the constructivist perspective: Piagetian's cognitive constructivism and Vygotskian's social constructivism. These two strands are different in emphasis, but they also share many common constructivist perspectives about teaching and learning. The cognitive psychologist, Lev Vygotsky shared many of Piaget's assumptions on cognitive constructivism about how students learn, but he placed more emphasis on the socio-cultural context of learning. One main difference between Piagetian's cognitive constructivism and Vygotskian's social constructivism is the sequence of development and learning. Piaget believed that development precedes learning. That is, student starts from a self-centred position and develops on his own accord, moving from himself into the social world as he develops, while Vygotsky believed that development begins with socialization and language acquisition, which lead to developmental learning. Learning is not a purely internal process, nor is it a passive shaping of behaviours (Vygotsky, 1978). Vygotsky favoured a concept of learning as a social construct which is mediated by language via social discourse. Therefore, Vygotsky's constructivist theory, which is often called social constructivism, has much more room for an active, involved teacher.

A constructivist teacher creates a context for learning in which students can become engaged in interesting activities that encourages and facilitates learning. However, the

teacher does not simply stand by and watch the students explore and discover. Instead, the teacher may often guide students as they approach problems,; may encourage them to work in groups to think about issues and questions,; and may support them with encouragement and advice as they tackle problems, adventures, and challenges that are rooted in real life situations that are both interesting to the students and satisfying in terms of the result of their work. Teachers thus facilitate cognitive growth and learning as do peers and other members of the student's community. Constructivist theorists do not believe knowledge is a constant for each object or event but rather that it is constructed by individuals as they interact with an object or an event, in relation to their past experiences, their beliefs and their current mental structures (Black & McClintock, 1995). Jonassen et al. (1997) stress the importance of the mind's interpretation of the external world and that knowledge is a personal and individualistic thing, grounded in physical and social experiences. They argue that the mental models that are produced by the mind are used to explain, predict or infer phenomena in the world. For constructivists, learning is the process by which accessed information is transformed into personal knowledge (Jonassen et al., 1997). It involves an evaluation of the new information based on existing mental models, and an augmentation and reorganization of these models to reflect the new knowledge. This is a process of internal negotiation of meaning. Since all learners engage in a learning experience with differing beliefs and background knowledge, and

because learning changes individuals' mental structures, it must be a personal experience.

It is also recognised that approaches which are learner-centred, exploratory and interactive are more conducive to vigorous construction of meaning by the students themselves (Glogoff, 2005). In his study, students studying an information system course were required to publish their work on their blogs and comment on other's works. He found that the student-centered blogging acknowledged the important attributes of learners as individuals and as a group. His students also agreed that the peer-review capabilities of blogging contributed to better understandings of course content.

2.2.1 Vygotsky's Two Main Concepts

The concept of the zone of proximal development (ZPD) is the most popular Vygotskian construct in Western education and has an important implication for the educators to analyse the instruction and assessment practices. Defined as "*the distance between the actual developmental level as determined by independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers*" (Vygotsky, 1978, p.86). Skills, rules, and knowledge, are internalized, creating the cognitive tools used in self-directed learning. Through a process of "scaffolding", a learner can be extended beyond the limitations of physical maturation to the extent that "*the development process lags behind the learning*

process" (Vygotsky, 1978, p.86). Though the term, scaffolding (Wood, Bruner, and Ross, 1976), was never used by Vygotsky. Another Vygotskian's concept - activity theory focuses not on the individual learner, but also with the entire activity system, a larger and more social unit of analysis. It is a key explanation concept in the study of the development of human thought. An activity system consists of a group, of any size, who are pursuing a specific goal in a purposeful way. For example, students on a networked learning course collaborating on a project would represent an activity system. Learning and teaching can be viewed at each level of an activity system--activity, action, or operation. To understand the system purpose, the learning of the individual participant is mediated by tools. Tools make activity possible in the first place, and can be both physical (networks, books, software) and cognitive (concepts, language, memory). Mayes and Freitas (2004) illustrate these concepts in terms of teaching: pedagogical frameworks are tools that give teachers a way of approaching instructional design, in that way shaping associated ways of thinking about learning. An activity is then when tools are used for a purpose within the activity system.

Mayes and Freitas (2004) viewed e-learning itself as both a tool and as a simulated activity system which participants are introduced to and learn to perform the actions and operations. Most of the university learning can be

organized and led by a teacher. Teachers acquire guidance in the art of scaffolding as they learn to use web 2.0 tools to engage students supportively. The design principles for constructivist teaching and learning activities (TLAs) can be (1) ownership of the task; (2) coaching and modelling of thinking skills; (3) scaffolding; (4) guided discovery; (5) opportunity for reflection; and (6) exposure to ill-structured problems (Mayes and Freitas, 2004).

2.2.2 Blogging and Vygotsky's Social Constructivism

The research of Ferdig and Trammel (2004) is significant in assessing the educational value of blogs based on educational theories of Vygotsky (1978). They argue that the discursive nature of knowledge construction is best addressed by the immediacy and commentary based system of blogging. They observe that there will be a natural tendency for reflection and analysis on the part of the student, given feedback systems are integral to the blogging interface, but also note that the contextualisation of learning through hypertext links to other materials encourages revisiting and revising of learned concepts, thus, enriching the learning experience. Compared to asynchronous discussion forums such as newsgroups and bulletin boards, Ferdig and Trammel (2004) contend that blogs are more successful in promoting interactivity that is conversation; a mode of interaction more conducive to improved student and teacher relationships, active

learning, higher order thinking, and greater flexibility in teaching and learning more generally. On a day-to-day basis, continual blogging makes it possible to record the knowledge building process of a student. Blogging is a learning process and also a knowledge sharing process when bloggers read, comment to and link to each other. The Vygotsky's concept of the zone of proximal development (ZPD) is relevant to the social aspect of blogging. The "zone" is an area where a student can learn when helped by a knowledgeable individual or supported by cultural resources. From a Vygotskian standpoint, the knowledgeable other which can be a blog for a subject matter or refer to a number of expert blogs for knowledge sharing becomes a tool for the student. When it is well constructed, the media act as a scaffold, linking prior knowledge to new knowledge.

In Hong Kong, there are researches focusing on blogging in social constructivism context such as the use of blog for information system undergraduate students to generate thoughts and share learning experiences (Du & Wagner, 2005). Researches are found for exploring the possibility of building blog-supported learning communities for pre-service teacher in Hong Kong (Deng & Yuen, 2007).

2.3   Reflective Thinking as Higher-order Thinking Skill

Thinking skills, especially higher order thinking skills, become more and more crucial in teaching and learning environment. The Learning and Skills Research Centre (LSRC) (2004) in United Kingdom carried out a study on different thinking skill frameworks in order to increase the awareness of teaching thinking skills in different level of education. Thinking skill was defined as:

> *"...the expertness, practical ability or facility in the process or processes of thinking (processes that occur spontaneously or naturally, or which are acquired through learning and practice)." (LSRC, 2004, p.18)*

One of the important higher-order thinking skills which should be taught in higher education is reflective thinking. The ultimate aim of higher education is to prepare professionals to apply knowledge to practice in the real world. Since most of the real problems faced by the professional are usually ill-defined, may have multiple facets and do not have perfect solutions, the professional is required to see the world on their own behalf (Schön, 1987), and come up with their own interpretation of the reality. The challenge of educators, thus, is to help the students to deal with everyday situations in competent manner. Reflection has then been identified as an effectual learning strategy for such aim (Schön, 1987).

2.3.1 Reflective Thinking as Social Critical Thinking

The social constructivist theories of those three scholars (Schön, Dewey and Vygotsky) are in common that knowledge and actions are fundamentally social in origin and are situated in particular context. Schön views reflection as a dialogue of thinking and acting through which performance can be enhanced (Law, 2004). Reflection-on-action and reflection-in-action are the two essential factors for the development of professionalism. Reflection-on-action refers to thinking back on the action already finished or being paused in the midst of an action, while reflection-in-action occurs when a practice is being undertaken. Schön believed that the effectiveness of a practicum depends crucially on social interactions, especially reciprocally reflective dialogues between coach and student who have to maintain mutual communication which eventually leads to the convergence of the interpretations of the concepts in question (Schön, 1983; 1987).

In fact, Schön's theory is rooted in that of Dewey (1933) and Vygotsky (1978). Dewey is normally considered to be the originator of the concept of reflective thinking as an aspect of learning and education and his widely quoted definition is,

> *"...active, persistent and careful consideration of any belief or supposed form of knowledge in the light of the grounds that support it and the further conclusion to which it tends."*
> *(Dewey, 1933, p.9)*

Dewey views reflection as a preferred form of thinking initiated by doubt and confusion perceived in a situation, in result of a problem resolution based on previous experiences. The role of reflection is to regulate the dialectic relationship between knowing and acting; reflective thinking is a tool for problem resolution and operates through the progressive cycle of "inquiry". Dewey emphasized the role of tools in the emergence of mind, especially language (Dewey, 1933). Mezirow interprets Dewey's definition as implying that "*reflection means validity testing*" (Mezirow, 1991, p. 101). When Mezirow himself considers reflection, the influence of critical theory upon his work becomes apparent. Mezirow defines reflection as:

> *"Reflection involves the critique of assumptions about the content or process of problem solving.... The critique of premises or presuppositions pertains to problem posing as distinct from problem solving. Problem posing involves making a taken-for-granted situation problematic, raising questions regarding its validity." (Mezirow, 1991, p.105)*

Vygotsky viewed reflection as the transferral of argumentation from a social level to an internal one. Reflection can be understood as self-regulation which is acquired by a series of learning experiences occurring in the ZPD. Through the social interaction, the form and content of self-regulation are gradually transferred from the more competent teacher to then be internalized by the learner. According to Vygotsky's theories, reflection also plays a mediating role by transforming meaningful experiences into learning which leads to development. Vygotsky,

similar to Dewey, regarded language as the most powerful cultural tool in achieving convergence of meaning and co-construction of knowledge during social interactions. Based on Vygotsky's theory of dialectical relationship between the intra- and inter-psychological and the transformation of one into another, high-order thinking like reflection is developed through consistent agent-world dynamic interactions (Law, 2004).

2.3.2 Blogging and Reflective Thinking

The concept of using blogging or online journaling for fostering reflective thinking has been widely discussed in the literature of all contexts (Kember, 1999; George, 2002; Hazzan, 2002; Lee, 2005; Perschbach, 2006; Xie & Sharma, 2008). Kember et al. (1999) indicates that there is a need for measuring the level of reflective thinking for ill-structured problems. Researches have been explored the depth the health-care discipline students reflect their learning in Hong Kong (Kember, 1999). Other studies also adopted the same coding category (Kember, 1999) in health-care discipline (Wallman & Lundmark, 2008; Hanson & Alexander, 2010).

2.4   Literature Reviews on Learning Outcomes

There are two common approaches for assessing the learning outcomes which consists of (1) assessing by learning objectives, and (2) assessing by learning approaches. Over twenty years of research on teaching and learning in higher education has shown that student learning outcomes - examination results, concept maps, open-ended responses, etc. - are closely related to how students experience their studies. Bloom's taxonomy of learning objectives has been chosen for long time as the framework for approaching the problem of assessing for higher learning outcomes (Bloom et al, 1956).   On the other hand, psychologists have paid more attentions to developing one grand theory of learning on how students approach their studies in higher education. Studies showed that student learning outcomes are closely related to how they want to approach their studies.

2.4.1 Learning Outcomes as Learning Objectives

Bloom's taxonomy formed the basis for early work on the development of instructional objectives for classes and curricula. This taxonomy is a hierarchical structure representing six levels of thinking and learning skills that range from basic learning objectives such as knowledge of content through higher-order learning such as synthesis and evaluation. The higher-order categories of Bloom's taxonomy such as analysing, synthesising, evaluating is being treated as higher level of cognitive skills. In recent years, many universities shifted their emphasis

from instructional objectives, which describe what instructors do and the content of material presented during classroom instruction, to student learning outcomes, which describe what students can do as a result of their educational experiences (CityU, 2006). This change in emphasis is associated with changes in the language used and changes in expectations about instructional style. Instructional objectives were typically described as things (knowledge, understanding, content, facts) that could be delivered during a lecture or presented in written text. In contrast, student learning outcomes are described using concrete verbs (behaviours that can be observed in the student) rather than nouns. Along with this change in language is a change in emphasis on classroom instructional activity. Although passive activities such as lecturing can be an efficient method for transmitting basic facts and knowledge, active learning strategies that engage students in learning are expected to encourage the development of higher-order thinking skills.

In order to incorporate the student-centered learning paradigms into the existing structure, Bloom's taxonomy (1956) has been refined and developed into a two-dimensional framework using six cognitive processes and four knowledge categories (LSRC, 2004). There is more emphasis on aligning learning objectives with learning activities and assessment. The revised version of Bloom's taxonomy

(Anderson & Krathwohl, 2001), draws heavily on Bloom's version (1956) by retaining six cognitive process categories with slightly different order and terminologies. The major change is the structure of the taxonomy which has two-dimensions, one dimension with six cognitive processes (remember, understand, apply, evaluate and create) and the other with four types of knowledge (factual, conceptual, procedural and metacognitive).

2.4.2 Learning Outcomes as Approach of Study

Marton and Säljö (1976) describe two approaches to learning - the deep approach and the surface approach. A "deep" approach is indicated by an intention to understand the material to be learnt, using strategies such as reading widely, combining a variety of resources, discussion, reflection, relating parts to a whole, and applying knowledge in real world situations. An intention to reproduce the material to be learnt and avoid failure through regurgitating information and using rote learning techniques characterizes the "surface" approach. Biggs (1999a) has illustrated some factors that encourage students to adopt a surface approach to learning as shown in Table 2-3.

Student's side	Teacher's side
Only achieve a minimal pass	No intrinsic structure of a subject
Non-academic get higher priorities	Assessing for independent facts
Insufficient time, heavy workload	Encourage cynicism in teaching and
Misunderstand requirements	assessment
Cynical view of education	Insufficient time to engage task
High anxiety	Create anxiety and low expectation
Inability to understand at a deep level	of success

Table 2-3 Factors encouraging a surface learning approach

How the students approach their studies is, in turn, related to how they perceive and understand the teaching and learning context. How they perceive and understand that context is in turn, related to their prior experiences of teaching and learning, and to the context itself. The key issue is, however, that students perceive the same context in different ways. These different ways are systematically related to how they approach their studies and to the quality and quantity of their learning outcomes (Prosser and Trigwell, 1999).

2.5   Biggs' 3P Model

To further explain the relationship between learning outcomes and study approaches, Biggs and Moore (1993) describe the factors that form the "3P" model of teaching and learning (Figure 2-2). The 3P model consists of three learning-related factors: (1) presage, before the learning takes place; (2) process, during learning; and (3) product, the outcome of learning.
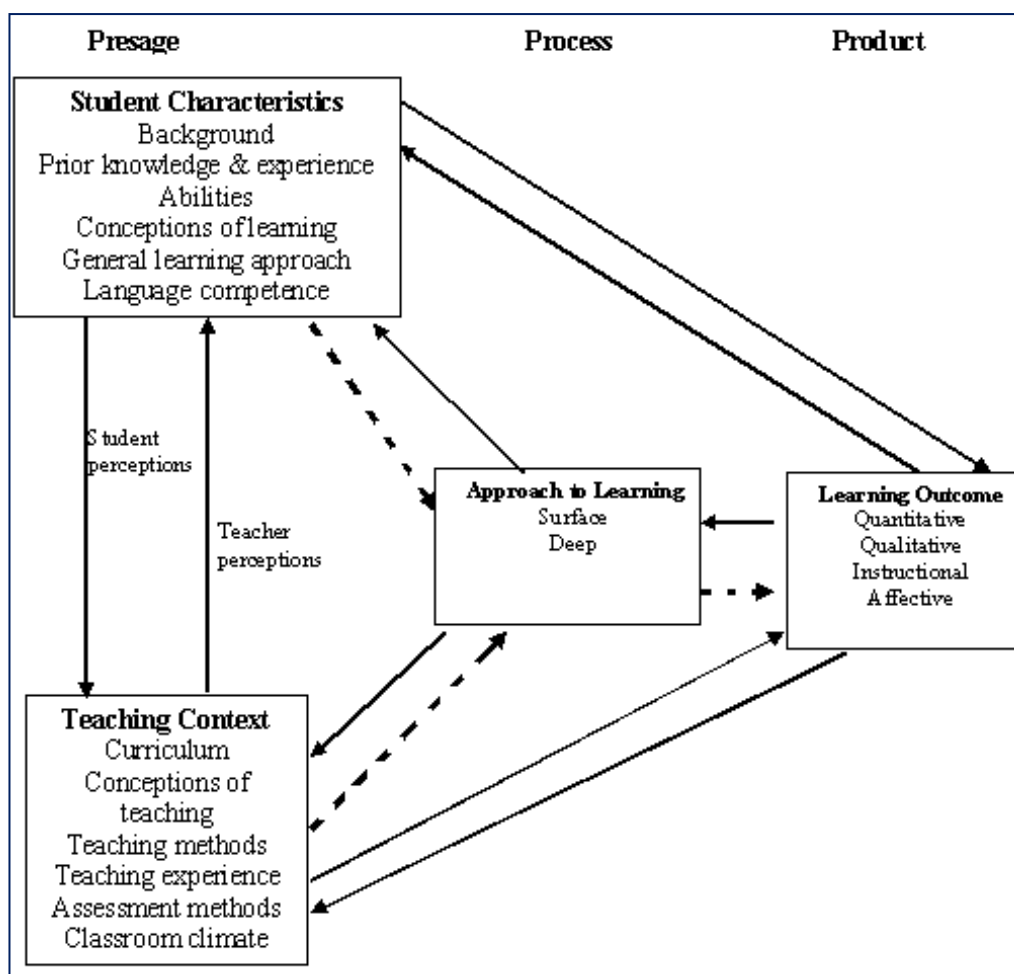
Figure 2-2 3P model of Teaching (Biggs & Moore, 1993)

The overall assumption that Biggs has about learning through this 3P model is that learning outcomes are a result of the interactions of the teaching and learning contexts with the student approaches to learning. Both student and teaching presage factors interact to produce an approach to learning, which produces its characteristic outcome. Students bring into the learning system some predispositions that are learning-related, such as prior knowledge, abilities, values and expectations, and ways of learning. These learning-related characteristics are referred to as the student presage factors that have a direct impact on the ways students choose to process academic tasks.

The teaching context is the environment set by the teacher and the institution, through the course structure, curriculum content, methods of teaching and assessment. Students perceive and interpret the teaching context and adopt a study approach that they think will help them to meet the demands of the teachers and the courses. Hence, an approach to learning is not simply a fixed attribute of the learner, but a function of both learner's characteristics and the teaching factors. The student and teaching contexts when combined, will produce a particular approach to learning which is broadly conceptualized as either "deep" or "surface" (Entwistle and Ramsden, 1983). The approach that students use to process academic tasks is referred to the "Process" phase in Biggs' 3P model of learning.

The "Product" phase of the 3P model suggests that study approaches are related to qualitative differences in learning outcomes. The deep approach will produce high quality learning outcomes, while a surface approach will result in lower quality outcomes. The 3P's (Presage, Process and Product) when combined explain what learning is about. It involves the interaction of the student and teaching contexts to produce a particular approach to learning, either deep or surface, which affects the quality of learning outcomes.

Under the 3P model of teaching and learning, all components are supporting each other as a balanced system. For instance, students with different characteristics will have

different perceptions towards the teaching context (learning environment) and then perform different learning approaches, which results in different learning outcomes. According to Biggs, the general direction of effects of the 3P model (marked by dotted-line arrows) is that student and teaching presage factors jointly determine the approach a student uses for a given task, and that in turn determines the outcome. To ensure the entire system is working properly, all components are aligned to each other (marked by solid-line arrows). Imbalance in the teaching system will result in poor teaching and surface learning. The Study Process Questionnaire (SPQ) (Biggs, 1987) sets out to measure the different approaches to learning.

2.6 Influences of Blogs on Learning Outcomes

Students learn for many reasons. Students' preferred approach to learning and preferred learning environment are two important components of learning environment before learning take places (Biggs, 1992). Even the same student can and do adopt either deep approach or surface approach to different tasks, and they may even swap between them in the same task. The learning context consists of assessment methods, curriculum, teaching methods and the atmosphere of the institution (Ramsden, 1992). Although educators do not have control over students' past learning experiences or their personal characteristics, they do have control over the learning environment. In terms of the evaluation of new technologies in teaching and learning, studies would suggest that student learning

outcomes from the use of the new technologies would relate to how the students approached their studies with the new technologies (Prosser, 2000). This would depend, for example, on how they saw the aims of the new technologies in their learning - not how well the new technologies met the teacher's aims; how they saw the use of the new technologies relating to their perceptions of what was to be rewarded in the assessment; how they experienced their workload associated with using the new technologies, etc. These perceptions would depend on how well the new technologies were designed and integrated into the subject and course structure, what the aims were for the use of the new technologies, and importantly what the student's prior experiences were of using similar technologies. Xie, Ke and Sharma (2008) found that the blog journaling promoting reflective thinking as well as deep thinking and learning. Studies (Leung & Kember, 2003; Phan, 2006) are found for examining the relationships between learning approaches and reflective thinking. Both study results showed that the important existence of learning approaches and reflective thinking practices in different subject disciplines. That is, deep learning approach is consistent with three stages of reflection: understanding, reflection and critical reflection.

These relationships between students' perceptions and learning approaches form the basis of the current study to understand what the students perceived from using a blog in their learning and how a blog affects the students' learning approaches and their learning

outcomes. Chan and Ridgway (2006) concluded that the blog does not always support collaborative learning. Their research found that the blog was well received by the students for recording and sharing purposes, but extended interaction among the students and deeper reflective level were hardly found. This may be due to the students' conceptions of learning and different components in the teaching context. All of these are possible factors that may cause potential imbalance in the 3P model of teaching and learning, which may affect the student's learning outcome and the usefulness of the blogging technology.

2.7   Literatures on Research Methods for Blog Content

Most education researches related to blogging usually adopt both qualitative (content analysis) and quantitative (questionnaire) research design approach in examining the effectiveness of blogs and the student learning experiences. Content analysis with pre-designed coding categories is the commonly used method to analyse the rich source text-intensive content of the blog postings (Leslie & Murphy, 2008; Sun, 2010).

Content analysis is a commonly used method to analyse the qualitative data such as conference scripts. Rourke et al. (2001) has reviewed and summarised 14 different computer mediated communication content analysis studies. Wong et al. (1995) has developed a coding scheme according to Boud et al.'s (1985) model and Mezirow et al.'s model (1990) to analyse the student nurses' reflective papers. The coding scheme used by

Kember et al. (1999) also referred to Mezirow's (1991) work, but a different framework

from the one used by Wong et al. (1995). Kember et al. (1999) then revised the seven

coding categories from Mezirow's (1991) work into four coding categories, as shown in

Figure 2-1, which align the meaning of the scales in the Reflection Questionnaire

(Kember et al., 2000).

Coding categories for reflective thinking	Relevant scales in Reflective Questionnaire
Habitual action	Habitual action
Introspection	Understanding
Thoughtful action	
Content reflection	Reflection
Process reflection	
Content and process reflection	
Premise reflection	Critical Reflection

Figure 2-1 The coding categories for reflective thinking (Kember et al., 1999)

Table 2-4 summarised the descriptions of the seven coding categories from Mezirow's

model.

	Coding Category	Description
Non-reflective Action	Habitual Action	It refers to what has been previously learned and becomes automatic through frequent use.
	Introspection	It refers to the feelings or thoughts about oneself (i.e., the affective domain) and involves no attempt to re-examine or test the validity of prior knowledge and involves no attempt to re-examine or test the validity of prior knowledge.
	Thoughtful Action	It makes use of existing knowledge, without attempting to appraise that knowledge, so learning remains within pre-existing meaning schemes and perspectives. Typically, "book learning" associated with university education, although a cognitive process may be considered as thoughtful action.
Reflective Action	Content Reflection	It addresses what we perceive, think, feel or act upon.
	Process Reflection	It concerns how one performs those functions and how well they are performed.
	Content and Process Reflection	They are deemed to be at the same level whereas premise reflection is thought to be at a higher level of reflective thinking.
	Premise Reflection	It entails the why of the stated processes and enhances the opportunity to experience a perspective transformation. Premise reflection then requires a critical review of presuppositions from conscious and unconscious prior to learning and their consequences.

Table 2-4 Descriptions of the coding categories for reflective thinking (Kember et al., 1999)

Content analysis which can be in qualitative or quantitative way, is an inductive process involving a real world situation, using descriptive data in the form of blog content or other quantitative results that generated from the blogging process, and resulted in an interpretation of result such as students' blogging experience. Figure 2-3 exhibits a flowchart for the typical process of content analysis research (Neuendorf, 2002).
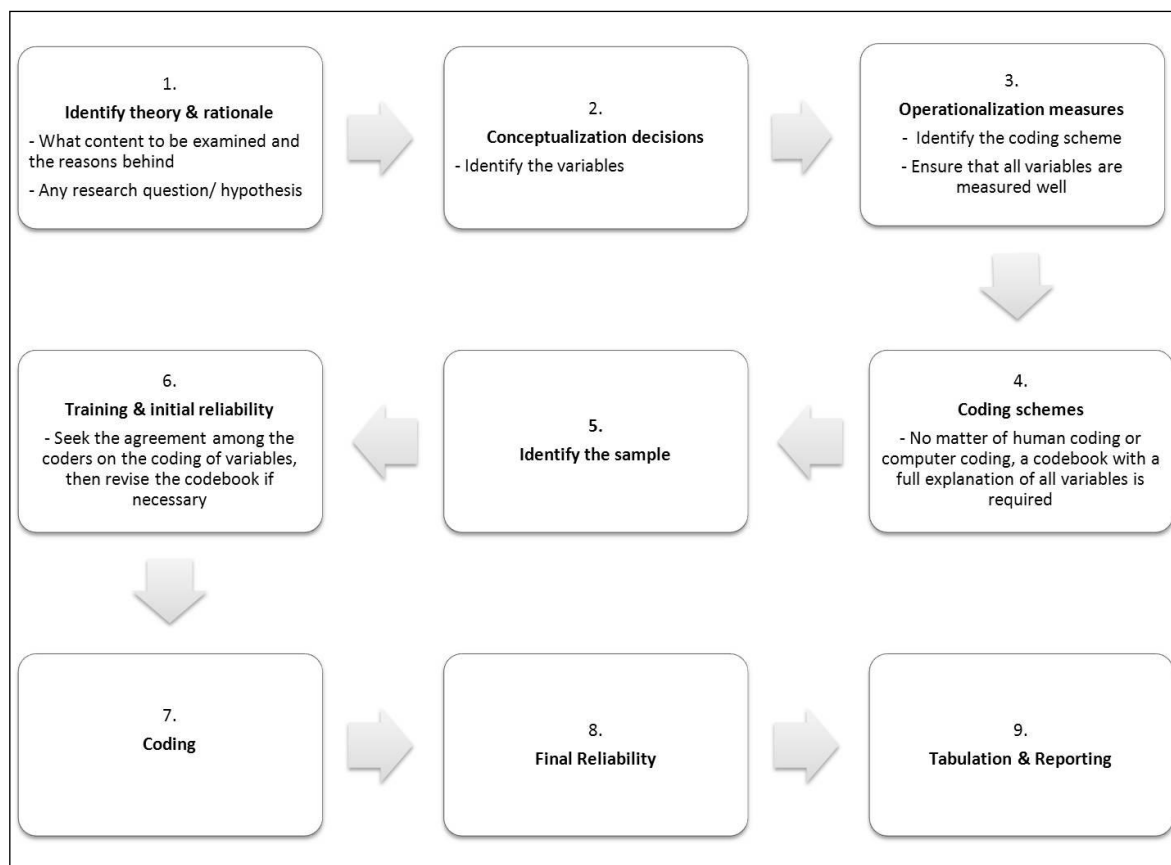
Figure 2-3 Typical Process of Content Analysis Research (Neuendorf, 2002)

A blog usually refers to a website which contains a series of frequently updated, reverse

chronologically ordered posts on a common web page, usually written by a single author.

It is characterized by instant text/graphic publishing, an archiving system organized by

date and a feedback mechanism in which readers can "comment" on specific posts. Blogs

offer extensive opportunities for social scientific research. In addition to the static blog

content, the unstructured characteristics of blogs in terms of the frequency of blog posts,

blog comments, blogrolls, topical links in blog posts, commenter-provided links, blogroll

links, and generic links elsewhere on the site provide tremendous analytical alternatives

for the study (Hookway, 2008). Therefore, web data mining, web mining in short, may be

one possible method for studying blogs. Web mining aims to discover information from the web hyperlink structure, page content and usage data. There are three types of web mining tasks: (a) web structure mining, (b) web content mining, and (c) web usage mining (Liu, 2007).

a. Web structure mining discovers useful knowledge from hyperlinks. The core underlying assumption is that the links to other page indicate recognition of the linked content as "interesting". Bruns et al. (2010) suggested many forms of linked content for web mining. For instance, the patterns of interlinkage between blogrolls indicate the existence of a long-term network of recognition between peers, and the patterns of interlinkage between blog posts indicate the existence of a network of debate on specific topics. Such networks of debate can be seen to persist over greater or lesser periods of time. Furthermore, the patterns of interlinkage between blog posts and comments indicate that posts or comments have an ongoing relevance to particular networked debates. If a comment is linked to in a further post, it indicates that the comment has itself provoked further discussion and commentary, and that the conversation constitutes a dialogue between blogosphere authors and commenters. If blog posts are referred to in comments threads, especially if these are on other blogs, it indicates that the initial post has relevance and influence in an ongoing, networked debate.

b. Web content mining extracts useful information from blog content. The blog postings can be classified or clustered according to their topics. Also, the complete collection of all blog posts for a given blog provides a reliable indication of the interests of the individual blogger which may be further traced by tracking changes in topical coverage over time. To further this, bloggers' interests can be compared in specific periods of time, and/or in relation to broad topical domains across multiple blogs (Bruns et al., 2010).

c. Web usage mining refers to the discovery of user access patterns from the blog usage logs, which record every click made by each user.

Social researchers who will consider using the emerging web data mining to analyse the blogs, should be aware of the methodological and ethical issues such as privacy and copyrighted issues associated with blog research (Hookway, 2008).

2.8   Summary

This chapter contains reviews on the major areas related to the dissertation study which are theoretical foundations of social constructivism, reflective thinking and student learning outcomes. It also covers methodological issue in analysing student learning towards the blogging technology, and the rationale for generating and exploring the research foci in this study. The review on the theoretical foundations relates knowledge construction to the Vygotskian ideas, and supports the significance of motivating student

learning particularly in reflective thinking by blog journaling. Review on previous research findings in social constructivism and reflective thinking over the blogs or online journal helps to generate the research foci and to situate them in the context of previous work in the field. The extensive review justified the necessity to move forward with this research, and to achieve the final goal of improving the currently used blogging technologies as reflective journaling in Division of Computer Studies.

CHAPTER 3   RESEARCH METHODOLOGY

Nowadays, university is using lots of web 2.0 technologies in the teaching and portal site or other social websites such as Facebook. These situations raise some interesting questions about how students perceive the blogging technology created in the university. These questions have become the starting point for the research in the present study involving a range of factors that influence student learning approach and reflective thinking by adopting blogging technology in Division of Computer Studies (DCO) at the Community College of City University of Hong Kong (CCCU).

The study examined sub-degree students' perceptions and actual usages of using blogs in their learning, and their change in learning approaches and their level of reflective thinking in information technology (IT) education. As many tertiary students now have more exposure to the use of blogs in personal life, their opinion on the topic becomes more useful in providing guidance to teachers who intend to embark on the route of using blogs in their teaching, particularly in information technology (IT) education. The training of reflective thinking was used commonly in teacher education and health-care training before.

The research adopted a mixed research method which combined both quantitative and qualitative methods. The study included a questionnaire which is composed of two previously developed questionnaires, the Reflection Questionnaire (Kember, 2000) and

the Revised Study Process Questionnaire (R-SPQ-2F) (Biggs et al., 2001), and content analysis of blog posts and student interviews. The research set out to explore the relationships between the student learning approaches and their level of reflective thinking. Reflection Questionnaire (Kember, 2000) was used to measure the level of reflective thinking that the students can achieve after using the blog in learning, while the R-SPQ-2F was used for measuring the learning approaches before and after using the blog. A content analysis is carried out for understanding the content of students' blog in respect of knowledge construction and reflective thinking. Then, some of the students were interviewed for further explanations on what they have received from blogging and suggestions on improving the adoption of blogs in teaching and learning. Most of the education researches used questionnaire as quantitative research instrument while content analysis as qualitative research methods. Apart from following these methods, the research also explored the potential uses of data mining methods in studying the impact of blogging technology towards the student learning.

This chapter reviews the research methods used in the present study which are about the design of the study, the reasons of selecting instrument and results of pilot study. Besides, details of main study such as the sample selection, data collection and data analysis are also included in this chapter.

3.1 Purposes and Significance of Study

The aim of the research was to increase the understanding of students' experiences using blogs as a reflective thinking tool. It also investigated how the blog affects the students' learning approaches. Students' suggestions on improving the applications of blogs in teaching IT were also sought from the research. It is hoped that the findings of the study would address to the following questions:

RQ1.   How well do the students use blog in their study?

RQ2.   Students with what learning approach reflect deeper with the blog?

RQ3.   Is there any significant change in students' learning approaches and level of reflective thinking before and after blogging?

RQ4.   To what extent does the actual use of blogging enhance the student's reflective thinking and knowledge construction?

The research was designed to explore the effects of attempts to promote reflective thinking for associate degree students as part of the professional training and look for any specific relationships among student performance, learning approach and level of reflective thinking. It is hoped that the researcher can define better strategies of using blogging technology in teaching and learning activities which enables other teaching staff in DCO to incorporate similar teaching and learning strategies in correspondence with learner needs and characteristics, in result of motivating students to learn better.

This study also attempted to explore the extent to which appropriately-designed blogging activities can be an effective instructional method in the classroom, and that the educational applications of appropriately-designed blogging activities in higher education have the potential to be successful. There have been few previous attempts to analyse the blog contents by text mining in educational research. The research extends any blogging application in teaching and learning area in a new direction by using text mining for assessing student usage of blog in reflective thinking purposes in higher education. Hopefully, this study would serve as a catalyst for further research into the use of text mining analysis in educational research.

3.2   Design of the Study

The current research adopted a triangulated mixed method research approach which has recently attracted investigators of online learning (De Laat & Lally, 2005; Perschbach, 2006). De Laat & Lally (2005) suggested that the nature of electronically networked learning has significantly changed teaching and learning which requires the use of more than one means of analysing the relevant data to create a holistic investigation. In mixed method research, a qualitative phase and a quantitative phase are included in the overall research study. Johnson and Onwuegbuzie (2004) defined mixed methods research as:

> *"the class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts or language into a single study."*(p17)

As mixed method research combines both quantitative and qualitative research methods, it not only provides qualitative and qualitative research strengths, but also uses the strengths of an additional method to overcome the weaknesses in other method (Johnson and Onwuegbuzie, 2004). Mixed method research is then an attempt to legitimate the use of multiple approaches in answering research questions, rather than restricting researchers' choices. As noted by Greene et al. (1989), there were five most important rationales or purposes for mixed research as shown in Table 3-1

Purpose	Explanation
Triangulation	Seeking convergence and corroboration of results from different methods and designs studying the same phenomenon
Complementarily	Seeking elaboration, enhancement, illustration, and clarification of the results from one method with results from the other method
Initiation	Discovering paradoxes and contradictions that lead to a re-framing of the research question
Development	Using the findings from one method to help inform the other method
Expansion	Seeking to expand the breadth and range of research by using different methods for different inquiry component

Table 3-1 Purposes for Mixed Method Research (Greene et al., 1989)

However, it is expensive and time consuming for a single researcher to conduct the entire mixed method research comparing with a single method research. Furthermore, the researcher should fully understand the methods in order to avoid some possible implementation problems such as problems of paradigm mixing, how to qualitatively analyze quantitative data and interpret conflicting results (Johnson and Onwuegbuzie,

2004). The current mixed method research started with a quantitative method in terms of questionnaire consisting of two appropriately-designed questionnaires: Study Process Questionnaire (SPQ) and the Reflective Questionnaire (RQ). Then, a content analysis based on pre-defined coding frame and word cloud analysis were carried out on some student blog postings selected from the sample of the quantitative analysis in order to triangulate the results drawn from the questionnaire. A keyword frequency analysis for all blog postings was carried out to further triangulate the results drawn from the two qualitative methods which were the word cloud analysis and content analysis for the focus group. Finally, some students were invited for an interview in order to understand their responses in depth. Figure 3-1 exhibits all the methods that were used in this research. Multiple methods and overlapping data sources were used in the study for enhancing the reliability of the results.
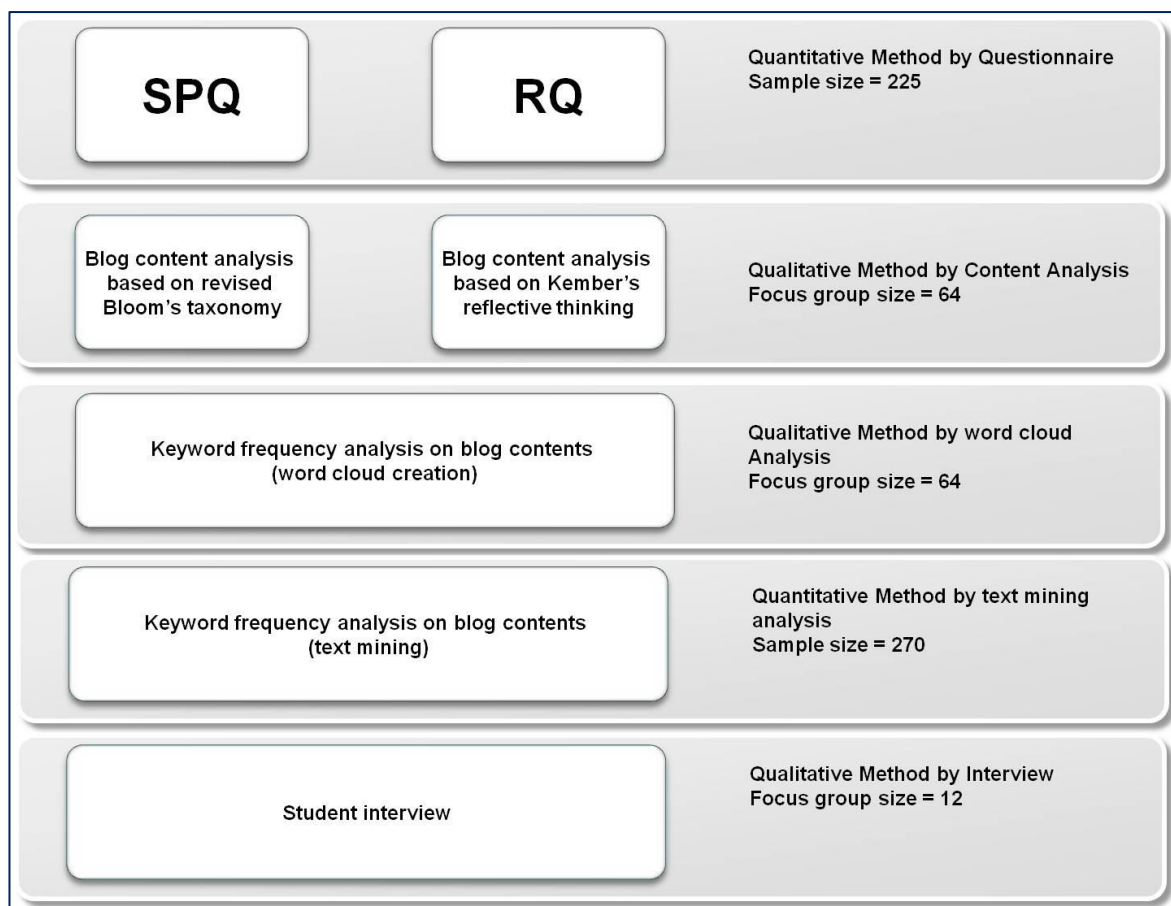
Figure 3-1 Research methods of current study

3.2.1 Study Design of Pre-teaching/ Post-teaching Questionnaires

All students including the control group responded to a similar questionnaire before the treatment (Week 1 of the semester) and after the treatment (Week 13 of the semester). The pre-treatment and post-treatment questionnaires included four different parts: (1) the student's demographic data, (2) the student experiences of blogging, (3) the 20-item Study Process Questionnaire (R-SPQ-2F), and (4) the Reflection Questionnaire (RQ). Basically, the contents of the pre-teaching questionnaire and the post-teaching one are the same, except the exclusion of the first two parts (demographics data part and blog experiences part) from the

post-teaching questionnaire. Repeating the questionnaire items in the pre-treatment and post-treatment surveys is particularly used to find out the effect of blogging on the students' learning approach and reflection thinking skills. The "perceived form" is for the pre-teaching phase which asks the students' reflection habits and learning approaches before using blogs in their learning whereas the "actual form" is for the post-teaching phase which asks what students actually received from the blog journaling activities. After having the raw scores, the pre-teaching means of each scale for each instrument were compared with the post-teaching means in order to identify the change of learning approaches and the reflection habit. The change of the learning approach can also be treated as one of the measurements for learning outcome.

3.2.2 Study Design of Post-teaching Learning Outcome

The course mark is usually used as a measurement of learning outcome. The overall course mark is derived from various assessment components consisting of online quizzes, class participation, group project and a personal portfolio. The reflective blog is part of the personal portfolio requirement. The student learning outcome was measured as the mark for personal portfolio as well as the overall course mark. The average mark of the personal portfolio and the overall course

mark were analysed together with the learning approaches and level of reflective thinking in order to see any relationships among these variables.

3.2.3 Study Design of Student Assignment – Blog Postings

As part of the assessment, the students were required to submit four reflective journal entries and one summary article to the blogging tool in Blackboard. The reflective journal entries were a collection of self-reflective journal entries of weekly lecture and tutorial. Students were encouraged to write journal(s) weekly and select the best four journal entries for submission. The summary article was an explanation of how all included items of the personal portfolio demonstrating the personal development in creative thinking and understandings of creativity by the students. Therefore, it also served as a reflection of their learning.

Based on the questionnaire scores (SPQ and RQ scores), students were divided into two subgroups (DA, SA) in accordance with SPQ scores, and another four subgroups (HA, U, R, CR) in accordance with RQ scores. The blogs of two students from each gender were selected for each SPQ subgroup, while one student for each gender of each RA subgroup. In each student blog, it contains four reflective journals and one summary. Roughly speaking, there were 64 student blogs containing 320 postings approximately, selected for content analysis. The selected blog postings were then computerized coded and retrieved based on

two pedagogical theories of the revised version of Bloom's taxonomy (Anderson & Krathwohl, 2001) that related to learning outcomes, and the level of reflective thinking (Kember et. al., 1999) that related to the value of reflection.

3.2.4 Study Design of Post-teaching Student Interviews

Interviews were used to gather in-depth information about how students used the blog over the semester and some suggestions on improving the pedagogical strategies of using blog in the teaching and learning activities. Interviews were chosen because they are an effective way to make explicit the thoughts and approaches of the participants, particularly in cases where the participants themselves are not always aware of how they experience in a given situation. An informal semi-structured interview was held with six to twelve students involved in the sample regarding their comments on blogging. Four questions to be asked during interview were,

- How do you find using blog in DCO10701?

- Do you think it helps you to understand the matters of DCO10701?

- Tell me some good features and bad features?

- Any other suggestion?

Recognizing that students may experience learning in the course in different ways, two students were randomly selected from the two learning approach groups (DA

and SA groups), and each type of reflective thinker groups (HA; U; R; CR groups). Details of the conversations were recorded by audio recorder and then transcribed into written scripts.

3.3   Selection of Instruments

This section discusses the selection of the instruments and the formation of coding frame for assessing students' learning experiences and the change of the level of reflective thinking the students can achieve after using the blog. The quantitative part of this study used a combined version of two appropriately-designed questionnaires: Study Process Questionnaire (SPQ) and the Reflection Questionnaire (RQ). For content analysis, it adopted a combined coding frame which consists of coding categories from the revised version of Bloom's taxonomy (Anderson & Krathwohl, 2001) that related to learning outcomes, and the level of reflective thinking (Kember et. al., 1999) that related to the value of reflection.

3.3.1 Study Process Questionnaire (SPQ)

The Study Process Questionnaire (SPQ) designed by Biggs (1987) was used to gather data on student approaches to learning. A revised two-factor (surface and deep) study process questionnaire (R-SPQ-2F) was developed (Biggs et al., 2001) with modified items from the original SPQ, with 10 items per each approach

subscale. This tool was chosen because the SPQ had been used widely in learning in a variety of systems of higher education. The questionnaire contains 10 questions representing a deep approach to learning, (e.g., "I find that I have to do enough work on a topic so that I can form my own point of view before I am satisfied") and 10 questions representing a surface approach to learning (e.g., "I learn some things by rote, going over and over them until I know them by heart"). Students were required to respond on a five-point likert scale, with 1 representing "never or rarely true" and 5 indicating "always or almost always true." The SPQ can be further divided into four sub-scales: (1) deep motive (DM), (2) deep strategy (DS), (3) surface motive (SM), and (4) surface strategy (SS).

Surface and deep strategies describe ways in which students engage the actual task itself. Surface strategy is to limit target to bare essentials and reproduce them through rote learning, while deep strategy is to discover meaning by reading widely, inter-relating with previous relevant knowledge, etc. Motivation describes the learners' motives for learning. Surface motive is to meet requirements minimally; a balancing act between failing and working more than is necessary, while deep motive is intrinsic interest in what is being learned; to develop competence in particular academic subjects. The range of scores is from 5 to 25 in the Strategy scales as well as in the Motivation scales. The higher the score in

each of these scales indicates a higher tendency of the learners' having that motive, strategy or approach.

Finally, the student's approach to learning is a composite of a motive and an appropriate strategy. Approaches describe fairly consistent orientations, or learning styles, displayed by students, and they may persist over reasonable periods of time. The range of scores is from 10 to 50 in the Approach scales. The higher the score in each of these scales indicates a higher tendency of the learners' having that motive, strategy or approach. For example, a student getting 45 marks in the Deep Approach scale means that s/he has a strong tendency to study for deep learning.

The Bigg's Study Process Questionnaire (in both English and Chinese versions) has been widely used in examining the study motives and strategies of students in a wide range of cultures, and has established an internal consistency measure of approximately 0.6 and 0.7 as reported in a number of studies. The tool was tested using reliability procedures and confirmatory factor analysis (alpha for subscales are DM=0.62, DS=0.63, SM=0.72, SS=0.57) (Biggs et al., 2001). Results of their study indicated that the final version of the questionnaire had reasonable Cronbach alpha values for scale reliability. Besides, confirmatory factor analysis showed desirable matches of an intended two-factor model. Well defined motive

and strategy subscales also emerged from the deep and surface approach scales. Therefore, it was concluded that teachers using the 20-item SPQ can handily use it to evaluate their own teaching and study approaches of their students as well. The present study has adopted the Chinese version developed by the original author.

3.3.2 The Reflection Questionnaire (RQ)

The Reflection Questionnaire (RQ), designed by Kember et al. (2000), was used to examine the extent to which students engage in reflective thinking in professional preparation courses. The 16-item questionnaire was based upon the extensive literature reviews on reflective thinking, in particular the influential work on critical reflection and transformative learning by Jack Mezirow (1991, 2000) and a research project on reflective teaching in Hong Kong. The RQ has four scales indicating the four levels of reflective thinking: (1) habitual action (HA), (2) understanding (U), (3) reflection (R), and (4) critical reflection (CR). Detailed descriptions for each subscale are described in Table 3-2. This structure suggests a kind of hierarchy in reflective thinking, with habitual action as the lowest level of reflection (or even non-reflection), and critical reflection is the most profound.

Scale name	Description
Habitual Action (HA)	Those have been learnt before and through frequent use become routine activities which are performed automatically or with little conscious thought.
Understanding (U)	Learning in which the student may reach an understanding of a concept without reflecting upon its significance in personal or practical situations.
Reflection (R)	Learning process which internally examines and explores an issue of concern, triggered by experience, which creates and clarifies in terms of self, and which results in a changed conceptual perspective.
Critical Reflection (CR)	A deeper level of reflection which may examine all possible outcomes before drawing a conclusion.

Table 3-2 Descriptions of Scales of Reflection Questionnaire

In the 16-item RQ questionnaire, each of the four scales has four items representing different level of reflective thinking. Students were required to respond on a five-point likert scale, with 1 representing "never or rarely true" and 5 indicating "always or almost always true." Table 3-3 lists the items for each subscale. The range of scores is from 4 to 20 for each scale. The higher the mean score in each of these scales indicates a higher tendency of the learners' having that deep level of reflective thinking.

Scale name	Items
Habitual Action (HA)	When I am working on some activities, I can do them without thinking about what I am doing.
	In this course we do things so many times that I started doing them without thinking about it.
	As long as I can remember handout material for examinations, I do not have to think too much.
	If I follow what the lecturer says, I do not have to think too much on this course.
Understanding (UN)	This course requires us to understand concepts taught by the lecturer.
	To pass this course you need to understand the content.
	I need to understand the material taught by the teacher in order to perform practical tasks.
	In this course you have to continually think about the material you are being taught.
Reflection (R)	I sometimes question the way others do something and try to think of a better way.
	I like to think over what I have been doing and consider alternative ways of doing it.
	I often reflect on my actions to see whether I could have improved on what I did.
	I often re-appraise my experience so I can learn from it and improve for my next performance.
Critical Reflection (CR)	As a result of this course I have changed the way I look at myself.
	This course has challenged some of my firmly held ideas.
	As a result of this course I have changed my normal way of doing things.
	During this course I discovered faults in what I had previously believed to be right.

Table 3-3 Items listing for each RQ subscale

The questionnaire was validated internally by reliability procedures and confirmatory factor analysis, using data from a sizeable sample of nursing

students. Its Cronbach alpha values for the four scales are HA=0.62, U=0.76, R=0.63, and CR=0.68 (Kember et al., 2000). It was also tested externally with the Biggs' Study Processes Questionnaire (Leung & Kember, 2003).

3.3.3 Coding Scheme for Content Analysis

The blog contents were analysed according to the revised coding scheme on reflective thinking suggested by Kember et al. (1999) and learning objectives based on the revised version of Bloom's taxonomy suggested by Anderson and Krathwohl (2001) as a starting point.

This research adopted the same categories suggested by Kember and his colleagues (1999). Even though three categories (habitual action, introspection and thoughtful action) are classified as non-reflective action, it is worth to include these three categories in the content analysis in which the content analysis result was triangulated with the RQ portion of the questionnaire. Table 3-4 includes a coding scheme created by the researcher to identify instances of the level of reflective thinking in the students' blog postings.

Kember's level of reflective thinking	Coding format
Kember habitual action	KHA
Kember introspection	KI
Kember thoughtful action	KTA
Kember content reflection	KCR
Kember process reflection	KProR
Kember content and process reflection	KCPR
Kember premise reflection	KPreR

Table 3-4 Coding for reflective thinking

Apart from locating the instances of individual reflective thinking, the research

also tried to seek evidences for achieving higher-order education objectives as the

outcomes of study. The bases of these codes were located according to the revised

version of Bloom's taxonomy suggested by Anderson and Krathwohl (2001)

which involves a two dimensional table, with six cognitive processes and four

types of knowledge. Table 3-5 provides a brief description for each type of

cognitive processes.

Dimension	Actions of cognitive process involved
Remember: can the student recall or remember the information?	define, duplicate, list, memorize, recall, repeat, reproduce state
Understand: can the student explain ideas or concepts?	classify, describe, discuss, explain, identify, locate, recognize, report, select, translate, paraphrase
Apply: can the student use the information in a new way?	choose, demonstrate, dramatize, employ, illustrate, interpret, operate, schedule, sketch, solve, use, write
Analyze: can the student distinguish between the different parts?	appraise, compare, contrast, criticize, differentiate, discriminate, distinguish, examine, experiment, question, test
Evaluate: can the student justify a stand or decision?	appraise, argue, defend, judge, select, support, value, evaluate
Create: can the student create new product or point of view?	assemble, construct, create, design, develop, formulate, write

Table 3-5 Descriptions of Cognitive Processing Dimension

Even though only three categories (analyse, evaluate and create) are classified as higher order cognitive skills, it is worth to include the other three categories (remember, understand and apply) in the content analysis in which the content analysis result was then triangulated with the SPQ portion of the questionnaire. Table 3-6 includes a coding scheme created by the researcher to identify instances of the students' learning outcome in the students' blog postings.

Cognitive process dimension	Coding Format
Create	AKC
Evaluate	AKE
Analyse	AKAna
Apply	AKApp
Understand	AKU
Remember	AKR

Table 3-6 Coding for learning outcomes

3.4   Course Context for the Main Study

The study was carried out in the Division of Computer Studies (DCO) of the Community College of City University of Hong Kong (CCCU), which currently is a main sub-degree education provider of a range of pre-associate and associate degree programs. CCCU has used Blackboard learning system as a common teaching and learning portal, and all course materials are available over this system. Students normally take five courses in each semester. The main study was based on a one-semester three-credit course (DCO10701 Creative Thinking for Media Design) taught by the researcher. The course is only offered in Semester A of each academic year. The study was administered to about

260 students who enrolled in full-time Associate of Science in Creative and Interactive Media Production (AScCIMP) offered by DCO across four cohort-years. The course intended learning outcomes (CILOs) of this course are to (1) describe the attributes and barriers of a creative thinker; (2) self-assess their own creative potential; (3) apply appropriate techniques of creative thinking in problem-solving and media design tasks; and (4) reflect the self-change in attitudes conducive to creative thinking. The students were required to take two-hour lecture and one-hour laboratory for the course every week during the 13-week semester.

The course did not require any end-of-semester paper-format exam, it was 100% assessed by coursework. The planned assessment was not based on absorption of subject matter. As the course aimed to improve attitudes and thinking abilities; therefore, evaluation was based on the degree to which students demonstrate such gains. In view of the CILOs, the assessment plan involved the following items:

a. **Personal Learning Portfolio (40%).** Each student was asked to submit a personal learning portfolio in providing sufficient evidences of learning experiences in the course. They had to demonstrate their full understanding of the nature of creative thinking; how the students and other people applied the techniques of creative thinking in problem-solving tasks and media design; and

reflected their own change in attitudes conducive to creative thinking. It was suggested to have the following items:

i. **A summary** of the students themselves, why the items were being presented in the learning portfolio, and what special meaning they have to the student?

ii. **Four selected reflective journal** entries that were a compilation of specific assignments to be addressed in weekly lectures and tutorials.

iii. **A creative work** in any media design that the students always wanted to do but until they took the studied course have lacked courage, time, or motivation.

iv. **A description of any creative Ps** (person, product, process, performance and place, etc.)

b. **Group Project (35%)**. The first week was introduction, in which the course objectives were presented and discussed, and everyone introduced themselves on a personal page. All students filled out an online form in which they could choose to consent to the present study. A group of three to five students was asked to produce a ten-minute video/mixed-media production. The objectives of this task were to demonstrate understanding of the nature of creative thinking and apply

the techniques of creative thinking in individual/ group problem-solving tasks and

media design.

c. **Online Quizzes (15%)**. There were about four online quizzes that students have

to finish at Blackboard. Some of them were testing students' understandings on

basic concepts and techniques of creative thinking. Students were also required to

complete the BLOG Attitudes and Approaches Survey twice which was the

pre-teaching and post-teaching questionnaire of the study. A maximum of four

marks were given to those students who completed the questionnaire twice.

d. **Class Participations (10%)**. The tutorials adopted edutainment format which

require students' active participations in classes. Students should maintain at least

80% of tutorial attendance. In addition, they should actively involve in the group

discussion and be willing to share his/her idea.

Among all the assessment items, the study only analysed the data sought from the

questionnaires, the summary article and four selected reflective journal entries included

in the personal learning portfolio. Students were asked to build their personal learning

portfolio in the blogging tools provided in Blackboard. Figure 3-2 exhibits a sample

student blog created in Blackboard. As the content of reflective journals should relate

what the students experience in their lecture and tutorials, the course information

including the teaching schedules for the studied course are attached in Appendix C for

reference.

Figure 3-2 Sample of Student Blog

3.5 Sample Selection for the Main Study

The present study adopted a mixed research method including both questionnaire survey

as quantitative method and content analysis on blog postings as qualitative method as

data collection. The sample was drawn from DCO10701 course which is taught by the

researcher in Semester A from four consecutive academic years since year 2007. Furthermore, the effect of blogging is not the sole factor for deep learning approach and deep reflection. Biggs and Moore (1993) describe many possible factors from student characteristics and elements from teaching context may affect different learning outcomes.

In order to demonstrate the cause-effect relationship, random selection and assignment are very important. However, in many educational researches, random assignment is not easy or not possible. A quasi-experiment with pre-and post-tests with a non-equivalent selection on control group was used.

Questionnaires were administered to both main group and control group. There were appropriately 260 students enrolled in DCO10701 as the experiment group, while about 110 students studying other DCO courses which also taught by the researcher were invited as the control group. Table 3-7 lists out the numbers of students across the cohort-year and in the control group.

Cohort	No. of students	Purpose
2006	55	Pilot testing
2007	52	Experiment group
2008	65	
2009	70	
2010	83	
Total	260	
2010	112	Control group

Table 3-7 Number of students of the study

A focus group was selected for content analysis of blog postings. For each cohort-year, around 16 students were selected as focus group. Based on the questionnaire scores (SPQ and RQ scores), students were divided into two subgroups (deep approach - DA and surface approach - SA) in accordance with SPQ scores, and another four subgroups (HA, U, R, CR) according to RQ scores. For each cohort-year, the blogs of two students from each gender were selected from DA and SA group, while only one student from each gender was selected from each of the other four subgroups (HA, U, R, CR). In each student blog, it contained four reflective journal entries and one summary. Roughly speaking, there were 64 student Blogs containing about 320 postings selected for content analysis. Table 3-8 shows the sample design for the focus group.

Cohort-Year	2007	2008	2009	2010
SPQ				
Deep Approach (DA)	2F / 2M	2F / 2M	2F / 2M	2F / 2M
Surface Approach (SA)	2F / 2M	2F / 2M	2F / 2M	2F / 2M
RQ				
Habitual action (HA)	1F / 1M	1F / 1M	1F / 1M	1F / 1M
Understanding (U)	1F / 1M	1F / 1M	1F / 1M	1F / 1M
Reflection (R)	1F / 1M	1F / 1M	1F / 1M	1F / 1M
Critical Reflection (CR)	1F / 1M	1F / 1M	1F / 1M	1F / 1M

Focus group size: 64 students; F denotes Female and M denotes Male

Table 3-8 Sample design for the focus group

3.6   Data Collection and Strategies for the Main Study

Data were collected and analysed in different formats. The pre-teaching and post-teaching survey were administered to the students from the experiment group in Week 2 and 13 of the studied semesters in the form of online survey in Blackboard, while the similar ways but in the form of online survey as Google Form for the control group. The researcher created one blog for each student at Blackboard and made them available for posting in Week 2. Students then were free to post new entry to the blog. At the end of Semester and after the online marking by the researcher, all the blog postings were archived as word documents for content analysis. Follow-up student interviews were conducted during Semester break. Details of the proposed schedule are shown in Figure 3-3.
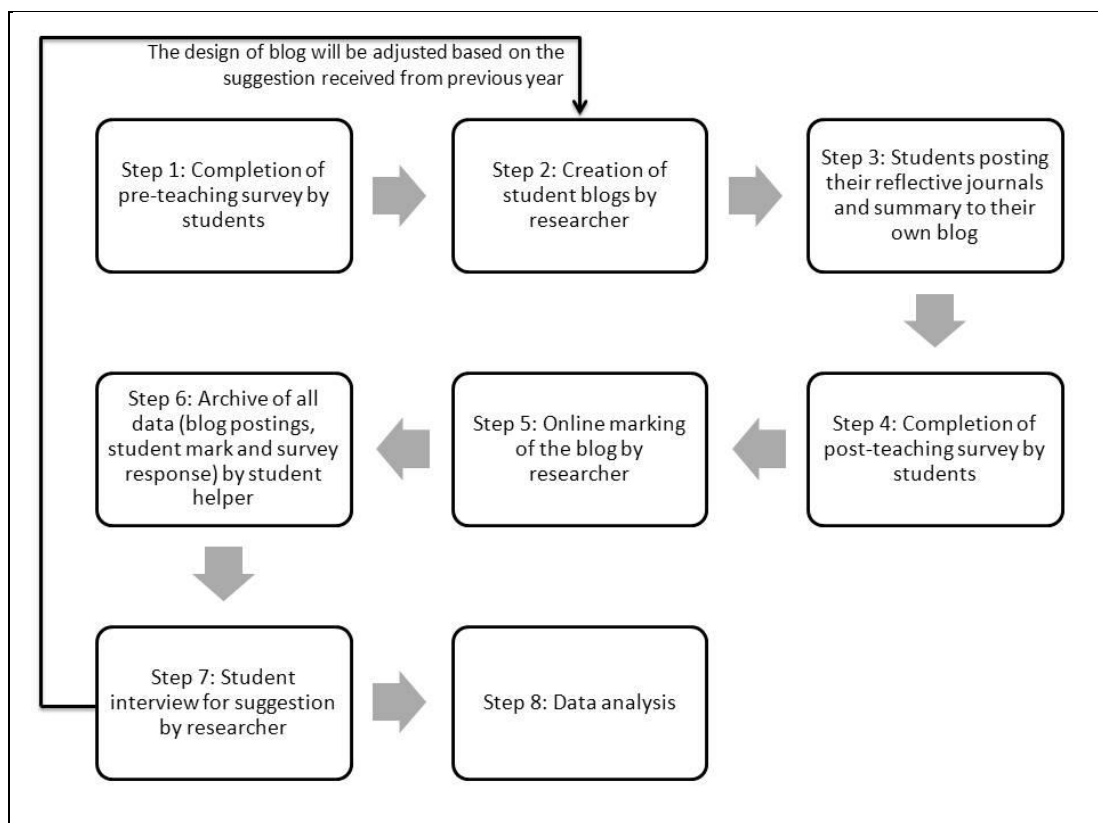
Figure 3-3 Steps of Data Collection of the Study

To ensure a high response rate for the questionnaire and blog content, the pre-teaching

and post-teaching questionnaires and the blog journals were treated as part of the

assessment in experiment group. However, students were informed the purpose of the

questionnaire data and their blog postings would also serve as the data of this research.

For the control group, the participation was voluntary and a supermarket coupon valued

HK$50 was given for those who completed both pre-teaching and post-teaching

questionnaires. All participants were informed that their identity would be kept as

confidential. Each of them was assigned a subject ID.

3.7   Data Analysis

Both qualitative and quantitative methods were used to inform each other in a continual process of interaction, triangulation and re-analysis (Huberman and Crandall 1982). Data collected from the questionnaires was analysed by the SimStat® from Provalis Research tools. The reason of using SimStat® was that it can analyse different data formats: numerical and categorical data, dates and short alpha-numeric variable, memos and documents variables, allowing one to store in the same project file responses to open-ended questions, interview transcripts, and full reports. It also works closely with content analysis tool - QDA Miner® and the text mining tool – WordStat® on the same set of data. Therefore, both quantitative and qualitative analyses in the study were performed by the three mentioned tools.

Descriptive analysis was carried out on the student demographical data and student blogging experience items, based on students' responses to the pre-treatment questionnaire. Furthermore, the following statistics procedures were used to answer the four main research questions.

RQ1. How well do the students use blog in their study?

RQ2. Students with what learning approach reflect deeper with the blog?

RQ3. Is there any significant change in students' learning approaches and level of reflective thinking before and after blogging?

RQ4. To what extent does the actual use of blogging enhance the student's reflective thinking and knowledge construction?

3.7.1 Descriptive Analysis

To describe the reflective thinking habit and learning approach of DCO classes, descriptive analysis, based on students' responses to the pre-teaching and post-teaching form of the questionnaire, was used. The item mean score was used as the basis for fair comparison between different scales of questionnaire which could contain differing numbers of item. Graphical representations of students' average perceptions of learning approach towards their learning environment and their level of reflective thinking for the sample as a whole were used to describe differences. In order to ensure the instruments are applicable to the study, statistics analysis including internal consistency (alpha reliability) and discriminant validity (correlations between scales) were carried out for each of the RQ scales and R-SPQ-2F scales.

3.7.2 Quantitative Analysis

Data collected through the questionnaire from both experiment group and control group was firstly stored in Microsoft Excel file format. The responses were then be further coded and assigned with a numeric value for each answer during the

pre-analysis stage. Then it was imported into SimStat® for analysis process.

There are seven hypotheses in total to be tested for the quantitative analysis part,

which mainly addressed the first three research questions.

3.7.2.1 Gender Differences in Habit of Reflective thinking and Learning Approach

> *Hypothesis #1*
>
> *There is no gender difference on the habit on reflective thinking and*
>
> *learning approach*

In order to study whether the gender has any significant effects on the

questionnaires, information about each scale's ability to differentiate between the

perceptions of students with different gender was obtained by performing for each

scale an independent sample T-test with effect size, with cohort as the main effect

and using the gender subgroup as the unit of analysis.

3.7.2.2 Associations between Students' Learning Approach and Reflective

   Thinking Habit

> *Hypothesis #2*
>
> *There is no association between students' learning approach and habit of*
>
> *reflective thinking*

The associations between SPQ scores and their RQ scores were analysed in terms of simple correlation co- efficient (r) and standardised regression coefficients (β).

3.7.2.3 Associations between students' learning approach and learning outcome

Hypothesis #3

There is no association between students' learning approach and learning outcome

The associations between pre-teaching and post-teaching SPQ scores and their post-teaching assessment marks were analysed in terms of simple correlation co-efficient (r) and standardised regression coefficients (β).

3.7.2.4 Associations between Reflective Thinking Habit and Learning Outcome

Hypothesis #4

There is no association between reflective thinking habit and learning outcome

The associations between student habit in reflective thinking (RQ pre-teaching and post-teaching scores) and learning outcomes (assessment mark) were analysed simple correlation co- efficient (r) and standardised regression coefficients (β).

3.7.2.5 Difference between Pre-teaching and Post-teaching Learning Approaches

> *Hypothesis #5*
>
> *There is no difference between the learning approaches before teaching and after the teaching*

The descriptive statistics (mean scores) were obtained from the sample for each of the SPQ scales of pre-teaching and post-teaching forms and then the means of each pair of SPQ scales were compared by using a paired t-test.

3.7.2.6 Difference between Pre-teaching Reflective Thinking Habit and Post-teaching Reflective Thinking Habit

> *Hypothesis #6*
>
> *There is no difference between the pre-teaching and post-teaching level of reflective thinking habit.*

The descriptive statistics (mean scores) were obtained from the sample for each of the RQ scales of pre-teaching and post-teaching forms and then the means of each pair of RQ scales were compared by using a paired t-test.

3.7.2.7 Associations between Experiment Group and Control Group

> *Hypothesis #7*
>
> *There is no group difference on the habit on reflective thinking and learning approach.*

The descriptive statistics (mean scores) were obtained from the sample for each of the RQ and SPQ scales of pre-teaching and post-teaching forms and then the means of each pair of SPQ and RQ scales for both experiment group and control group were compared by using a paired t-test.

3.8   Qualitative Analysis of Students' Blog Postings

The qualitative content of the student blog was examined to find out how much and at which level reflection occurs in students' blog (research question three and four). All the blog postings, linked with the quantitative data, were imported in QDA Miner for further analysis. Figure 3-4 exhibits screen snapshot of using QDA Miner. Thirteen codes derived from the revised Bloom's taxonomy (Anderson and Krathwohl, 2001) and the level of reflective thinking (Kember, 1999) was applied to the text of the blog postings for the selected sample. The use of pre-defined codes enhanced the validity of the study. The sample of main study comprised of all postings in 16 student blogs for each of the four cohort-years. In total, there were 64 student blogs including about 320 blog postings. External validity is the extent to which the findings of an investigation can be generalised

(Neuendorf, 2002). By replicating the process in the four succeeding cohort-year, the findings, in particular in year 2007-2008 can be generalised. However, the use of a single coder who is the researcher as well as the course lecturer in the study limited the generalisation of the study findings. There were several pragmatic reasons for not being able to utilise inter-rater checking in the study. First, the research, was part of a doctoral degree study, did not have any resource in employing extra rater(s) to code all or part of the coding. Having an inexperience rater requires training on coding as well as understanding the meaning of each coding category. Even with experience raters, significant amount of time should be required for comprising a common and mutually agreed meaning of each coding category among the raters. Otherwise, any inappropriate arrangement may affect the overall reliability of the study. In order to strike a balance between reliability and limited resource issue, intra-coder checking on all the sample blog postings was conducted twice with at least two-day interval. In addition, the use of multiple methods and overlapping data sources also optimised the reliability of this study.
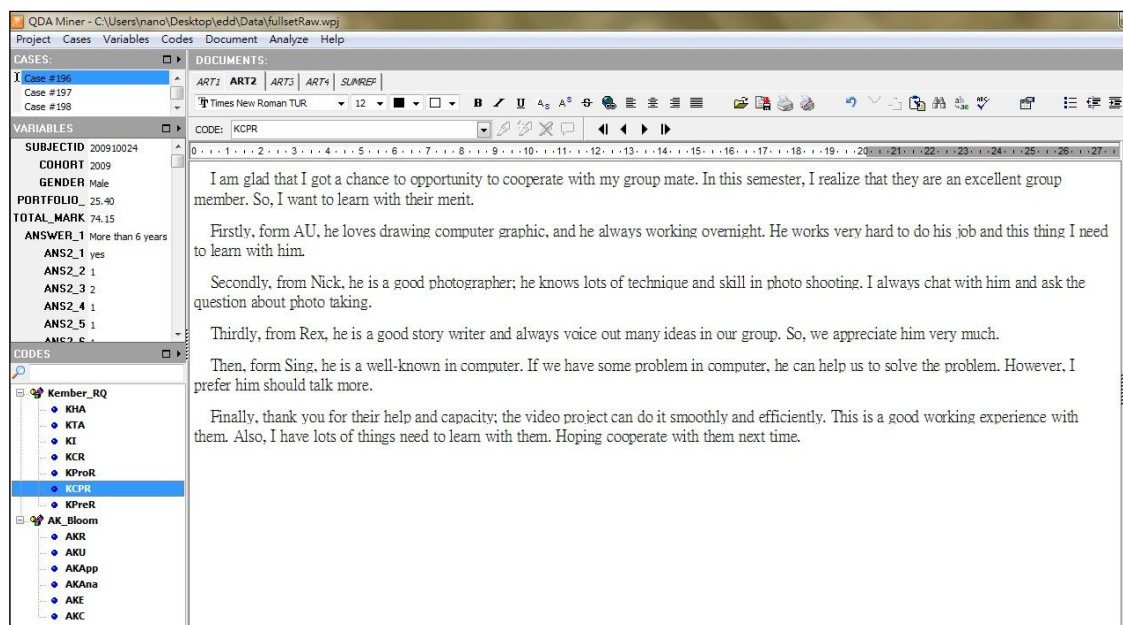
Figure 3-4 Snapshot of Content Analysis by QDA Miner

Once the codes were assigned to the text, the data were analysed for frequency to identify evidences for addressing the four research questions. Furthermore, the sample blogs were then further analysed into different groups: (1) gender group, (2) learning approach group, (3) reflection group, and (4) cohort year group. In addition to the content analysis, keywords in context (KWIC) analysis in terms of word clouds were generated for all sample blog contents. The top 25 frequently used keywords were used, together with the keywords for Bloom's higher order cognitive skills, for the keywords in context (KWIC) analysis of all blog contents of the main study.

3.9   Qualitative Analysis of Student Interview

Personal interviews were held with six to twelve students involved in the sample regarding their comments on the experience of using blog in learning. The interview

result was analysed and categorised into three different aspects of suggestion: (1) learning experiences of DCO10701, (2) user experiences of using blogging tool in DCO10701, and (3) other suggestions.

3.10   Summary

The research aimed at exploring the possibility of blog to enrich the students' experience in reflective thinking and knowledge construction, in result of moving to deeper learning approach. It helped the researcher better understand student reflective thinking habit and learning approaches towards blogging. This understanding enabled the education practitioners to rethink whether their usual teacher-centred approach in IT education need to move to more student-centred approach. Therefore, courseware developers can enhance the existing web-based learning strategies in order to motivate students to learn better. Furthermore, as the class sizes in higher education grow rapidly, some teachers may find it difficult to motivate learners to deep learning approaches. Because of this, the situation can be improved if the study can prove that reflective thinking by blogging motivates student to learn deeper and able to solve the ill-defined real life problems.

In this study, apart from using SPQ as an instrument to find out the learning approach, after careful consideration of a number of questionnaires regarding reflective thinking, the researcher selected the Reflective Questionnaire (RQ). There were totally seven hypotheses which all involve the relationships between three major factors: (1) habit of

reflective thinking, (2) learning approach and (3) learning outcome. Different statistical methods were used to test all these seven hypotheses.

This study also attempted to prove that blogging can be an effective instructional method over the web for reflective thinking and knowledge construction, and the application of blog in IT sub-degree education has the potential to be successful. The research extended the work of the measurement tools for reflective thinking in a new domain which is IT education. Hopefully, this study will serve as a catalyst for further research which put more emphasises on reflective thinking in IT professional education.

CHAPTER 4 PILOT STUDY FOR THE DATA ANALYSIS

The aim of the research was to increase understanding of students' experiences using blogs as reflective thinking tool. In order to ensure the chosen instruments are applicable to the context of the study, a pilot test with 55 students was carried out in December 2006. This group of students was taken one DCO course named DCO10701 Creative thinking for Media Design in Semester A, 2006, which also asked them to reflect throughout the learning process. Data drawn from the questionnaire and the blog posts is analysed and findings are used to refine the survey and the coding scheme for coding analysis. Once the reliability and validity for the instruments were confirmed, main study would begin in September, 2007. The revised questionnaire was given to students in the first week and the last week of semester A in year 2007-08. Follow-up student interviews were conducted in Revision Week, Semester A 2007-08. Content analysis was then carried out during the semester break. Details of the proposed schedule are shown in Figure 4-1.
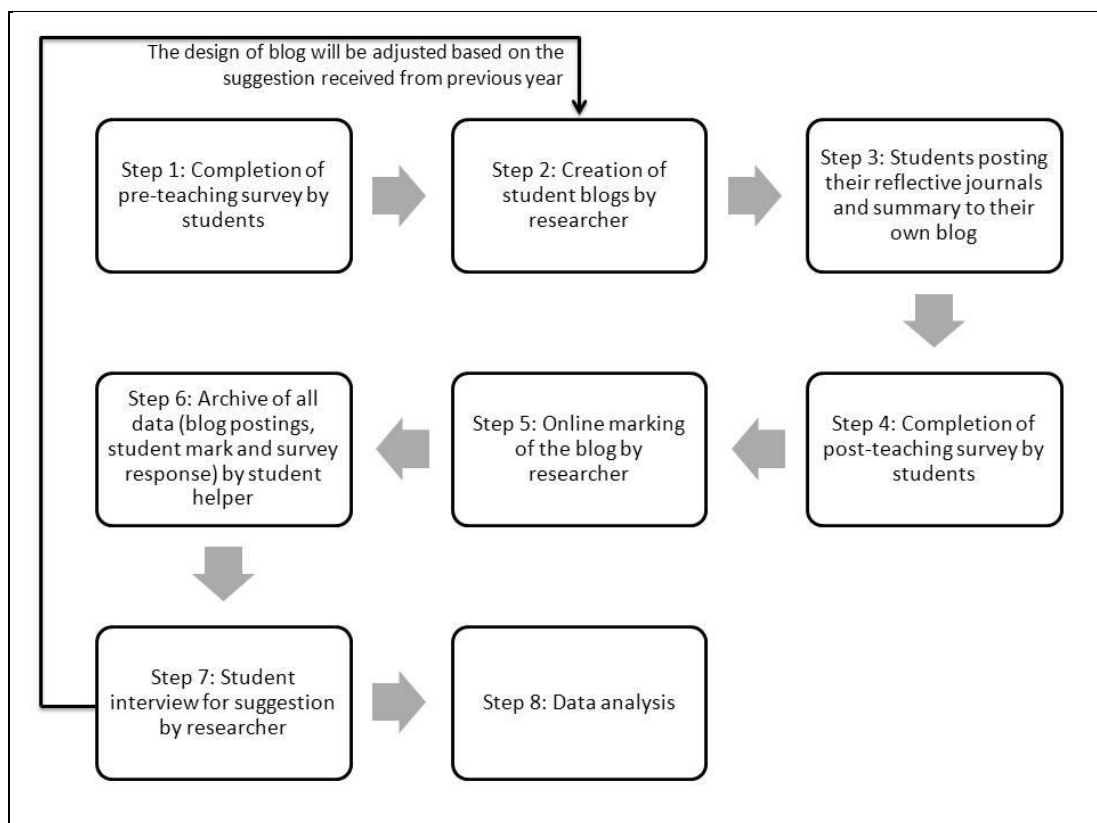
Figure 4-1 Steps of Data Collection of the Study

In the pilot study, students were asked to build their own blog over the public weblog applications such as Xanga or blogger at the beginning of semester. To gain in-depth information about the students' experiences of blogging, a variety of different teaching and learning activities were designed and used in order to encourage them for reflective thinking and constructing knowledge among the class. A pilot study with 55 students from the class taught by the researcher was conducted to,

- make sure that the combined version of questionnaire was applicable to the students in Division of Computer Studies;

- check that students' understandings of individual items were consistent with the researcher's understandings;

- provide a reference regarding the amount of time required to administer the questionnaire;

- make sure that the coding scheme for content analysis was applicable to the students' blog postings;

- enrich the content of the coding scheme of the content analysis and include examples of phases for each coding category;

4.1   Pilot Study for Quantitative Analysis

To ensure that the instrument was applicable to Hong Kong students, the combined questionnaire with bilingual (English and Chinese) version for SPQ item and English-only version RQ items were pilot-tested with fifty-five DCO10701 students. Each person was asked to complete one full set of combined questionnaires which contained items for collecting demographic data and blogging experiences, SPQ items as well as RQ items. The pilot study used the Cronbach alpha reliability coefficient of each of the scales in SPQ and RQ to determine internal consistency of the subscale, as well as the mean of correlation of a scale with other scales to determine the discriminant validity of the questionnaire.

Table 4-1 reports the Cronbach alpha reliability coefficient and mean of correlation of each of four subscales for SPQ. The subscale reliability estimates ranged from 0.74 to 0.85 for all the individual values. All reliability indexes are comparable to those obtained

when the SPQ was used in previous study (DM=0.62, DS=0.63, SM=0.72, SS=0.57)

(Biggs et al., 2001). The results indicate that the subscales can be interpreted as internally

consistent and measuring distinct features at an acceptable level.

SPQ Sub-scale (N=55)	No. of item	Alpha Reliability	Discriminant Validity
Deep Motive (DM)	5	0.85	0.45
Deep Strategy (DS)	5	0.84	0.38
Surface Motive (SM)	5	0.74	0.29
Surface Strategy (SS)	5	0.77	0.41

Table 4-1 Internal Consistency Reliability and discriminant Validity for SPQ (Pilot Study)

Table 4-2 exhibits the Cronbach alpha values and discriminant validities for each

subscale in RQ scales. The subscale reliability estimates ranged from 0.60 to 0.76 for all

the individual values. All reliability indexes are comparable to those obtained when the

RQ was used in a previous study (HA=0.621, U=0.757, R=0.631, CR=0.675) (Kember et.

al., 2000). The values all reach acceptable levels indicating that the subscales can be

interpreted as internally consistent and measuring distinctively.

RQ Sub-scale (N=52)	No. of item	Alpha Reliability	Discriminant Validity
Habitual Action (HA)	4	0.74	0.43
Understanding (U)	4	0.60	0.28
Reflection (R)	4	0.67	0.33
Critical Reflection (CR)	4	0.76	0.44

Table 4-2 Internal Consistency Reliability (Cronbach Alpha Coefficient) for RQ (Pilot Study)

The intention of the interview process based on the questionnaires' responses was to

obtain first-hand feedbacks from students about readability, comprehensibility and

suitability of the questionnaire. As the questionnaire was delivered in an electronic format

in Blackboard as an online survey, many students found it difficult in answering Question 10 in the electronic version which was shown as an empty box. This is a follow-up question for Question 9 "Which type of blogging software do you have?" if the student selected the option of "Others, please specify". Figure 4-2 exhibits a snapshot of Question 9 and Question 10 in Blackboard survey. In order to solve this problem, students suggested adding a statement at Question 10 stating that "Only applicable if you answer "Others, please specify" in Question 9".

Figure 4-2 Snapshot of Question 9 and Question 10

During the pilot study, it appeared that completing the initial version of the questionnaire took students around 10 minutes. Appendix A provides the final version of questionnaire used in the present study.

4.1.1 Pilot Study for Qualitative Analysis

To ensure the coding scheme for the content analysis was applicable to the students' blog postings, a sample of 15 student blogs including 68 units of blog postings in total were

selected from the pilot study for content analysis. Thirteen codes using a framework combining the revised coding scheme on reflective thinking (Kember et. al., 1999) and a revised version of Bloom's taxonomy (Anderson and Krathwohl, 2001) were applied to the text of all blog postings by the researcher herself. Table 4-3 exhibits the user profile of the sample of the pilot study.

Subject ID	Gender	Type	Total mark		Total scores for each questionnaire subgroup					
			Portfolio	Course	DA	SA	HA	UN	RE	CR
200607036	F	DA	24.8	70.2	**36**	22	14	14	7	11
200607022	F	DA	33.6	84.35	**41**	24	8	9	13	11
200607017	M	DA	35.2	83.45	**43**	22	12	14	12	11
200607030	M	DA	28.5	78.65	**33**	17	12	10	9	8
200607049	F	SA	23.7	58.65	26	**28**	14	11	10	10
200607023	M	SA	16.8	50.9	24	**25**	11	14	9	11
200607054	M	SA	21.5	67.8	26	**30**	15	12	12	15
200607015	F	SA/UN	19.75	50.75	23	**29**	13	**15**	11	10
200607010	F	HA	24.2	64.25	32	27	**18**	15	14	13
200607041	M	HA	23.45	67.25	30	22	**18**	16	11	11
200607042	M	UN	26	75.95	39	27	8	**13**	8	12
200607032	F	RE	29.7	76.1	37	30	8	9	**18**	15
200607055	M	RE	19.3	52.3	30	30	11	12	**15**	13
200607007	M	CR	21.3	66.65	35	23	13	14	12	**17**
200607048	F	CR	28.75	75	36	25	12	13	13	**16**

Note: DA – Deep Approach; SA – Surface Approach; HA – Habitual Action; UN – Understanding; RE – Reflection; CR – Critical Reflection

Table 4-3 User Profile of the Sample of the Pilot Study

4.1.2 Pre-processing Stage of Content Analysis

After all postings were imported into the software QDA Miner® for content analysis, the following of pre-processing procedures have been carried out before the content analysis was being processed.

- If there is any content written in Chinese found, it was translated to English content and placed after the original text enclosing with a bracket [ ].

- In order to ensure the confidentiality of student's personal particulars, all student information such as student identity number and student name found from the blog content would be removed from the blog content.

4.1.3 Reliability of Content Analysis

Even though the inter-coder reliability or "*the amount of agreement or correspondence among two or more coders*" (p141) is a critical component of content analysis in particular when human coders are used in content analysis (Neuendorf, 2002), a test-retest reliability which is also called intra-coder reliability was used to provide an estimate of the relative consistency of judgments within a coder over time. After coding the sample of 15 student blogs including 68 units of blog postings along the thirteen coding categories, five student blogs including 25 units of blog postings (36.76% of the total coding posts) were selected for re-coding one week after the first coding. The overall test-retest agreement percentage was 76.7% (alpha=0.53) which showed the reliability was acceptable. Table 4-4 exhibits the test-retest agreement of the pilot study.

Code	Code Descriptions	% Agreement	Krippendorff's Alpha (α)
Cognitive process dimension in revised Bloom's taxonomy			
AKApp	AKApp	85.70%	0.42
Kember's level of reflective thinking			
KHA	Habitual Action	83.30%	0.4
KI	Introspection	88.90%	0.44
KTA	Thoughtful Action	84.60%	0.41
KCR	Content Reflection	75.00%	0.33
KProR	Process Reflection	66.70%	0.25
KCPR	Content & Process Reflection	100%	
KPreR	Premise Reflection	0%	0
	TOTAL	**66.70%**	**0.25**

Table 4-4 Test-retest agreement (pilot study)

Seven disagreement codes were found from the test-retest process. Negative reliability values were found for two coding categories, "apply" from revised Bloom's taxonomy and "content and process reflection" of Kember's reflective thinking scheme. In order to distinguish the differences among the 13 coding categories and improve the reliability of the content analysis in the main study, those disagreement codes were gone through once again by the researcher and consolidated by merging them together in the computerised software QDA Miner®. The coding book, found in Appendix B, was revised with detailed descriptions together with example of codes. Table 4-5 shows the coding frequency of each individual case, which is represented by the last three digits of the subject ID. For example, the last three digits "007" was displayed as the column heading in Table 4-5 for subject ID (200607007).

Figure 4-3 Coding Frequency to Bloom's Taxonomy Coding Categories

Note: AKAna: Analyse; AKApp: Apply; AKC: Create; AKE: Evaluate; AKR: Remember; AKU: Understand

Figure 4-4 exhibits the distribution of codes in accordance with the coding

scheme of reflective thinking. Most of the codes fall into the lower three thinking

skills (habitual action, thoughtful action and introspection) while very few codes

are found for the highest reflective thinking skills such as premise reflection.
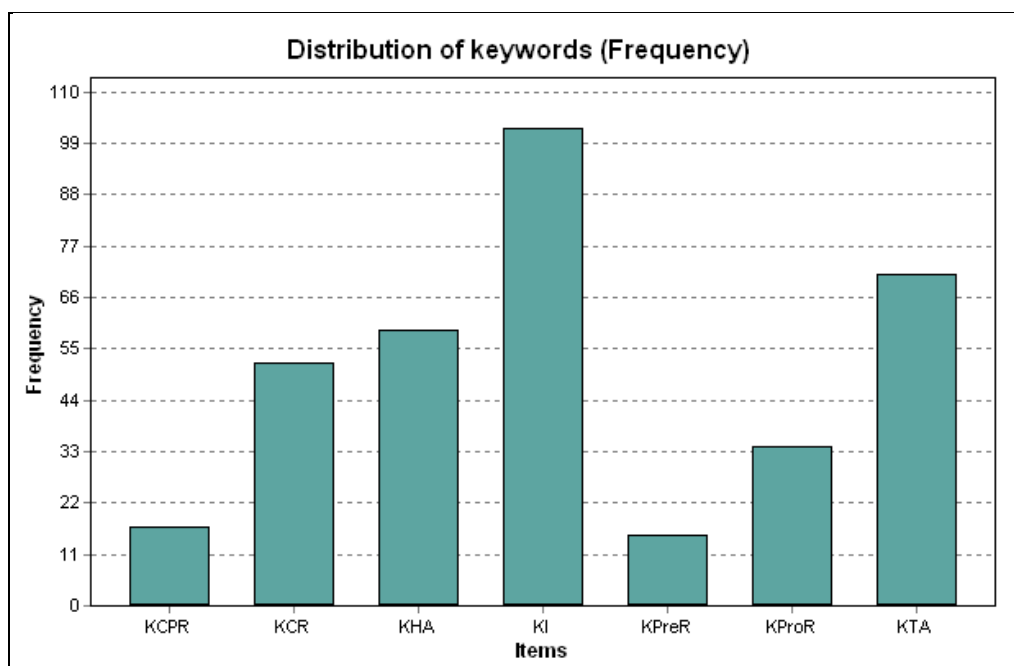
Figure 4-4 Coding Frequency to Kember's Reflective Thinking Coding Categories

Note: KCPR: Content and Process Reflection; KCR: Content Reflection; KHA: Habitual Action; KI: Introspection; KPreR: Premise Reflection; KProR: Process Reflection; KTA: Thoughtful Action

One possible reason of having low frequency in higher reflective thinking categories and high frequency in introspection is that students may not know how to reflect. One suggestion to the treatment of the main study is to consider providing some workshops in reflective writing or some guidelines on writing reflective journals. The coding book was further revised with some example of statements, which attached in Appendix B.

4.1.4 Keyword in Context (KWIC) Analysis for Blog Content

Furthermore, in order to identify the common key words used in the student blog postings, key word in context (KWIC) analysis in term of word cloud would be carried out for each individual student blog posting, as well as each studied

clusters such as the gender groups, the learning approach groups (DA and SA) and

the RQ groups (HA, U, R and CR) for the selected sample. Found in Wikipedia,

word cloud is defined as "a visualization of word frequency in a given text as a

weighted list". The application TagCrowd (http://tagcrowd.com/) was used to

generate the word clouds in this study.

By reading all word clouds generated for the sampled postings, it was found that

the words "Creative" or "Creativity", and "Thinking" appearing to be the top two

words in all sorts of word clouds. In order to examine whether there would be any

change of content in the blogs written by the students through out the semester, a

word cloud has been generated for each blog posting for each sampled student

blog. In total, there were five word clouds for the four reflective journals and the

summary for each sampled student. It was found that there was change of the key

words in the word cloud of the first article comparing with the last article. For

example, for subject 200607036, the keywords listed in the first word cloud

picture in Figure 4-5 are mainly related to the tutorial topics such as six hats (a

role play for learning six hat thinking) and expression word such as "funny". In

comparing with this word cloud with the other word cloud for the summary article,

it was found that more keywords show deep thinking such as "change",

"different", "give", "reflective" and "thought".

Word cloud for the first reflective journal

Showing top 25 of 106 possible words

Share

anyway (2) creative (4) critical (2) different (3) face (5)

feeling (2) funny (4) girl (2) group (4) haha (2) hat (6) ideal (2)

learnt (2) method (2) mix (2) photo (2) problem (2) quite (4) rose (2) sister (2)

six (4) style (3) teacher (2) theme (2) thinking (17)

Word cloud for summary – the last article

Showing top 25 of 123 possible words

Share

anyway (3) change (5) convergent (2) creative (4)

designer (4) different (5) funny (3) future (2) give (3)

hair (2) imagine (2) lecture (5) life (2) listen (2) mix (3) person (2)

reach (3) really (5) reflective (3) special (5)

style (6) test (5) thinking (14)

thought (3) watch (3)

Figure 4-5 Word Cloud Comparison for Subject 200607036

Furthermore, a word cloud for all blog posts under different groups would be

generated for comparison. For instance, a word cloud for gender group (Female vs.

Male) and another clouds for learning approach groups (DA vs. SA) and reflective

thinking groups (HA vs. U vs. RE vs. CR). When comparing the word clouds for

gender groups, it was found that female group prefers using expression words such as "feel", "funny" and "love", while the male group mainly used rational words such as "method", "idea", "problem". Figure 4-6 exhibits the two word clouds for female group and male group.

Word cloud for female group

Word cloud for male group

Figure 4-6 Word Cloud Comparison for Gender Groups

4.2 Strategies of Promoting Deep Reflection

The researcher noticed that the student reflections were not as deep as the researcher expected. It was suggested to provide more guidelines on reflective writing to the students at the beginning of the semester. One-page note for recapturing what had been done in the class together with some guided questions for reflection had been prepared for the main study. Figure 4-7 exhibits a sample of the note.
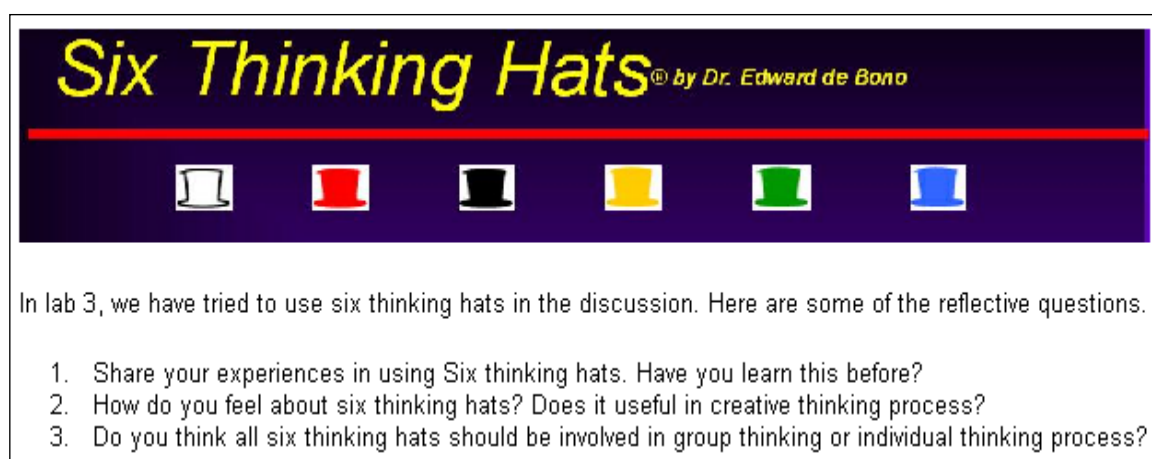
Figure 4-7 Sample note for encouraging student reflection

4.3 Summary

This chapter included the reliability test and validity test for quantitative data analysis, as well as the reliability test for content analysis. It was found that the reliability and discriminant validity of the questionnaire was satisfactory and comparative to the results of previous studies which implied the questionnaire was applicable to the study. The reliability value of the content analysis was unsatisfactory. One possible reason was the understanding of each coding category of the researcher was inconsistency over the time.

Therefore the researcher has been revised the codebook by including more detailed

descriptions and example for each coding category.

CHAPTER 5   QUANTITATIVE DATA ANALYSIS

This chapter is used to describe the quantitative findings of the present study. Data for the present study were collected from DCO students in CCCU. The study was based on the course DCO10701 Creative thinking for Media Design which asked the students to use blog as a reflective tool of their learning process. The course has been taught by the researcher. It is a one-semester three-credit course and has been started in every Semester A (totally 13 weeks) since year 2006. Two hundred and sixty associate degree level students have been accepted during the past four years since year 2007. Students are required to take a two-hour lecture and one-hour laboratory each week.

The course does not have any examinations. Students taking this course are assessed by a wide range of assessments in both individual and small group basis. Apart from the traditional lecture and edutainment-format tutorial in each week, students are required to (i) do three to four online quizzes and survey; (ii) submit personal learning portfolio consisting of reflective journals and summary; (iii) a group project in media production.

In addition to the formal requirements of the course, the study made use of two well-established questionnaires: the Study Process Questionnaire (SPQ) and the Reflective Questionnaire (RQ). In order to accommodate the Chinese students, the SPQ questionnaires adopted a bilingual version. The combined form was administered to all of the 260 DCO students attending DCO10701 in CCCU which was taught by the researcher.

The findings for data analysis are reported in the following sections of this chapter. All the statistical procedures were carried out using SimStat® statistics package.

5.1   Data Cleaning

For the experiment group, as the questionnaire and the blog postings are compulsory for coursework assessment, the response rate is 86.54%. There are 260 cases for the experiment group in which 35 cases are found invalid. For the control group, as it is on voluntary basis, there are 35 responses received from a total of 112 invitations to take part with the response rate of 31.25%. Nine cases among the 35 cases are found invalid. Possible reasons for invalid cases for both groups involve those questionnaires missing a part of the choices, unmatched cases for pre-teaching and post-teaching forms, or empty blog submission.

5.2   Reliability and Validity of the SPQ and RQ Questions

The questionnaire was consisted of three parts: (1) demographics data; (2) Study Process Questionnaire (SPQ) and (3) Reflective Questionnaire (RQ). SPQ is a widely-applicable nature of the instrument and there are consistencies in the past studies throughout Asia, especially in Hong Kong (McKay & Kember, 1997). One of the authors of SPQ, David Kember also designed another instrument regarding assessing level of reflective thinking, which is called Reflective Questionnaire (RQ) (Leung & Kember, 2003). It has extensive

uses in assessing reflective thinking in medical education such as nursing education (Wallman & Lundmark, 2008; Hanson & Alexander, 2010) and teacher education (Deng & Yuen, 2009). The data collected from both experiment and control group consisting of 251 students in total were analysed to determine the validity and reliability of the instruments, in order to explore whether the two instruments are applicable to the study. The internal consistency reliability was used to indicate whether each item in a scale assesses a similar construct. The Cronbach alpha reliability coefficient of each of the scales in SPQ and RQ were used as an index of scale internal consistency. Furthermore, the scale intercorrelations were examined to check discriminant validity (i.e. whether each scale assesses a separate construct). The mean of correlation of a scale with other scales were used as a convenient index of discriminant validity. Table 5-1 reports the Cronbach alpha reliability coefficient and mean of correlation of each of two scales (together with 4 subscales) of the pre-teaching and post-teaching scores for SPQ. The scale/ subscale reliability estimates ranged from 0.47 to 0.86. These indices show satisfactory reliabilities and are comparable to those obtained when the SPQ was used in previous study (DM=0.62, DS=0.63, SM=0.72, SS=0.57) (Biggs et al., 2001). The mean correlation of a scale with other scales for the pre-teaching form and post-teaching form ranged from 0.15 to 0.43. The results suggest that raw scores on scales in SPQ measure distinct.

SPQ Sub-scale	No. of item	Alpha Reliability		Discriminant Validity	
		Pre	Post	Pre	Post
Deep Motive (DM)	5	0.58	0.58	0.22	0.22
Deep Strategy (DS)	5	0.56	0.62	0.21	0.25
Surface Motive (SM)	5	0.68	0.79	0.29	0.43
Surface Strategy (SS)	5	0.47	0.70	0.15	0.32
Deep Approach (DA)	10	0.75	0.77	0.23	0.25
Surface Approach (SA)	10	0.73	0.86	0.21	0.37

Table 5-1 Internal consistency reliability and discriminant validity for SPQ (Main Study)

Table 5-2 reports the Cronbach alpha reliability coefficient and mean of correlation of each of four scales of the pre-teaching and post-teaching for RQ. The scale reliability estimates ranged from 0.43 to 0.72 (n=251) for all individuals. These figures showed a satisfactory reliabilities and slightly lower than the RQ of previous study (HA=0.62, U=0.76, R=0.63, CR=0.68) (Kember et al., 2000). The mean correlation of a scale with other scales for the pre-teaching form and post-teaching form ranged between 0.16 and 0.39. Both reliability and validity estimates are relatively lower than those in previous study which might be due to the small sample size.

RQ Sub-scale	No. of item	Alpha Reliability		Discriminant Validity	
		Pre	Post	Pre	Post
Habitual Action (HA)	4	0.54	0.66	0.22	0.33
Understanding (U)	4	0.72	0.47	0.39	0.18
Reflection (R)	4	0.56	0.54	0.24	0.23
Critical Reflection (CR)	4	0.43	0.53	0.16	0.22

Table 5-2 Internal consistency reliability and discriminant validity for RQ (Main Study)

5.3   Descriptive Analysis

The section analyses some possible psychometrics factors of the students in which the researcher may be interested to know before carrying out the quantitative data analysis.

The gender profile of respondents is given in Table 5-3.

Group	Gender	Invited	Valid Responses	Valid %
Experiment	Female	112	95	84.82%
	Male	148	130	87.84%
Control	Female	15	2	13.33%
	Male	87	24	27.59%

Table 5-3 Gender Profile of respondents

Comparing with the high response rates of experiment group, the number of valid responses of female control group was very low (only two responses) even though the response rate was over 10%. This may due to the reason of voluntary participation in the study for the control group while the experiment group was asked to complete the questionnaire in the form of an assessment. Marks were given to those students in experiment group who completed the questionnaire, while the control group only received a supermarket coupon upon completion. In addition, the students in the control group were recruited in year 2010, which was the last year of the study. It was not feasible to recruit some more female students for the control group.

The experiment group consisted of students taking the same course (DCO10701) from four consecutive years. The distribution of valid cases from different cohort years is given in Table 5-4.

Cohort	Invited	Valid Responses	Valid %
2007-2008	52	46	88.46%
2008-2009	65	48	73.85%
2009-2010	70	61	87.14%
2010-2011	83	70	84.34%
Total	260	225	86.54%

Table 5-4 Distribution of Valid Cases from Different Cohort Years for Experiment Group

5.3.1 Descriptive Analysis for Internet Experiences

The young generation is exposed to internet technology at an early age. In order to understand more about the internet background, questions regarding internet usage were included in the pre-teaching questionnaire. The age range of the students is from 19 to 23. Over 80% of students from both experiment and control groups indicated that they have been internet users for more than six years. As the students from experiment group major in digital media design while students from control group major in computer networks and programming, the percentage of having more than six years internet experience for control group (92.3%) is higher than the percentage of experiment group (84.4%), which is shown in Table 5-5. They rely on the internet heavily as indicated in Table 5-6 that internet was their main source of information. The ranking patterns of source of information between the two groups are also found similar.

Year of Internet Experience	Experiment Group (n=225)	Control Group (n=26)
Less than 1 year	2 (0.9%)	1 (3.8%)
1-3 years	2 (0.9%)	-
4-6 years	33 (14.7%)	1 (3.8%)
More than 6 years	190 (84.4%)	24 (92.3%)

Table 5-5 Years of Internet Experience

Sources of information	Experiment Group (n=225)	Control Group (n=26)
The internet	213 (94.7%)	26 (100%)
Newspaper	204 (90.7%)	23 (88.5%)
Television	198 (88%)	24 (92.3%)
Magazines	179 (79.6%)	18 (69.2%)
Blog	138 (61.3%)	18 (69.2%)
Discussion Forum	133 (59.1%)	23 (88.5%)
Email/ newsletter	124 (55.1%)	20 (76.9%)
The radio	124 (55.1%)	17 (65.4%)

Table 5-6 Sources of Information

Table 5-7 shows the top four internet usages of both groups are the same. They

are (1) information search, (2) download materials, (3) reading others' blog, and

(4) communicating with instant message.

Usages of Internet	Experiment Group (n=225)	Control Group (n=26)
Create "blog" that others can read on the web	140 (62.2%)	18 (69.2%)
Send or receive instant messages	192 (85.3%)	24 (92.3%)
Download material you find online – like songs, text or images	201 (89.3%)	24 (92.3%)
Share something online that you created yourself, like your own artwork, photos, stories or videos	138 (61.3%)	20 (76.9%)
Look online for news or other information	208 (92.4%)	26 (100%)
Read someone else's blog	197 (87.6%)	23 (88.5%)
Post a comment to someone else's blog	129 (57.3%)	18 (69.2%)

Table 5-7 Types of Internet Usage

It demonstrated that all the students, either from experiment group or control

group, are sophisticated users of internet as they surfed on the internet not only

for searching information, but also for various reasons.

5.3.2 Descriptive Analysis for Blog Experiences

Apart from the internet experience, a number of questions with regard the students' previous blogging experiences were also included in the pre-teaching questionnaire. Unlike the rich internet experience shown in Table 5-5, Table 5-8 shows that there is less blogging experience in control group than in experiment group. About 38.7% of students from experiment group only have one to three years of blogging experience while another 31.1% of the experiment group students have four to six years of experience. However, higher percentage of control group students (42.3%) has their own personal websites before the study while only one-third of the experiment group said they have personal websites before.

Years of Blogging	Experiment Group (n=225)	Control Group (n=26)
Less than 1 year	41 (18.2%)	8 (30.8%)
1-3 years	87 (38.7%)	10 (38.5%)
4-6 years	70 (31.1%)	6 (23.1%)
More than 6 years	27 (12%)	2 (7.7%)

Table 5-8 Years of Blogging

As shown in Table 5-9, 11.6% of the experiment group and 30.8% of the control group indicate that they do not have any online blogs. The majority of student usually has one or two blogs. Over 75% of these blog owners are the only authors of their blogs, as shown in Table 5-10.

No. of Blog	Experiment Group (n=225)	Control Group (n=26)
None	26 (11.6%)	8 (30.8%)
1	98 (43.6%)	9 (34.6%)
2	68 (30.2%)	6 (23.1%)
3	20 (8.9%)	3 (11.5%)
More than 3	13 (5.8%)	--

Table 5-9 Number of Blog the Students have online

Authorship	Experiment Group (n=225)	Control Group (n=26)
Only author	198 (88%)	20 (76.9%)
Multiple author	27 (12%)	4 (15.4%)
Unanswered	--	2 (7.7%)

Table 5-10 Authorship of Blog

In order to understand the blogging behaviour of the experiment in details, some more follow-up questions were included in the pre-teaching questionnaire for the experiment. 57.5% (n=129) of experiment group students would use their real name in their blog while 42.7% (n=96) would use pseudonyms. Over 80% of students used Xanga (www.xanga.com) as their blogging software. It was found that students mainly posted textual (88.9%) and photo (91.9%) content in their blog, as shown in Table 5-11. Only 9.8% of students would post new material to their blog several times a day. Table 5-12 shows that the majority only post new materials several times a week or even less. In terms of time spent, 36.9% of students spend one to two hours in a week on blogging while another 36.9% of students spend less than one hour a week.

Blog Content	Experiment Group (n=225)
Text, in the form of essays, articles or written entries	200 (88.9%)
Photo	205 (91.9%)
Images other than photos, like drawings, graphs and clipart	154 (68.4%)
Video	123 (54.7%)
Audio	85 (37.8%)

Table 5-11 Types of Blog Content

Posting Frequency	Experiment Group (n=225)
Several times a day	22 (9.8%)
Once a day	32 (14.2%)
3 – 5 times a week	85 (37.8%)
Less Often	86 (38.2%)

Table 5-12 Frequency of Posting New Materials

Table 5-13 shows that the two main sources of inspiration for blogging are (1) their personal experience (84.4%) and (2) a song, movie or TV show (73.3%). This aligned the findings of reasons for blogging shown in Table 5-15, which saying that "To document your personal experiences and share them with others" was the main reason for blogging and over 80% of students thought that "To make money" was not a reason at all. Table 5-14 shows that only 7.6% of students found blogging is a big part of their life. Most of them viewed blogging as a hobby (49.8%) or only one of the activities from their list (41.3%).

Inspirations of Blogging	Experiment Group (n=225)
A personal experience you had	190 (84.4%)
A song, movie or TV show	165 (73.3%)
Something you heard or read in the news media	118 (52.4%)
Something else I haven't already mentioned	97 (43.1%)
Something you read on another blog	93 (41.3%)

Table 5-13 Sources of Inspiration for Blogging

Meaning of Blog	Experiment Group (n=225)
My blog is very important to me and it is a big part of my life	17 (7.6%)
My blog is like a hobby for me, and I enjoy working on it when I can	112 (49.8%)
My blog is something I do, but not something I spend a lot of time on	93 (41.3%)
Unanswered	3 (1.3%)

Table 5-14 Meaning of Blogging

Reasons of Blogging	Experiment Group (n=225)		
	Major Reason	Minor Reason	Not a Reason
To document your personal experiences and share them with others	138 (61.3%)	75 (33.3%)	12 (5.3%)
To stay in touch with friends and family	91 (40.4%)	82 (36.4%)	52 (23.1%)
To express your creativity	83 (36.9%)	94 (41.8%)	48 (21.3%)
To influence the way other people think	74 (32.9%)	102 (45.3%)	49 (21.8%)
To share practical knowledge or skills with others	68 (30.2%)	106 (47.1%)	51 (22.7%)
To store resources or information that is important to you	65 (28.9%)	112 (49.8%)	48 (21.3%)
To entertain people	52 (23.1%)	100 (44.4%)	73 (32.4%)
To motivate other people to action	49 (21.8%)	105 (46.7%)	71 (31.6%)
To network or to meet new people	49 (21.8%)	68 (30.2%)	108 (48%)
To make money	12 (5.3%)	15 (6.7%)	198 (88%)

Table 5-15 Reasons for Blogging

5.4 Analysis of the Psychometrics of Each Questionnaire

This section reports the differences between male and female students' habit of reflective thinking and their learning approach towards blogging. Analyses involving independent sample T-tests were used to answer the following hypothesis.

Hypothesis #1

There is no gender difference on the habit on reflective thinking and learning approach.

In order to study whether the gender has any significant effects on the questionnaires, information about each scale's ability to differentiate between the perceptions of students with different genders was obtained by performing an independent sample T-test for each scale and by using the gender subgroup as the unit of analysis. As the response rate of the control female group was very low (only two responses) and unevenly between the genders, the studied sample combining the experiment group and control group with 137 females and 235 males was used in this analysis in order to investigate the gender effect. Table 5-16 reports the mean and standard deviation between male and female students for each pre-teaching and post-teaching SPQ scores, while Table 5-17 reports the mean and standard deviation between male and female students for each pre-teaching and post-teaching RQ scores.

		Mean		SD		Difference between male and female				
		M	F	M	F	t	df	Sig. 2-tailed	Mean Diff.	Effect Size (d)
HA	Pre	12.35	12.27	2.15	2.43	.26	187.32	.80	.08	.04
	Post	11.35	11.15	2.63	2.61	.58	203.53	.56	.21	.08
U	Pre	12.70	12.41	2.96	2.86	.74	206.58	.46	.29	.10
	Post	13.24	13.35	2.16	2.03	-.39	209.38	.70	-.11	-.05
R	Pre	13.99	13.98	2.46	2.57	.04	197.46	.97	.01	.01
	Post	13.67	13.52	2.26	1.87	.56	219.43	.58	.15	.08
CR	Pre	12.91	12.6	2.18	2.09	1.07	207.76	.29	.31	.15
	Post	12.42	12.51	2.21	2.20	-.28	202.91	.78	-.08	-.04

Note: HA – Habitual Action; U – Understanding; R – Reflection; CR – Critical Reflection; Pre – Pre-teaching; Post – Post-teaching; M – Male; F – Female

Table 5-17 The mean scores of female and male groups on RQ pre-teaching and post-teaching scales

The results shown in Table 5-17 indicates that there were no gender difference on all items of reflective thinking. The mean of each item score generated using male and female scores on each scale of reflective thinking and the learning approach scores were used to draw the graphical profile provided in Figure 5-1 to Figure 5-3.
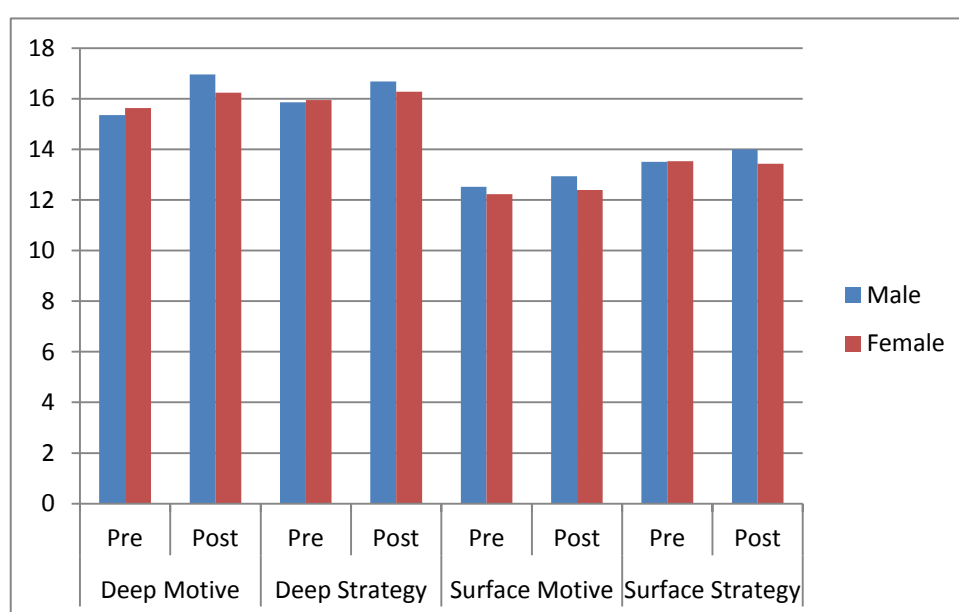
Figure 5-1 Histogram of the female and male mean scores on pre-teaching and post-teaching SPQ sub-scales (DM, DS, SM, SS)
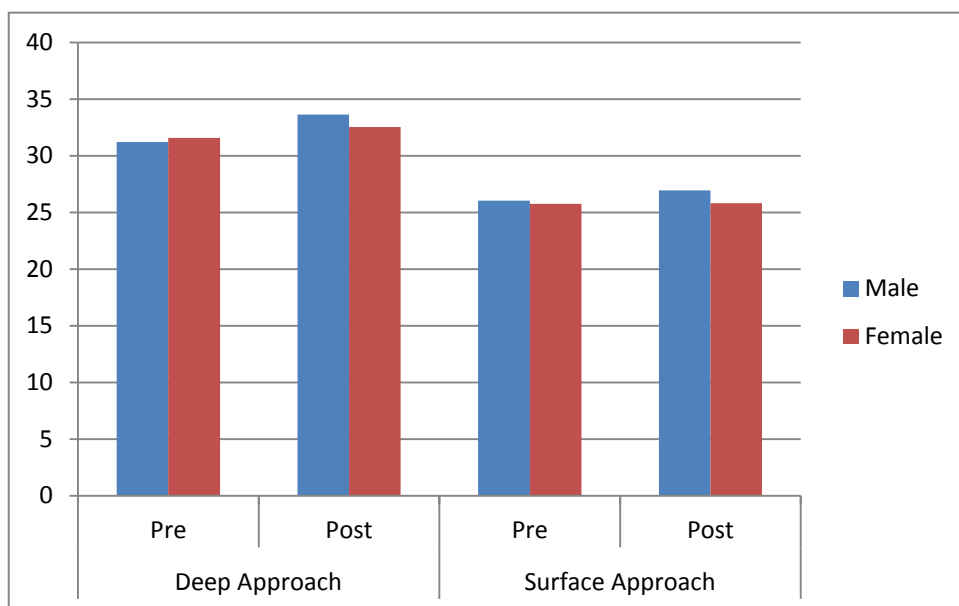
Figure 5-2 Histogram of the female and male mean scores on pre-teaching and post-teaching SPQ scales (DA, SA)
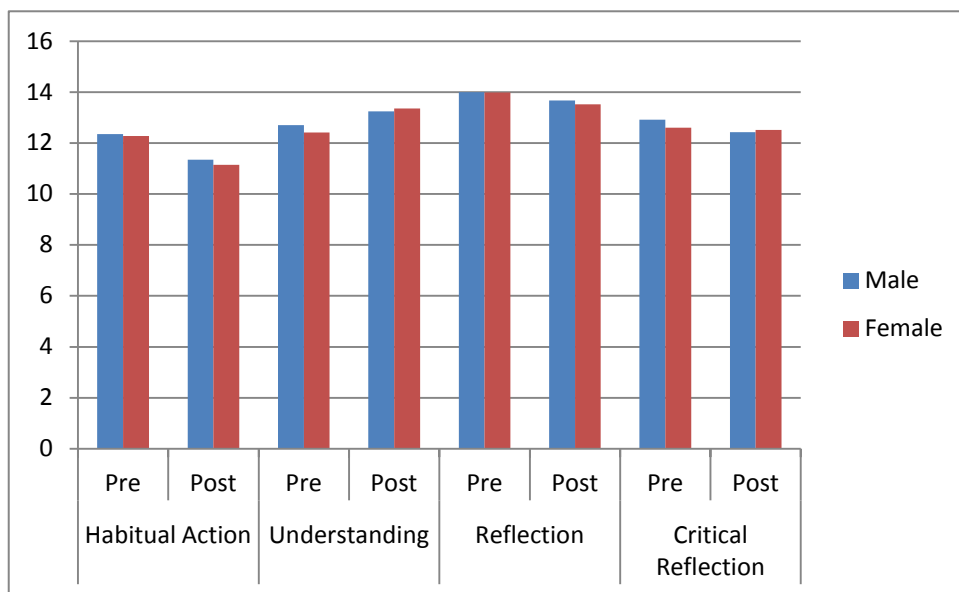
Figure 5-3 Histogram of the female and male mean scores on pre-teaching and post-teaching RQ scales (HA, U, R, CR)

Although it is statistically proven that there is no gender difference on the habit on reflective thinking and learning approach. It is possible that such claims were statistically "diluted" because of the combination of control and experiment gender groups.

5.5   Comparison of the Two Questionnaires

This section reports the strength and statistical significance of associations between SPQ

scores and their habits in reflective thinking (RQ scores). Simple correlations and

standardised regression analysis were used to answer the following hypothesis.

Hypothesis #2

There is no association between students' learning approach and habit of

reflective thinking

The results of the simple correlation and regression analysis reported in Table 5-18

suggested that there were significant positive associations between pre-teaching deep

learning approach and the two higher levels of RQ scales, reflection ($r=0.42$, $p<0.01$) and

critical reflection ($r=0.46$, $p<0.01$). The surface learning approach was found highly

significantly positively associating to the lowest level of RQ scales, that is the habitual

action style in reflective thinking ($r=-0.26$, $p<0.01$) and also slightly positively associated

to understanding scale ($r=0.13$, $p<0.01$).

	Pre-teaching			
	Deep Approach		Surface Approach	
	r	*β*	*r*	*β*
Habitual Action	.11	.22	.26***	.57***
Understanding	.11	.18	.13*	.22*
Reflection	.42***	.83***	-.09	-.20
Critical Reflection	.46***	.99***	.01	.02

* $p<0.05$ ** $p<0.01$ *** $p<0.001$

Table 5-18 Pearson correlation of SPQ scales and RQ scales (Pre-teaching)

The results of the simple correlation and regression analysis reported in Table 5-19 indicates similar patterns found in post-teaching mode with pre-teaching mode. The deep learning approach was found positively associate with those higher levels of reflective thinking (understanding (r=0.27, p<0.001), reflection (r=0.43, p<0.001) and critical reflection (r=0.30, p<0.001). The surface learning approach was found negatively associating with all top three levels of reflective thinking (understanding (r=-0.21, p<0.01), reflection (r=-0.34, p<0.001) and critical reflection (r=-0.15, p<0.05) and positively associate with habitual action (r=0.52, p<0.001).

| | Post-teaching | | | |
| | Deep Approach | | Surface Approach | |
	r	β	r	β
Habitual Action	-.12	-.24	.52***	1.45***
Understanding	.27***	.61***	-.21***	-.66***
Reflection	.43***	1.02***	-.34***	-1.13***
Critical Reflection	.30***	.70***	-.15*	-.49*

* p<0.05   **p<0.01   ***p<0.001

Table 5-19 Pearson correlation of SPQ scales and RQ scales (Post-teaching)

In order to understand the results in depth by splitting the learning approach (DA and SA) into four subscales (DM, DS, SM and SS), simple correlation and regression analysis of learning approach sub-scales and the RQ scales were carried out. The results shown in Table 5-20 and Table 5-21 further confirmed that there were same association between both pre-teaching and post-teaching learning approach and the RQ scales. That means that the null hypothesis was rejected and the learning approach statistical significantly associated with the RQ scales.

	Pre-teaching							
	Deep Motive		**Deep Strategy**		**Surface Motive**		**Surface Strategy**	
	r	*β*	*r*	*β*	*r*	*β*	*r*	*β*
Habitual Action	.13*	.14*	.08	.08	.20**	.27**	.28***	.3***
Understanding	.14*	.12*	.07	.06	.18**	.19*	.04	.03
Reflection	.35***	.38***	.42***	.44***	-.10	-.13	-.06	-.06
Critical Reflection	.46***	.54***	.39***	.45***	-.12*	-.02	.04	.04

Note: HA – Habitual Action; U – Understanding; R – Reflection; CR – Critical Reflection;

* p<0.05   **p<0.01   ***p<0.001

Table 5-20 Pearson correlation of SPQ sub-scales and RQ Scales (Pre-teaching)

	Post-teaching							
	Deep Motive		**Deep Strategy**		**Surface Motive**		**Surface Strategy**	
	r	*β*	*r*	*β*	*r*	*β*	*r*	*β*
Habitual Action	-.05	-.06	-.16*	-.18*	.49***	.77***	.50***	.69***
Understanding	.18**	.21**	.31***	.40***	-.20**	-.36**	-.19**	-.30**
Reflection	.38***	.48***	.40***	.54***	-.31***	-.58***	-.34***	-.55***
Critical Reflection	.28***	.34***	.27***	.35***	-.12	-.22	-.17**	-.27**

Note: HA – Habitual Action; U – Understanding; R – Reflection; CR – Critical Reflection;

* p<0.05   **p<0.01   ***p<0.001

Table 5-21 Pearson correlation of SPQ sub-scales and RQ Scales (Post-teaching)

5.6   Relations between Questionnaires and Student Performances

This section reports the strength and statistical significance of associations between learning outcomes and the questionnaires (SPQ and RQ). Simple correlations and standardised regression analysis were used to answer the third and fourth hypothesises.

Hypothesis #3

There is no association between students' learning approach and learning outcome

Hypothesis #4

There is no association between reflective thinking habit and learning outcome

All students from the experiment group were selected from the classes taught by researcher in a course named DCO10701 Creative Thinking for Media Design. Their learning outcomes at the end of this course were assessed by a number of different courseworks. As the students from the control group were having different assessment pattern (Examination: 70%; Coursework: 30%), they were excluded in this analysis. Table 5-22 exhibits the mean and standard deviation of the two learning outcome measures which were the total mark of the course as well as the mark of the personal portfolio. Also, the pre-teaching and post-teaching SPQ scales were used as a learning approach measure. Simple correlation and regression analyses were used to determine whether association exists between students' pre-teaching learning approaches and each student learning outcome measure.

Assessment	Full marks	Mean	SD	Min.	Max.
Total Marks	100	70.42	10.14	30	92
Personal Portfolio	40	23.27	6.22	0	39

Table 5-22 Descriptive Statistics for learning outcome (n=225)

The results of the simple correlation analysis reported in Table 5-23 suggest a statistically significant positive association between the portfolio outcome and both pre-teaching ($r=0.15$ $p<0.05$) and post-teaching ($r=0.13$ $p<0.05$) deep learning approach. The result

from the analysis also indicates that there was a significant positive relationship between

pre-teaching deep learning approach and the total mark of the course (r=0.18, p<0.01).

	Pre-teaching Deep Approach		Pre-teaching Surface Approach		Post-teaching Deep Approach		Post-teaching Surface Approach	
	r	*ß*	*r*	*ß*	*r*	*ß*	*r*	*ß*
Portfolio	.15*	.2*	.02	.02	.13*	.16*	.06	.05
Total	.18**	.4**	.001	.002	.08	.16	.08	.11

* p<0.05   **p<0.01   ***p<0.001

Table 5-23 Simple correlation and regression of SPQ scales and learning outcomes

However, the results of regression analysis (ß) in Table 5-23 indicated that both the

relationships between the pre-teaching deep learning approach score and portfolio (ß=0.2,

p<0.05, f^2=0.02) as well as total course mark (ß=-0.4, p<0.01, f^2=0.01) were insignificant

as the effect size was too small. Furthermore, the portfolio mark (ß=0.16, p<0.05, f^2=0.04)

was also statistically insignificantly related to post-teaching deep approach.

The results of the simple correlation analysis (reported in Table 5-24) suggest the two

learning outcomes, portfolio marks and total course mark, were all statistically significant

and positively associated with the four pre-teaching RQ scales (HA, U, R, CR). However,

the results in Table 5-25 indicates that there were significant negative relationship

between post-teaching understanding scale and both learning outcome measures,

portfolio (r=-0.17, p<0.05) and total course mark (r=-0.16, p<0.05). The post-teaching

reflection scale was also found to be negatively associated with the total course mark

(r=-0.14, p<0.05).

	Pre-teaching							
	Habitual Action		Understanding		Reflection		Critical Reflection	
	r	*β*	*r*	*β*	*r*	*β*	*r*	*β*
Portfolio	.19**	.53*	.31***	.66***	.24***	.61***	.16*	.47*
Total	.24***	1.07***	.34***	1.17***	.28***	1.14***	.22**	1.02**

* p<0.05   **p<0.01   ***p<0.001

Table 5-24 Simple correlation and regression of pre-teaching RQ scales and learning outcomes

	Post-teaching							
	Habitual Action		Understanding		Reflection		Critical Reflection	
	r	*β*	*r*	*β*	*r*	*β*	*r*	*β*
Portfolio	.06	.15	-.17*	-.50*	-.12	-.34	.08	.21
Total	.13	.48	-.16*	-.76*	-.14*	-.67*	-.004	-.02

* p<0.05   **p<0.01   ***p<0.001

Table 5-25 Simple correlation and regression of post-teaching RQ scales and learning outcomes

The effect sizes of all the regression analysis results (β) for pre-teaching reflective thinking scales were very small which indicated that both assessments were statistically insignificant related to assessment performance. Insignificant relationship was found between the post-teaching reflection score and the total course mark (β=-0.67, p<0.05, f2=0.04).

5.7 Changes in Questionnaire Scores (Pre-Teaching to Post-Teaching)

During the collection of data, all students completed part B and part C of the questionnaire to determine their pre-teaching learning approach and thinking style in early semester. At the end of the semester, this same batch of students also completed a parallel questionnaire related to their post-teaching learning approach and thinking style. The pre-teaching form for experiment group was used to measure the learning approach and thinking style before blogging, while the post-teaching form was used to measure the

same qualities after blogging. Students from control group were also asked to fill in the questionnaire twice in order to act as a comparison with the experiment group. By using of these two forms of the revised questionnaire, the researcher was able to determine whether changes exist in students' learning approach and habit of reflective thinking to answer the following hypothesises.

Hypothesis #5

    There is no difference between the learning approaches before teaching and after the teaching

Hypothesis #6

    There is no difference between the pre-teaching and post-teaching level of reflective thinking styles.

To examine the difference between students' learning approach and thinking style towards the blogging in the course DCO10701, data were analysed by the descriptive statistics (total scores) obtained from the sample for each of the scales and subscales of pre-teaching forms and post-teaching forms and then the total scores of each pair of SPQ and RQ scales and subscales would be compared by using a paired t-test.

The average item scores was used as the basis for fair comparison between different scales of pre-teaching and post-teaching questionnaire which could contain differing numbers of item (see Table 5-26 for SPQ and Table 5-27 for RQ).

		Group	Min.	Max.	Mean	Std. Deviation
Pre–teaching	Deep Motive	Exp.	9	22	15.47	2.57
		Control	8	22	16.77	3.34
	Deep Strategy	Exp.	10	22	15.9	2.54
		Control	12	22	16.81	2.71
	Surface Motive	Exp.	5	20	12.4	3.13
		Control	6	19	12.04	3.59
	Surface Strategy	Exp.	7	19	13.52	2.43
		Control	9	19	14.85	3.52
	Deep Approach	Exp.	20	43	31.36	4.66
		Control	22	44	33.58	5.76
	Surface Approach	Exp.	13	36	25.92	4.86
		Control	15	36	26.88	6.5
Post–teaching	Deep Motive	Exp.	10	24	16.66	2.71
		Control	11	22	16.62	2.9
	Deep Strategy	Exp.	7	23	16.51	3.03
		Control	12	22	17.12	2.76
	Surface Motive	Exp.	5	22	12.7	4.17
		Control	6	20	12.69	3.77
	Surface Strategy	Exp.	6	23	13.76	3.68
		Control	8	21	14.08	3.25
	Deep Approach	Exp.	19	46	33.16	5.29
		Control	23	44	33.73	5.34
	Surface Approach	Exp.	13	44	26.46	7.45
		Control	15	39	26.77	6.44

Table 5-26 Descriptive Statistics for SPQ Scales

		Group	Min.	Max.	Mean	Std. Deviation
Pre-teaching	Habitual Action	Exp.	5	18	12.32	2.26
		Control	6	17	11.69	3.2
	Understanding	Exp.	4	18	12.58	2.92
		Control	9	20	15.19	2.58
	Reflection	Exp.	7	19	13.99	2.5
		Control	10	18	13.96	2.01
	Critical Reflection	Exp.	7	19	12.78	2.14
		Control	4	15	11.42	2.9
Post-teaching	Habitual Action	Exp.	4	17	11.27	2.62
		Control	6	17	11.04	2.62
	Understanding	Exp.	7	20	13.28	2.1
		Control	7	20	14.58	3.59
	Reflection	Exp.	8	20	13.6	2.1
		Control	8	20	13.81	2.97
	Critical Reflection	Exp.	5	18	12.46	2.2
		Control	9	19	13.04	2.72

Table 5-27 Descriptive Statistics for RQ Scales

The total scores generated from each scale and each subscale of the pre-teaching and

post-teaching SPQ questionnaire were used to draw the graphical profile provided in

Figure 5-4 and Figure 5-5 respectively.
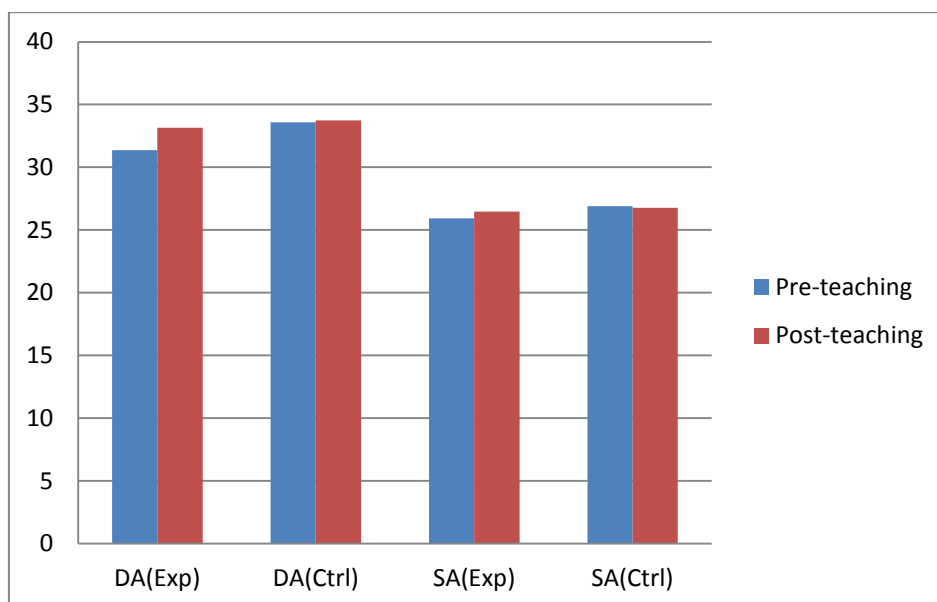
Note: DA – Deep Approach; SA – Surface Approach; Exp – Experiment Group; Ctrl – Control Group

Figure 5-4 Histogram of the total score of SPQ scales
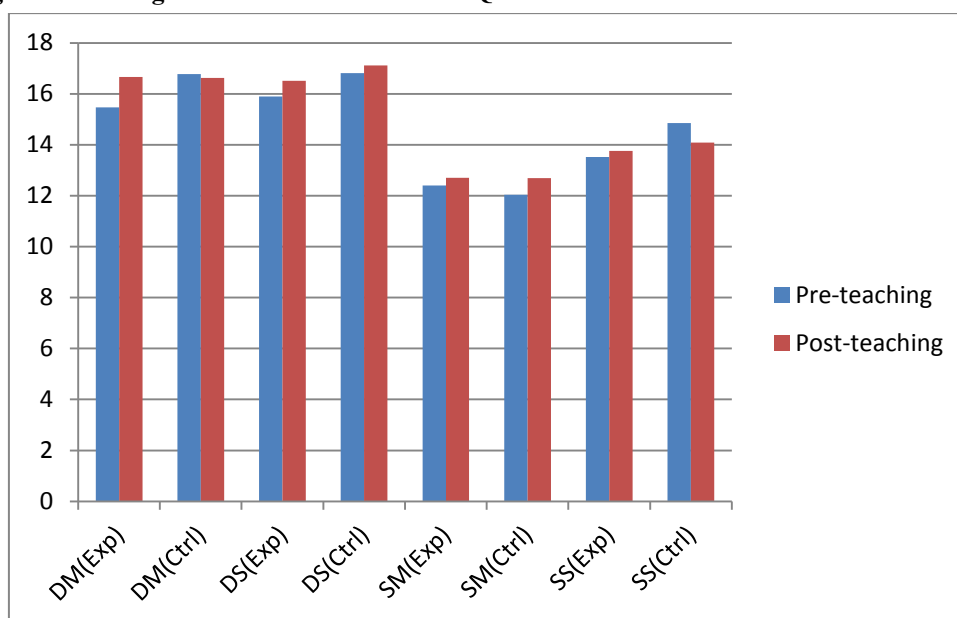
Note: DM – Deep Motive; DS – Deep Strategy; SM – Surface Motive; SS – Surface Strategy; Exp – Experiment Group; Ctrl – Control Group

Figure 5-5 Histogram of the total score of SPQ subscales

The result from the analysis (reported in Table 5-28) indicated that there was a significant difference in the deep approach (MD=-1.8, SD=6.65), t=-4.06, p<0.001), 2-tailed, with a medium effect size (d=-0.54) in particular of the deep motive (MD=0.15, SD=3.78), t=2, p=<0.001, with a medium effect size (d=-0.66) for the experiment group only. That means that there were changes between the pre-teaching and post-teaching deep approach. For the surface approach, there was no statistically significance showing that there were any changes in pre-teaching and post-teaching stages for both groups.

Pair	SPQ subscales Post by Pre	Group	Paired Differences			
			Mean Diff.	Std. Dev	t	Effect Size (d)
1	Deep Motive	Exp.	-1.19	3.59	**-4.97*****	**-.66**
		Control	.15	3.78	.21	.08
2	Deep Strategy	Exp.	-.61	3.74	-2.44	-.33
		Control	-.31	3.58	-.44	-.18
3	Surface Motive	Exp.	-.3	5.23	-.87	-.12
		Control	-.65	3.17	-1.05	-.42
4	Surface Strategy	Exp.	-.24	4.4	-.83	-.11
		Control	.77	3.61	1.09	.43
5	Deep Approach	Exp.	-1.8	6.65	**-4.06*****	**-.54**
		Control	-.15	6.85	-.11	-.05
6	Surface Approach	Exp.	-.55	9.01	-.91	-.12
		Control	.12	6.15	.1	.04

Note: Df of experiment group: 224   Df of control group: 25
95% Co. - 95% Confidence Interval of the Difference
* p<0.05   **p<0.01   ***p<0.001

Table 5-28 Paired Sample Test of pre-teaching and post-teaching learning approaches

The total scores generated from each scale of the pre-teaching and post-teaching RQ questionnaire were used to draw the graphical profile provided in Figure 5-6.
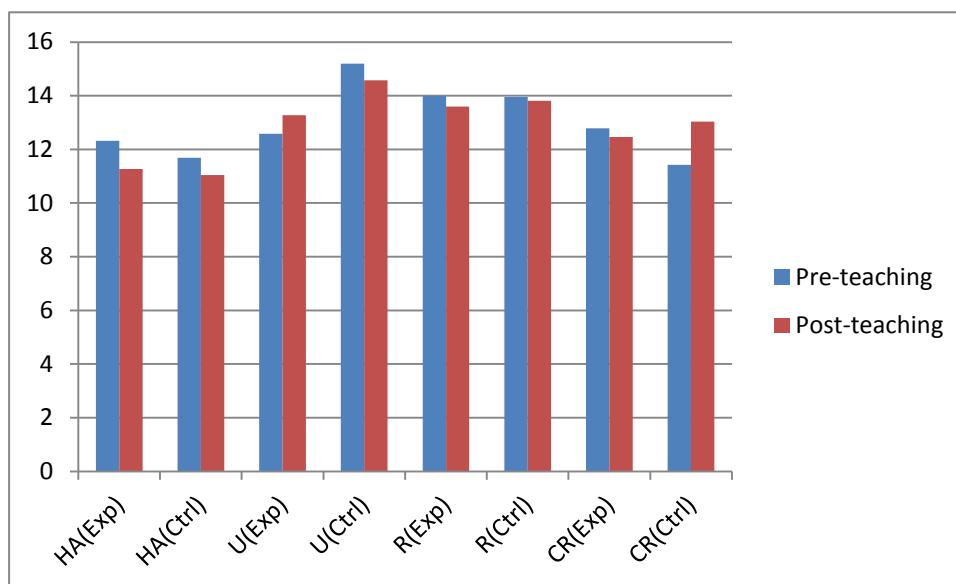
Figure 5-6 Histogram of the mean score of RQ scales

The result from the analysis (reported in Table 5-29) indicates that there was a significant difference in the two lower level of reflective thinking scales including (1) habitual action (MD=1.05, SD=2.83), t=5.59, p=<0.001, with a large effect size (d=0.75), and (2) understanding (MD=-0.71, SD=3.93), t=-2.69, p=<0.01, with a medium effect size (d=-0.36), t=-2.69, p<0.01 of the experiment group. It was also noticed that there was significant difference in the highest level of reflective thinking – critical reflection (MD=-1.62, SD=2.89), t=-2.85, p=<0.01, with a large effect size (d=-1.14) of the control group.

Pair	RQ subscales Post by Pre	Group	Paired Differences			
			Mean Diff.	Std. Dev	t	Effect Size (d)
1	Habitual Action	Exp.	1.05	2.83	**5.59***	.75
		Control	.65	3.12	1.07	.43
2	Understanding	Exp.	-.71	3.93	**-2.69**	-.36
		Control	.62	3.23	.97	.39
3	Reflection	Exp.	.38	3.43	1.67	.22
		Control	.15	2.24	.35	.14
4	Critical Reflection	Exp.	.32	3.3	1.45	.19
		Control	-1.62	2.89	**-2.85**	-1.14

Note: Df of experiment group: 224   Df of control group: 25
95% Co. - 95% Confidence Interval of the Difference
* p<0.05   **p<0.01   ***p<0.001
Table 5-29 Paired Sample Test of RQ Scales

5.8 Difference between Experiment and Control Groups on the Questionnaire

This section reports the differences on the habit of reflective thinking and their learning approach towards blogging between experiment and control groups. Analyses involving independent sample T-tests were used to answer the following hypothesis.

> *Hypothesis #7*
>
> *There is no group difference on the habit on reflective thinking and learning approach.*

In order to study whether the blogging have any significant effects on the questionnaires, information about each scale's ability to differentiate between the perceptions of students with different genders was obtained by performing for each scale an independent sample T-test and the type of study group as the unit of analysis. Table 5-30 reports the mean and standard deviation between experiment and control group students for each pre-teaching

and post-teaching SPQ scores, while Table 5-17 reports the mean and standard deviation

between experiment and control group students for each pre-teaching and post-teaching

RQ scores.

		Mean		SD		Difference between study groups				
		Exp	Ctrl	Exp	Ctrl	t	df	Sig. 2-tailed	Mean Diff.	Effect Size (d)
DM	Pre	15.47	16.77	2.57	3.34	**-2.34***	248	.02	-1.29	-.3
	Post	16.66	16.62	2.71	2.9	.07	248	.94	.04	.01
DS	Pre	15.9	16.81	2.54	2.71	-1.71	248	.09	-.91	-.22
	Post	16.51	17.12	3.03	2.76	-.99	248	.32	-.62	-.13
SM	Pre	12.4	12.04	3.13	3.59	.52	248	.6	.35	.07
	Post	12.7	12.69	4.17	3.77	.02	248	.99	.01	0
SS	Pre	13.52	14.85	2.43	3.52	-1.89	27.83	.07	-1.34	-.72
	Post	13.76	14.08	3.68	3.25	-.43	248	.67	-.33	-.06
DA	Pre	31.36	33.58	4.66	5.76	**-2.21***	248	.03	-2.19	-.28
	Post	33.16	33.73	5.29	5.34	-.52	248	.6	-.58	-.07
SA	Pre	25.92	26.88	4.86	6.5	-.95	248	.34	-1	-.12
	Post	26.46	26.77	7.45	6.44	-.21	248	.84	-.31	.03

Note: DM – Deep Motive; DS – Deep Strategy; SM – Surface Motive; SS – Surface Strategy; DA – Deep Approach; SA – Surface Approach; Pre – Pre-teaching; Post – Post-teaching; Exp – Experiment group; Ctrl – Control group

Table 5-30 Difference between experiment and control group scores on SPQ pre-teaching and post-teaching scales

It was found that the control group students got slightly significantly higher scores in

pre-teaching deep learning approach items, t(248)=-2.21, p<0.05, 2-tailed, with a small

effect size (d=-0.28), in particular the deep motive items, t(248)=-2.34, p<0.05, 2-tailed,

with a small effect size (d=-0.3), than experiment group students. These results indicated

the control group students were deeper biased in learning approach at the beginning of

the course. The results shown in Table 5-30 indicated that there was no group difference

on all post-teaching learning approach items.

		Mean		SD		Difference between study groups				
		Exp	Ctrl	Exp	Ctrl	t	df	Sig. 2-tailed	Mean Diff.	Effect Size (d)
HA	Pre	12.32	11.69	2.26	3.2	.96	27.99	.35	.62	.36
	Post	11.27	11.04	2.62	2.62	.43	248	.67	.23	.05
U	Pre	12.58	15.19	2.92	2.58	**-4.36***	248	0	-2.61	-.55
	Post	13.28	14.58	2.1	3.59	-1.81	27.03	.08	-1.3	-.69
R	Pre	13.99	13.96	2.5	2.01	.07	248	.95	.03	.01
	Post	13.6	13.81	2.1	2.97	-.36	27.98	.72	-.21	-.14
CR	Pre	12.78	11.42	2.14	2.9	**2.33***	28.25	.03	1.37	.38
	Post	12.46	13.04	2.2	2.72	-1.23	248	.22	-.57	-.16

Note: HA – Habitual Action; U – Understanding; R – Reflection; CR – Critical Reflection; Pre – Pre-teaching; Post – Post-teaching; Exp – Experiment group; Ctrl – Control group

Table 5-31 Difference between experiment and control group on RQ pre-teaching and post-teaching scales

It was found that the control group students were highly significantly higher score in pre-teaching understanding items, $t(248)=-4.36$, $p<0.001$, 2-tailed, with a medium effect size ($d=-0.55$), than experiment group students. It was also noticed that the experiment group students were highly significantly higher score in pre-teaching critical reflection items, $t(28.25)=-2.33$, $p<0.05$, 2-tailed, with a small effect size ($d=-0.38$), than control group students. These results indicated the experiment group students were focused on critical reflection as thinking style at the beginning of the course. The results shown in Table 5-31 indicated that there was no group difference on all post-teaching reflective thinking items.

5.9   Summary

This chapter reported the findings of the quantitative data analysis part for the study. A combined questionnaire including Study Process Questionnaire (SPQ) and Reflective Questionnaire (RQ) scales were administered to a sample of associated degree-level

students using blogging as reflection of learning experiences taught by the researcher. In order to show the effect of blogging, a group of associated degree-level students also taught by the researcher was invited to fill in the questionnaire twice as a control group comparison. The data were analysed initially to determine the validity and reliability of the questionnaire in terms of its internal consistency reliability and discriminant validity. The internal consistency reliability estimates ranged from 0.47 to 0.86 for both SPQ scales and RQ scales, which were quite comparable with other related studies.

In order to find out the difference on genders, independent sample T-test was used. Despite the combination of experiment and control group due to the low response in control female group, it was found that there was no difference in learning approach except the post teaching deep motive subscale. Same results were found for all scales in reflective thinking subscales.

It was found that the control group students were highly significantly higher score in pre-teaching understanding items, $t(248)=-4.36$, $p<0.001$, 2-tailed, with a medium effect size ($d=-0.55$), than experiment group students. It was also noticed that the experiment group students were highly significantly higher score in pre-teaching critical reflection items, $t(28.25)=-2.33$, $p<0.05$, 2-tailed, with a small effect size ($d=-0.38$), than control group students. These results indicated the experiment group students were focused on critical reflection as thinking style at the beginning of the course. The results shown in

Table 5-31 indicated that there was no group difference on all post-teaching reflective thinking items.

The present study also showed that there was strong relationship between the learning approach and the students' habit of reflective thinking. The study compared the pre-teaching data (SPQ and RQ scales) and post-teaching data by using simple correlation and regression. It was shown that a positive association between deep approach to higher levels of reflective thinking scales while negative association with habitual action in both pre-teaching and post-teaching modes. The vice-versa relationships were found between the surface approach and different levels of reflective thinking.

After analysing the learning outcomes of the student with the learning approach and the habit of reflective thinking by using correlation and regression, it was found that there were positive relationships between deep approach scores and the total course marks and the portfolio marks. Regression was used to analyse the association of the habit of reflective thinking of the student and the learning outcome. All four pre-teaching levels of reflective thinking scales have been found as a significant contribution to the explanation of the portfolio and total course marks. A power analysis by calculating the effect size (d) was carried out which indicated all the results were statistically insignificant.

In order to understanding the change in learning approach and level of reflective thinking, the study compared the pre-teaching data (SPQ and RQ scales) with post-teaching data by using paired t-test. It showed that a positive change between the pre-teaching and post-teaching total scores of deep approach and a positive change between the pre-teaching and post-teaching total scores of understanding of reflective thinking for the experiment group. Furthermore, the results showed that a negative change between the pre-teaching and post-teaching total scores of the lowest level of reflective thinking – habitual action. These implied that blogging might motivate students learn deeper and drive them to think reflectively.

CHAPTER 6   QUALITATIVE DATA ANALYSIS

This chapter is used to describe the qualitative findings of the present study. Apart from quantitative analysis of the survey, the blog postings from the students studying the course - DCO10701 Creative Thinking for Media Design from four consecutive cohorts were collected electronically for qualitative analysis. In the main study, there are 270 students including approximately 1350 blog postings were collected for qualitative analysis. A focus group was selected for content analysis of blog postings based on 13 coding categories, using a framework combining the revised coding scheme on reflective thinking (Kember et. al., 1999) and a revised version of Bloom's taxonomy (Anderson and Krathwohl, 2001). In addition to the content analysis, keywords in context (KWIC) analysis in terms of word cloud were generated for all blog contents in the focus group. The top 25 frequently used keywords identified from the word cloud analysis, together with the keywords for Bloom's higher order cognitive skills, were then used for the keyword frequency analysis of all 1350 blog postings collected from the main study. In addition to the quantitative data analysis and content analysis, the study also attempts to explore the possibility of using other analytical methods such as data mining. Furthermore, the results also aim at triangulating the quantitative results collected in answering the following research questions.

1. There is no gender difference on students' habit on reflective thinking and learning approach

2. There is no association between the students' learning approaches and learning outcome

3. There is no association between reflective thinking habits and learning outcome

4. There is no association between students' learning approaches and habits of reflective thinking

6.1   Content Analysis of Blog Postings

Sixty four student Blogs containing about 320 postings were selected for content analysis. For each cohort-year, about 16 students were selected as focus group. Based on the questionnaire scores (SPQ and RQ scores), students were divided into two subgroups (deep approach - DA and surface approach - SA) in according to SPQ scores, and another four subgroups (HA, U, R, CR) in according to RQ scores. For each cohort-year, the blogs of two students from each gender group were selected from DA and SA groups, while only one student from each gender were selected from each of the other four subgroups (HA, U, R, CR). Each student blog contains four reflective journals and one summary essay. Figure 6-1 and Figure 6-2 exhibit the frequency distribution by gender and type of the focus group for content analysis.
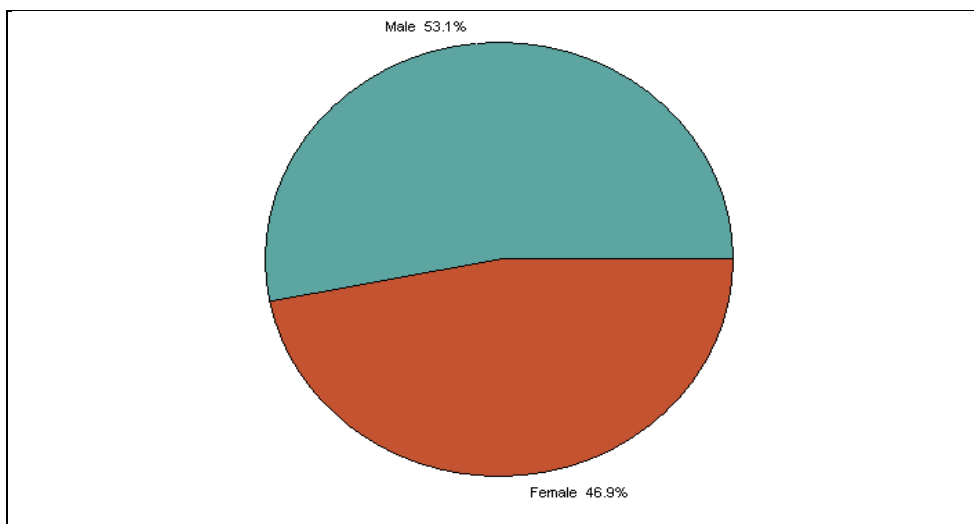
Figure 6-1 Frequency Distribution by Gender
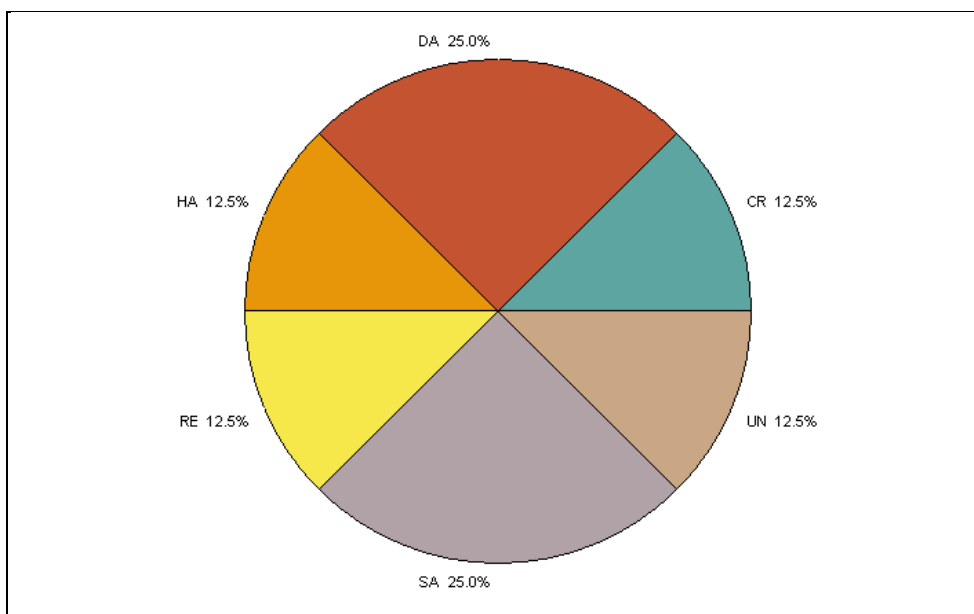
Figure 6-2 Frequency Distribution by Type

The details of user profile for the main study can be found in Appendix D. All postings

are imported into the computerised software QDA Miner® for content analysis and

thirteen codes were applied to the text of all blog postings by the researcher herself.

Among the 64 student blogs, 14 student blogs within which 14 blog postings were found

incomplete. Table 6-1 lists out those students in the form of subject ID and the name of

missing article. Among the incomplete student blogs, the researcher noted that most of

them were from the students of cohort 2007. After discussing with the students in cohort

2007, they explained that they did not have enough time to complete all journals before

the deadline (Friday of the last week of semester) as there were too many assignments to

be submitted in the same week. The course lecture, who was also the researcher, was

therefore taken this into consideration in setting the submission date in the following

cohorts. As a result, Table 6-1 also indicates that the number of incomplete blogs received

in cohort 2008 and onwards reduced sharply. To be exact, there are 64 student blogs

containing 306 postings collected for content analysis, which shows that the valid

percentage for content analysis is 85%.

Subject ID	Missing Journal
200708007	Summary
200708011	Reflective Journal 4
200708023	Summary
200708029	Reflective Journal 4
200708032	Summary
200708035	Summary
200708039	Summary
200708040	Summary
200708050	Reflective Journal 2
200708052	Reflective Journal 4
200809034	Reflective Journal 3
201011003	Reflective Journal 1
201011006	Summary
201011080	Summary

Table 6-1 List of Incomplete Blogs

Similar to the pilot study, same data pre-processing procedures were applied to the blog

content. As the researcher is the only coder, intra-coder test-retest reliability was carried

out for the main study in order to ensure the consistency of coding. A sample of 8 student

blogs including 39 units of blog postings (13% of the entire coding posts) was selected

for re-coding one week after the first coding. Table 6-2 shows the test-retest agreement of

the main study. Calculated with Krippendorff's alpha (α), a reliability coefficient

developed to measure the agreement among rater(s), the overall test-retest agreement

percentage is 97.50% (α=0.82) which appeared to be acceptable (Krippendorff, 2004).

Code	Code Descriptions	% Agreement	Krippendorff's Alpha (α)
Cognitive process dimension in revised Bloom's taxonomy			
AKR	Remember	100.00%	1.00
AKU	Understand	99.50%	0.95
AKAna	Analysis	100.00%	1.00
AKApp	AKApp	100.00%	1.00
AKE	Evaluation	100.00%	1.00
Kember's level of reflective thinking			
KHA	Habitual Action	92.10%	0.79
KI	Introspection	91.30%	0.83
KTA	Thoughtful Action	95.60%	0.81
KCR	Content Reflection	95.60%	0.83
KProR	Process Reflection	99.50%	0.98
KCPR	Content & Process Reflection	100.00%	1.00
KPreR	Premise Reflection	100.00%	1.00
	TOTAL	97.50%	0.82

Table 6-2 Test-retest agreement (Main Study)

Twenty-seven disagreement codes were found. Although the disagreement codes can be

consolidated by merging them together in the computerised software QDA Miner®, two

further explanations with example codes as shown in Table 6-3 were appended in the

codebook in order to distinguish the differences between the coding categories involved

in the disagreement codes, and ensure higher consistency in coding the remaining 56

student blogs. The revised coding book is included in Appendix B.

Case	Category/ Code	Text	Action
Subject ID: 200910041/ Reflective journal #3	Kember's Reflective Thinking level/ <u>Process Reflection (KPR)</u>	Start at 115th word, coded by researcher 2nd time Although we only have three group mates who are much less than the other group, it should be good news for us; we are the last group to finish it. *Why? I think I am too cautious with the practice. I use lots of time to think about how I can make the largest hole for us to pass through. I should "Don't think a lot, Just do it!". Some while, cautious is not a good thing. It will block our creative mind. I think I should have a mind likes the mind when I taking photo. "Don't think, just shoot". It will give an unexpected result.*	After revision, it should be coded as Process reflection (KPR) and this example would append in the KPR category as an example.
	Kember's Reflective Thinking level/ <u>Content Reflection (KCR)</u>	Start at 265th word, coded by researcher 1st time *Why? I think I am too cautious with the practice. I use lots of time to think about how I can make the largest hole for us to pass through. I should "Don't think a lot, Just do it!". Some while, cautious is not a good thing. It will block our creative mind. I think I should have a mind likes the mind when I taking photo. "Don't think, just shoot". It will give an unexpected result.*	
Subject ID: 200910041/ Summary	Revised Bloom's taxonomy/ Understanding (AKU)	Start at 39th word, coded by researcher 1st time *Actually, I am a left brain person. I studied physics, pure mathematics and computer study in F.7. I am totally a "logical" and "systematic" person. Moreover, I am traditional and close-minded. This is an opposite of a creative person.*	After revision, it should be coded as Thoughtful Action (KTA) and this example would append in the KTA category as an example.
	Kember's Reflective Thinking level/ <u>Thoughtful Action (KTA)</u>	Start at 40th word, coded by researcher 2nd time *Actually, I am a left brain person. I studied physics, pure mathematics and computer study in F.7. I am totally a "logical" and "systematic" person. Moreover, I am traditional and*	

		close-minded. This is an opposite of a creative person.	

Table 6-3 Examples of disagreement codes

6.1.1 Descriptive Analysis of Content Analysis

After coding the rest of 56 student blogs based on the finalised coding book, 1226 units of codes were identified from the main study. The coding frequency of each individual case is provided in Appendix E. Table 6-4 exhibits the coding frequency for each of the thirteen coding categories.

Category/ Code	Number of units of coding	Number of cases	Number of words
Kember's Reflective Thinking level/ Habitual action (KHA)	222	61	7762
Kember's Reflective Thinking level/ Thoughtful action (KTA)	132	58	9210
Kember's Reflective Thinking level/ Introspection (KI)	418	64	35261
Kember's Reflective Thinking level/ Content reflection (KCR)	140	58	11024
Kember's Reflective Thinking level/ Process reflection (KProR)	114	49	10520
Kember's Reflective Thinking level/ Content and Process Reflection (KCPR)	56	33	6620
Kember's Reflective Thinking level/ Premise reflection (KPreR)	21	15	2960
Revised Bloom's taxonomy/ Remember (AKR)	15	13	680
Revised Bloom's taxonomy/ Understanding (AKU)	25	22	1380
Revised Bloom's taxonomy/ Apply (AKApp)	50	33	2985

	22	19	2860
Revised Bloom's taxonomy/ Analyse (AKAna)	22	19	2860
Revised Bloom's taxonomy/ Evaluate (AKE)	9	9	952
Revised Bloom's taxonomy/ Create (AKC)	2	1	27

Table 6-4 Coding frequency for each coding category

Since the blog postings were collected from four consecutive cohort years, it is interesting to see whether there is any difference in the distribution of coding frequency among the four cohorts. Table 6-5 shows that the distributions of the coding frequency among the four different cohorts are similar to each other.

Cohort Category/ Code	2007	2008	2009	2010
Kember's Reflective Thinking level/ Habitual action (KHA)	50 (22.52%)	64 (28.83%)	53 (23.87%)	55 (24.77%)
Kember's Reflective Thinking level/ Thoughtful action (KTA)	35 (26.52%)	41 (31.06%)	35 (26.52%)	21 (15.91%)
Kember's Reflective Thinking level/ Introspection (KI)	97 (23.21%)	108 (25.84%)	124 (29.67%)	89 (21.29%)
Kember's Reflective Thinking level/ Content reflection (KCR)	39 (27.86%)	43 (30.71%)	27 (19.29%)	31 (22.14%)
Kember's Reflective Thinking level/ Process reflection (KProR)	20 (17.54%)	40 (35.09%)	35 (30.70%)	19 (16.67%)
Kember's Reflective Thinking level/ Content and Process Reflection (KCPR)	13 (23.21%)	19 (33.93%)	14 (25.00%)	10 (17.86%)
Kember's Reflective Thinking level/ Premise reflection (KPreR)	4 (19.05%)	9 (42.86%)	5 (23.81%)	3 (14.29%)
Revised Bloom's taxonomy/ Remember (AKR)	5 (33.33%)	5 (33.33%)	4 (26.67%)	1 (6.67%)
Revised Bloom's taxonomy/ Understanding (AKU)	4 (16.00%)	5 (20.00%)	7 (28.00%)	9 (36.00%)
Revised Bloom's taxonomy/ Apply (AKApp)	12 (24.00%)	16 (32.00%)	10 (20.00%)	12 (24.00%)
Revised Bloom's taxonomy/ Analyse (AKAna)	6 (27.27%)	5 (22.73%)	4 (18.18%)	7 (31.82%)
Revised Bloom's taxonomy/ Evaluate (AKE)	5 (55.56%)	2 (22.22%)	1 (11.11%)	1 (11.11%)
Revised Bloom's taxonomy/ Create (AKC)	2 (100%)			
Total units of coding	292 (23.82%)	357 (29.12%)	319 (26.02%)	258 (21.04%)

Table 6-5 Coding frequency among cohorts

Furthermore, it is found that there is no significant difference in the distribution of

coding frequency between male students and female students. Table 6-6 shows the

distributions of the coding frequency by gender.

Gender Category/ Code	Male	Female
Kember's Reflective Thinking level/ Habitual action (KHA)	123	129
Kember's Reflective Thinking level/ Thoughtful action (KTA)	75	70
Kember's Reflective Thinking level/ Introspection (KI)	259	223
Kember's Reflective Thinking level/ Content reflection (KCR)	80	73
Kember's Reflective Thinking level/ Process reflection (KProR)	59	68
Kember's Reflective Thinking level/ Content and Process Reflection (KCPR)	30	37
Kember's Reflective Thinking level/ Premise reflection (KPreR)	14	11
Revised Bloom's taxonomy/ Remember (AKR)	10	5
Revised Bloom's taxonomy/ Understanding (AKU)	18	11
Revised Bloom's taxonomy/ Apply (AKApp)	32	23
Revised Bloom's taxonomy/ Analyse (AKAna)	11	14
Revised Bloom's taxonomy/ Evaluate (AKE)	7	2
Revised Bloom's taxonomy/ Create (AKC)	2	

Table 6-6 Coding frequency by Gender

6.1.2 Evidences of Reflective Thinking

Most of the codes, about 39.70% of the total codes, are found falling to the

introspection category of Kember's level of reflective thinking scheme. It refers

to "*the feelings or thoughts about oneself and involves no attempt to re-examine*

or test the validity of prior knowledge" (Kember et. al., 1999, p.21). Table 6-7

lists out the coding frequency in terms of the number of units of coding, the

number of cases involved and the number of words for each coding category of

Kember's level of reflective thinking.

Category/ Code	Number of units of coding	% of Coding	Number of cases	% of Case	Number of words	% of words
Habitual action (KHA)	222	20.13%	61	18.05%	7762	9.31%
Thoughtful action (KTA)	132	11.97%	58	17.16%	9210	11.05%
Introspection (KI)	418	37.90%	64	18.93%	35261	42.30%
Content reflection (KCR)	140	12.69%	58	17.16%	11024	13.23%
Process reflection (KProR)	114	10.34%	49	14.50%	10520	12.62%
Content and Process Reflection (KCPR)	56	5.08%	33	9.76%	6620	7.94%
Premise reflection (KPreR)	21	1.90%	15	4.44%	2960	3.55%
Total:	1103	100%	338	100%	83357	100%

Table 6-7 Coding frequency details for Kember's level of reflective thinking

Figure 6-3 exhibits a histogram of the number of units of coding for each category

of Kember's levels of reflective thinking. It shows that students were generally

not reflecting deep enough in their reflective journals and merely describe what

was happening in the class and their personal feelings about the activities.
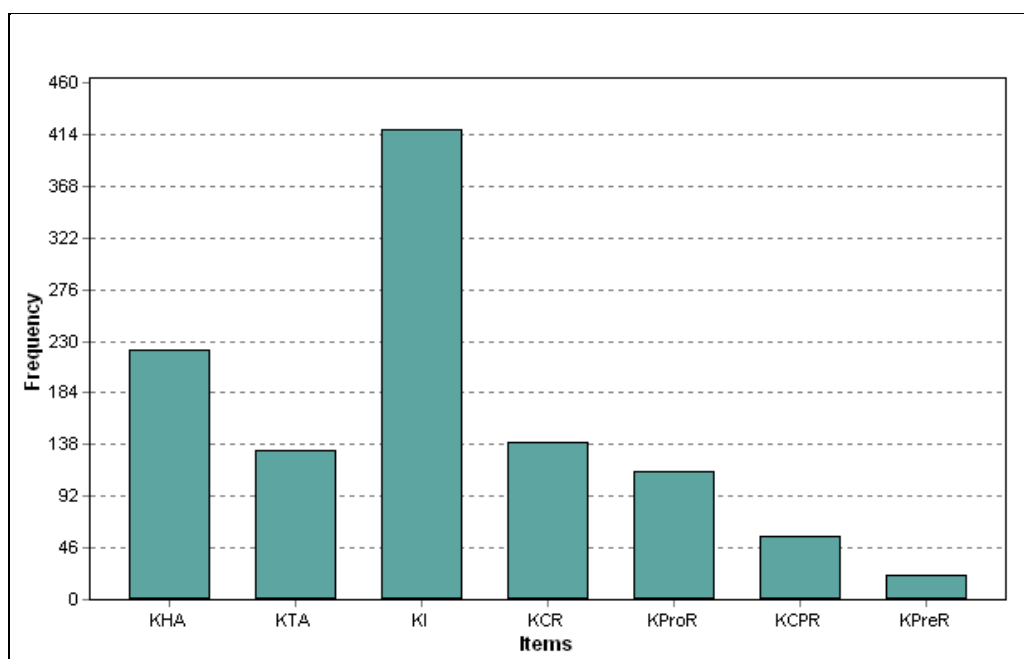
Note: KHA: Habitual Action; KTA: Thoughtful Action; KI: Introspection; KCR: Content Reflection; KProR: Process Reflection; KCPR: Content and Process Reflection; KPreR: Premise Reflection

Figure 6-3 Histogram of Coding Frequency by Kember's Reflective Thinking Coding Categories

Table 6-8 lists some example codes that found from the student blogs for each

coding category of Kember's level of reflective thinking.

Kember's level of reflective thinking	Examples from Blogs
Habitual action (KHA) N=222	*"During week 11 lecture, we have visited the River of Wisdom at Asia World Expo..."* Subject ID: 201011012 / Journal#2 *"On 5th October, 2007, I had the third laboratory. In this laboratory, my group mates and I had a role play about six hats thinking…"* Subject ID: 200708048/ Journal#1 *"Today, we are going to build a "bridge". But first, we need to change the previous partners."* Subject ID: 200910041/ Journal#4 *"On September 23, we had to draw two pictures to form a story, but we should follow the original picture to create two new own pictures…"* Subject ID: 200809063/ Journal#2
Thoughtful action (KTA) N=132	*"This is my second time to have this experiment. The first was done when I was in secondary school form six. At that time, I just try my best to apply physical method to accomplish the goal. Without my creative thinking, I just try to follow what teacher's saying and did my maximum. Although it succeeds, it is lack of fun."* Subject ID: 200708052/ Journal#3 *"Collecting things was easy, after a few minutes, we have collected a lot of things, that we thought useful. After we came back to the classroom and ten minutes have gone, we still had no idea to design, but we only had twenty minutes left."* Subject ID:

	201011010/ Journal#2
Introspection (KI) N=418	*"After this lesson, I got a new life aim for me. If I want to be a creative people, I should learn more than I can imagine. It's not the time for me take rest."* Subject ID: 200809017/ Journal#1 *"I strongly agree these three elements. However, my opinion has some difference between Robert Harris one. I believe that everyone has their own ability to invent something but it depends on their attitude."* Subject ID: 200809032/ Journal#1 *"After the two busy weeks, I feel really tired and having bad appetite. - Maybe still haven't got used to CIMP life. (My doctor advised me to keep doing exercise whenever I have spare time, because a health body is the soul for STUDY (even for creative thinking, I think!!!))"* Subject ID: 200910058/ Journal#4
Content reflection (KCR) N=140	*After that, I feel that we are not the best. Because our pose have not any creative components inside. On the other hand, one group complete the tasks by using the pose (the one who use feet put on the other one shoulder). I have great esteem for them. I discover that our group is not the most creative one in the class on every lesson, we are the simplest and the most stable one."* Subject ID: 200910041/ Journal#1 *"For example, in the past, I am afraid of failure, everything the pursuit of perfection. However, after this lesson six thinking hat this skill letting me know more about myself every time the pursuit of perfection will increase my pressure and unhappy."* Subject ID: 201011034/ Summary
Process reflection (KProR) N=114	*"In this part, it is too difficult for me. It is because I had not an experience to make a movie. But I am interesting of this thing. After finish the movie, I know that we need prepare many things before to make a movie. For example, we need to do some research about our movie. Besides, we need to consider the place for shoot a good angle. And we need to consider how to shoot a good angle. Moreover, we need writing a good story and consider that that the role is. When we are going to make a movie, we miss many practical problems. We need to solve the problem. After you shoot the angle, we need to edit the movie. In order to make a good movie, we attempt to learn new software for edit the movie. I think that this group project is a good challenge for me."* Subject ID: 200910057 / Summary *"However, I don't think that people use only one thinking style to think ideas. I think that a person's thinking style is diversified and composite and we need to make use of these thinking styles appropriately. We should not extremely use one thinking style (Hat) only to think ideas. For example, if we only use the Green Hat, the ideas we suggested may not be the best, realistic, and practicable or developed fully. Hence, if we want to have a good creative idea, I think we also need the other five Hats to make the idea better. Chinese has a well-known saying which is "the thing must fail if it has gone the extreme ". Therefore, I think that if we want to be a good creator, we should avoid using one thinking style only. Discussing with people who have different thinking styles is*

	an easy way to excite the good creative ideas. More different thinking styles involved in thinking process, more suggestion which improve the quality of the creative idea.” Subject ID: 200708040 / Journal#3
Content and Process Reflection (KCPR) N=56	*“For example, we need to fill in each square to set the theme at first. It makes us to think a Party in detail. We may ignore some important item if we do not use the Mandala. Therefore Mandala can help us to think in detail and generate the idea. It is very clear to list out every item and help people to recall everything. it is a very useful tool for someone who wants to design and create something. As you know, creating something need to find out an idea at first. This tool can help people focus on everything which needs to take a concern and through the development to create an idea easily. Mandala just like a formula, we will realize that some fresh and new ideas will come out if we follow the square and step by step to fill the detail. I think that it is amazing because some ideas are unbelievable and you have never thought it before. Therefore, Mandala is a good way to help you to have a creative thinking Another thing is that Mandala can help us to choose the best idea. As you know, there are many ideas when we create one thing so we need to choose and make a balance from those ideas. Something, we may miss something important and spend too much time on choosing or making a choice before we have not a final decision. Using Mandala can help us to solve this problem because it is very clear to list out every subject therefore we may not miss something which is important. Moreover, every theme is list out in each square; we may have a match from the square and choose each subject efficiently. It is very helpful for us to make a choice and do the job much better.”* Subject ID: 200809032/ Journal#4
Premise reflection (KPreR) N=21	*“When I start to think, what is so meaningful to people? Tears are the first thing comes out in my mind. Since tear is related to cry and crying moment is quite difficult to capture. So how about make a tear collector. Maybe if there is a reason for them to cry, they could release more their feeling and have less embarrass to be cry. And after that, they can show other people why they cry. It is also a better way to share their part of life. So I decide to create a tear container. Since tears are easy to dry, it's difficult to make them in liquid state in store. But how about make them dry on the glasses. When the waters dry, the salty crystals will remain on the glasses. Make them stay in between glasses is a quite easy way to collect them. And I think may be some little change of the structure of the container may be more attractive.”* Subject ID: 200910020/ Summary

N=frequency of code found in the Blogs

Table 6-8 Examples of code for Kember's level of reflective thinking

6.1.3 Evidences of Higher Order Cognitive Skills

Similar to the findings of reflective thinking listed in previous parts, most of the codes, about 40.65% of them, are found falling into the Apply category of revised Bloom's taxonomy. It refers to "*carry out or use a procedure in a given situation. Participant indicates a process or procedure (as defined by illustrating a minimum of three steps)*" (Anderson & Krathwohl, 2001, p.67). Table 6-9 lists out the coding frequency in terms of number of units of code, number of cases involved and number of words for each coding category of revised Bloom's taxonomy. By comparing with the figures in Table 6-7, the number of coding and the number of wording are about 10 times more than those for revised Bloom's taxonomy.

Category/ Code	Number of units of coding	% of Coding	Number of cases	% of Case	Number of words	% of words
Remember (AKR)	15	12.20%	13	13.40%	680	7.65%
Understand (AKU)	25	20.33%	22	22.68%	1380	15.53%
Apply (AKApp)	50	40.65%	33	34.02%	2985	33.60%
Analyse (AKAna)	22	17.89%	19	19.59%	2860	32.19%
Evaluate (AKE)	9	7.32%	9	9.28%	952	10.72%
Create (AKC)	2	1.63%	1	1.03%	27	0.30%
Total:	123	100%	97	100%	8884	100%

Table 6-9 Coding frequency details for Revised Bloom's Taxonomy categories

Figure 6-4 exhibits a histogram of the number of units of coding for each category of revised Bloom's taxonomy. It shows that there is less evidence found

for demonstrating higher order cognitive skills such as *critically analyse* or *judge*

a decision from the student blogs. Furthermore, evidence was found from the

blogs which demonstrated that students were able to apply what they learnt from

class in different domains.
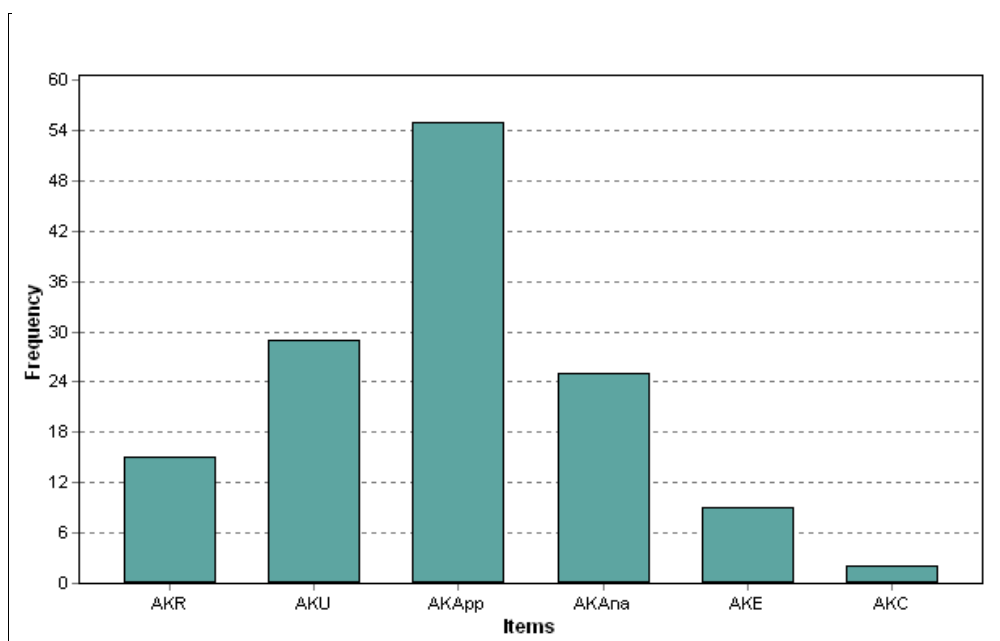
Note: AKR: Remember; AKU: Understand; AKApp: Apply; AKAna: Analyse; AKE: Evaluate; AKC: Create

Figure 6-4 Histogram of Coding Frequency by Revised Bloom's Taxonomy categories

Table 6-10 lists some example codes that found from the student blogs for each

coding category of the revised Bloom's taxonomy.

Revised Bloom's taxonomy	Examples from Blogs
Remember (AKR) N=15	*"Robert Harris thinks that creativity means ability, an attitude and a process."* Subject ID: 200809032/ Journal#1 *"Originality, Fluency, Flexibility, Elaboration and Sensitivity are the techniques for Divergent thinking."* Subject ID: 200910033/ Journal#2 *"SCAMPER is stand for Substitute, Combine, Adapt, Modify, Put to other uses, Eliminate, Re-arrange/ Reverse."* Subject ID: 200809017/ Journal#2
Understand	*"Although creative people are nonconformist, they will have some common*

(AKU) N=25	*attributes" Subject ID: 200708026/ Journal#3* *"Mind map can help us to generate ideas and encourage more consistent thinking, it also help us to create new concept. It is very useful to elaborated and create a new idea." Subject ID: 200809032/ Journal#2* *"Creation is an impact on traditional culture. It brings fresh and new ideas, products which are convenient, entertainment, thinking styles for people. In fact, create a new thing is not a difficult skill and it is not scientists patent. If we apply an appropriate creative skill, we will feel easy to creative new things." Subject ID: 201011082/ Summary*
Apply (AKApp) N=50	*"For example, I took part in a composition competition held by 7-11, celebrating 10 years ceremony of regression. I composed base on my experience in secondary school life. People in some career scope also doing creative work inspired by their past experience. For instance, furniture designers have to use their past experience (may feeling not comfortable when using some furniture) to think of a new design to improve the furniture' functions." Subject ID: 200708026/ Journal#3* *"I love taste food. There are three element in our decision which is good food--Food colour ,Smell and Taste .Besides this three element, the Molecular Gastronomy contain the other element which is increase a lots of interesting when we are eating .Nowadays, we always think how to creative to attract people. For example, fusion food and Japan vegetarian. I think Molecular Gastronomy can be attracting most people because it is very funny. We can enjoy the food taste, visual, great smell and gimmick." Subject ID: 200809047/ Summary* *"For example, I remembered once time when we discussed the group project - Love story, we have no idea then we used lateral thinking skill to think out lot of the ideas do not to be relevant, then we use this unconnected idea to make a new line of story plot." Subject ID: 201011012/ Summary*
Analyse (AKAna) N=22	*"In human imaginations, there are barriers when someone wants to link stuff of different fields together. It is because human has a sense of classification. If we have a good sense of imagination, we won't feel confused in facing complexity. That's mean if someone have enough ability of imagination, he would have good understanding in different things." Subject ID: 200708007/ Journal#2* *"One day when I open YouTube, a clip logo has attracted me. This clip titled " New Sport: walk on the water", I open it and I was shocked. These guy really success on running on the water. Because of their work are new, which is creative, and their process is really educational, I choose this as my creative P. These people have illustrated the problem solving with creativity, and their effort is really good, which be a good example for me to face any difficulty in future." Subject ID: 201011071/ Summary*
Evaluate (AKE)	*"But some times I don't really agree for some of your suggestion .For example: six head thinking .you teach us to forgot our character is and just*

N=9	*to think in one way .but I don't agree with that I think everyone get their own ideas don't have to just think in six heads ways, because when you got some of the ideas not in your way, you can't share it! This Is one of the main disadvantages of this thinking."* Subject ID: 200708023/ Journal#2 *"After seeing these pictures, I think the drawer is very creative. Nowadays, there are not many as creative as these pictures. Because of their contrary, they can catch my eyes. Further, they make me pay more attention on analyzing their implicationns.oth of positive implications and negative implications are significant. On the positive side, it is educational. On the negative side, it is contradictory also, the picture are full of appeal. These pictures, which are interesting and full of information. [PIC17] This picture gives washing baby instruction. On the left, it shows an appropriate method of taking care baby. However, on the right, it demonstrates a wrong mean of dealing babies. People do clean the baby slightly by the cloth and people do not sprinkle water on the baby by the sprinkler like irrigating the plant in real life. [PIC18]"* Subject ID: 200809003 / Summary
Create (AKC) N=2	*"To summarize, it is simply an equation for me: Creativity = Brain + Infinite / Brain to the power of Infinite"* Subject ID: 200708035/ Journal#1 *"For me, creativity in Chinese are "Create"（創）+ "Meaning"（意）..."* Subject ID: 200708035/ Journal#4

N=frequency of code found in the Blogs

Table 6-10 Examples of code for the Revised Bloom's taxonomy

6.1.4 Relationships between Coding Categories and Learning Types

The sample selection for focus group was based on the questionnaire scores for SPQ and RQ scores. Students with highest score were selected from the two learning approach groups (deep approach - DA and surface approach - SA) according to SPQ scores, and another four reflective thinking groups (HA, U, R, CR) according to RQ scores. Students with highest score in a particular scale among all scales in SQP or RQ, for instance someone scored highest in understanding scale, can be treated as his dominant thinking style. It is interesting to explore the distribution of coding for students with different learning types.

Table 6-11 lists out the coding frequency in terms of the number of units of code

by each learning type.

Learning Type Category/ Code	DA	SA	HA	UN	RE	CR
Kember's Reflective Thinking level/ Habitual action (KHA)	75	47	28	37	38	27
Kember's Reflective Thinking level/ Thoughtful action (KTA)	40	38	15	12	19	21
Kember's Reflective Thinking level/ Introspection (KI)	147	97	51	58	71	58
Kember's Reflective Thinking level/ Content reflection (KCR)	45	32	15	28	18	15
Kember's Reflective Thinking level/ Process reflection (KProR)	39	36	10	11	21	10
Kember's Reflective Thinking level/ Content and Process Reflection (KCPR)	27	14	5	8	11	2
Kember's Reflective Thinking level/ Premise reflection (KPreR)	10	5		3	6	1
Revised Bloom's taxonomy/ Remember (AKR)	4	3		2	6	
Revised Bloom's taxonomy/ Understanding (AKU)	10	6	3	1	8	1
Revised Bloom's taxonomy/ Apply (AKApp)	23	12	5	3	9	3
Revised Bloom's taxonomy/ Analyse (AKAna)	10	5	3	1	4	2
Revised Bloom's taxonomy/ Evaluate (AKE)	1	3		3	1	1
Revised Bloom's taxonomy/ Create (AKC)				2		

Note: DA – Deep Approach; SA – Surface Approach; HA – Habitual Action; UN – Understanding; RE – Reflection; CR – Critical Reflection

Table 6-11 Coding frequency by learning types

By comparing the two learning approach groups, deep approach and surface

approach, the coding frequencies in all coding categories for deep approach

group are higher than those for surface approach group. In particular to the

Kember's habitual action, introspection, content and process reflection, and

premise reflection, as well as the apply and analyse skills from revised Bloom's

taxonomy, the coding frequencies are found about 2 times more than those for the

surface approach group. For the reflective thinking groups, reflection group are

found to have the highest coding frequencies in all the coding categories except

Kember's content reflection and the evaluate skill from revised Bloom's

taxonomy.

6.1.5 Relationship among the Coding Categories

In order to further explore the relationship among codes, hierarchical cluster

analysis by the computerised software QDA Miner® was carried out through the

computation of co-occurrences index (Jaccard's Coefficient) on all codes. Figure

6-5 exhibits the dendrogram of the related codes.
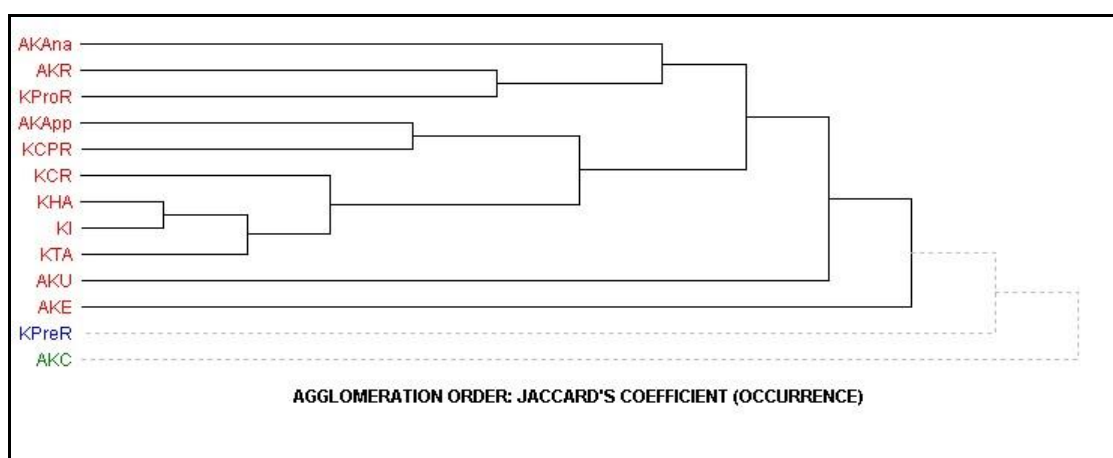
Note: AKR: Remember; AKU: Understand; AKApp: Apply; AKAna: Analyse; AKE: Evaluate;
AKC: Create; KHA: Habitual Action; KTA: Thoughtful Action; KI: Introspection; KCR: Content
Reflection; KProR: Process Reflection; KCPR: Content and Process Reflection; KPreR: Premise
Reflection

Figure 6-5 Dendrogram of all code categories

It is found that the *remember skill* group of revised Bloom's taxonomy is related

to the *process reflection* group of Kember's reflective thinking. Besides, the

apply skill group of revised Bloom's taxonomy is also found to relate to the

content and process reflection group of Kember's reflective thinking.

6.2 Word Cloud Analysis for Blog Content

In order to identify the top 25 keywords used in the student blog postings, word clouds

were generated by the internet application TagCrowd for each studied clusters such as the

learning approach groups (deep approach and surface approach) and the reflective

thinking groups (habitual action, understanding, reflection and critical reflection) for the

focus group of the main study in order to compare with each other. For instance, word

clouds for all postings of gender groups (Female vs. Male) and another clouds for

learning approach groups (DA vs. SA) and reflective thinking groups (HA vs. U vs. RE

vs. CR). In additional to these, word clouds for all these clustered groups for each cohort

years were also generated for comparison.

By comparing all word clouds generated for the sampled postings, it was found that the

words "Creative" or "Creativity", and "Thinking" appearing to be the top two words in

all generated word clouds.

6.2.1 Word Cloud Analysis for Gender Groups

No difference is found when comparing the word clouds of all blog postings of the gender groups. Figure 6-6 exhibits the two word clouds for all postings for female group and male group of all four cohorts.
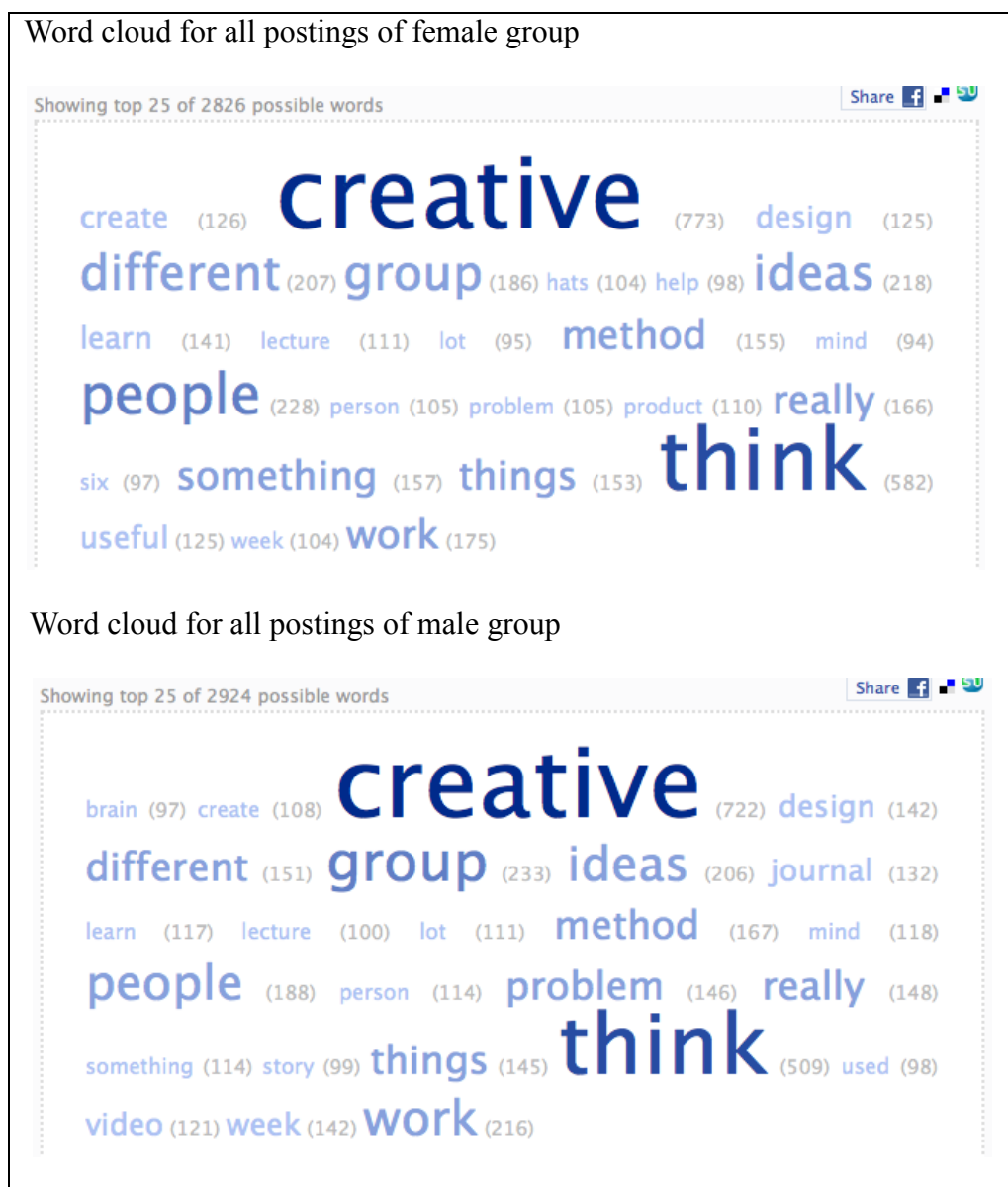
Figure 6-6 Word Cloud Comparison for all postings in Gender Groups

However, in cohort 2010, it is found that female group used expression words such as "feeling" and "love" in their postings, while the male group used more

rational words such as "method", "idea", "skill" and "work" when comparing the

word clouds for all postings of gender groups. Figure 6-7 exhibits the two word

clouds for all postings for female group and male group in cohort 2010.

Figure 6-7 Word Cloud Comparison for all postings in Gender Groups in cohort 2010

6.2.2 Word Cloud Analysis for Learning Approach Groups

When comparing the word clouds for learning approach groups, it is found that

deep approach group wrote more words related to thinking such as "reflective",

"learn" "problem" and "mind". Furthermore, there is a word "egg" appearing in the word cloud of surface approach group while another word "hat" found from the word cloud of the deep approach group. This indicates the difference in the preference of classroom activity between the groups. Deep approach group prefers the activity regarding six hats thinking while surface approach group prefers the activity regarding the making of egg protector. Figure 6-8 exhibits the two word clouds for all postings for learning approach groups of all cohorts.

Word cloud for deep approach group

Word cloud for surface approach group

Showing top 25 of 1931 possible words   Share

brain (65)   create (49)   **creative** (274)
design (95) **different** (84) egg (62) **group** (151)
help (52) **ideas** (129) important (45) learn (55) lesson (50) lot (57)
method (86) **people** (123) picture (54) problem (61)
really (62) skills (52) solving (61) something (70) things (82)
think (283) thought (44) **work** (101)
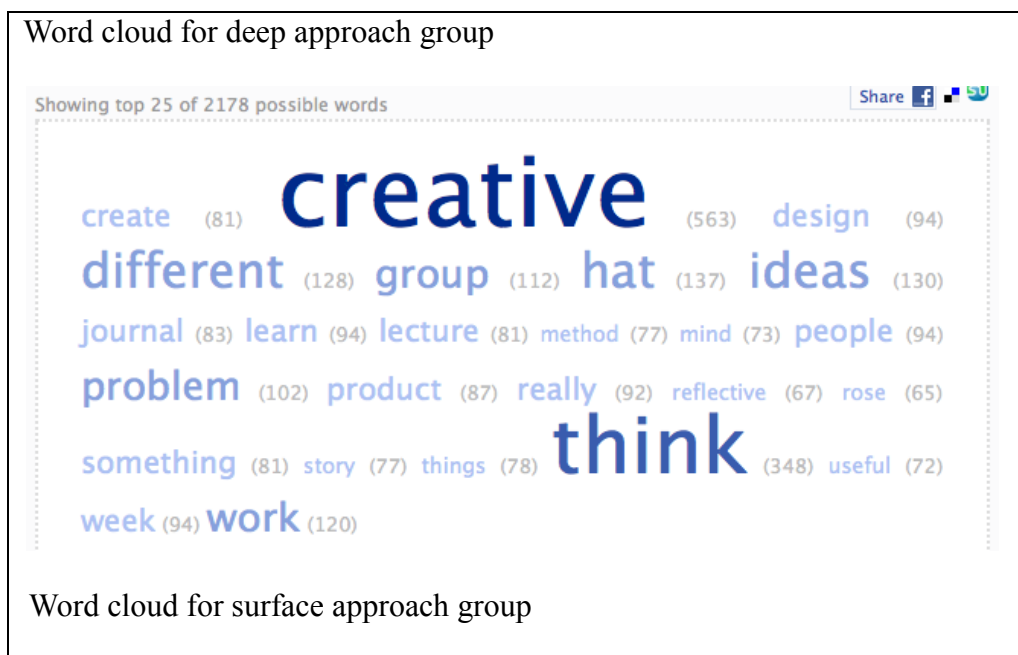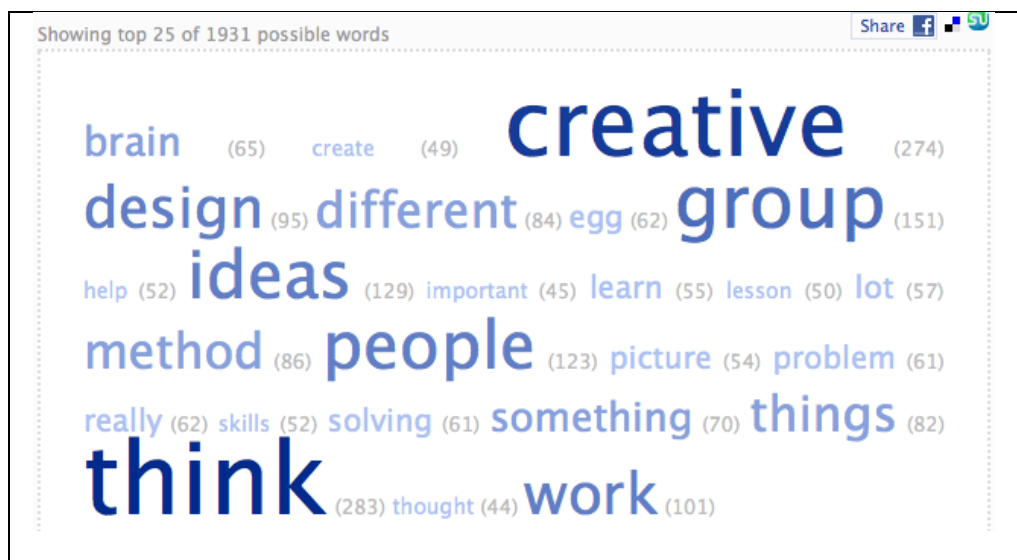
Figure 6-8 Word Cloud Comparison for learning approach Groups

Consistent findings were noticed from the comparisons of the word clouds of all postings for learning approach groups in cohort 2007 and 2008.

6.2.3 Word Cloud Analysis for Reflective Thinking Groups

No significant difference was found when comparing the word clouds of all blog postings for the reflective thinking groups of all cohorts. It is noticeable that the non-reflective groups (habitual action and understanding groups) tend to have more emotional wordings such as "love", "feel", "hope" and "crazy" in their word clouds. Consistent findings were found across all four cohort years. However, no particular word related to deep thinking was found from the word clouds of high level reflective thinking groups (reflection and critical reflection groups). Figure 6-9 exhibits the four word clouds for all postings for reflective

thinking groups including habitual action group, understanding group, reflection

group and critical reflection group.

Word cloud for all postings of habitual action group

Showing top 25 of 1226 possible words   Share

class (21) **creative** (78) different (28) drawing (20)
group (26) **ideas** (38) journal (21) learn (24) lecture (23)
lot (22) love (21) **method** (49) mind (18) others (23)
people (35) **person** (34) problem (20) really (21) school (19)
                                    think (81)
something (20) task (18) things (28)
week (41) **work** (29)

Word cloud for all postings of understanding group

Showing top 25 of 1270 possible words   Share

brain (22) **create** (35) **creative** (104) different (28)
feel (26) finish (22) **group** (56) **hats** (48) ideas (38) **learn** (36)
love (24) **method** (39) **people** (53) problem (21) product (22)
really (23) reflective (27) six (31) skill (22) something (28) things (27)
thinking (200)   useful (26)   video (31)
work (57)

Word cloud for all postings of reflection group

Word cloud for all postings of critical reflection group

Figure 6-9 Word Cloud Comparison for all postings in Reflective Thinking Groups

6.3   Keyword Frequency Analysis for Blog Content

Carrying out content analysis and word cloud generation are time consuming. By using

the software WordStat®, the researcher can carry out content analysis for large amounts

of textual information. It can help the researcher to identify its properties systematically

by identifying the frequencies of 270 student blogs including 1350 blog postings in the

main study. Table 6-12 lists out the top 25 keywords and their frequency for all the blog

postings. It is found that the word "Creative" is the top one in frequency which aligned

the observations of the word clouds – the word "creativity" appeared in every word

cloud.

RANK	KEYWORD	FREQUENCY	RANK	KEYWORD	FREQUENCY
1	CREATIVE	2420	13	CREATE	743
2	IDEA	1949	14	GOOD	736
3	WORK	1203	15	DESIGN	715
4	MAKE	1186	16	BRAIN	713
5	GROUP	1183	17	WEEK	690
6	THING	1170	18	METHOD	641
7	HAT	1141	19	MIND	616
8	TIME	1089	20	LECTURE	544
9	PEOPLE	1088	21	SKILL	544
10	LEARN	1052	22	DRAW	508
11	PROBLEM	813	23	LIFE	496
12	CREATIVITY	813	24	WRITE	496
			25	PERSON	493

Table 6-12 Keyword frequency for all blog postings

Further analysis has been done across the four cohort years. Figure 6-10 exhibits the top

25 keyword frequency across the four cohort years.
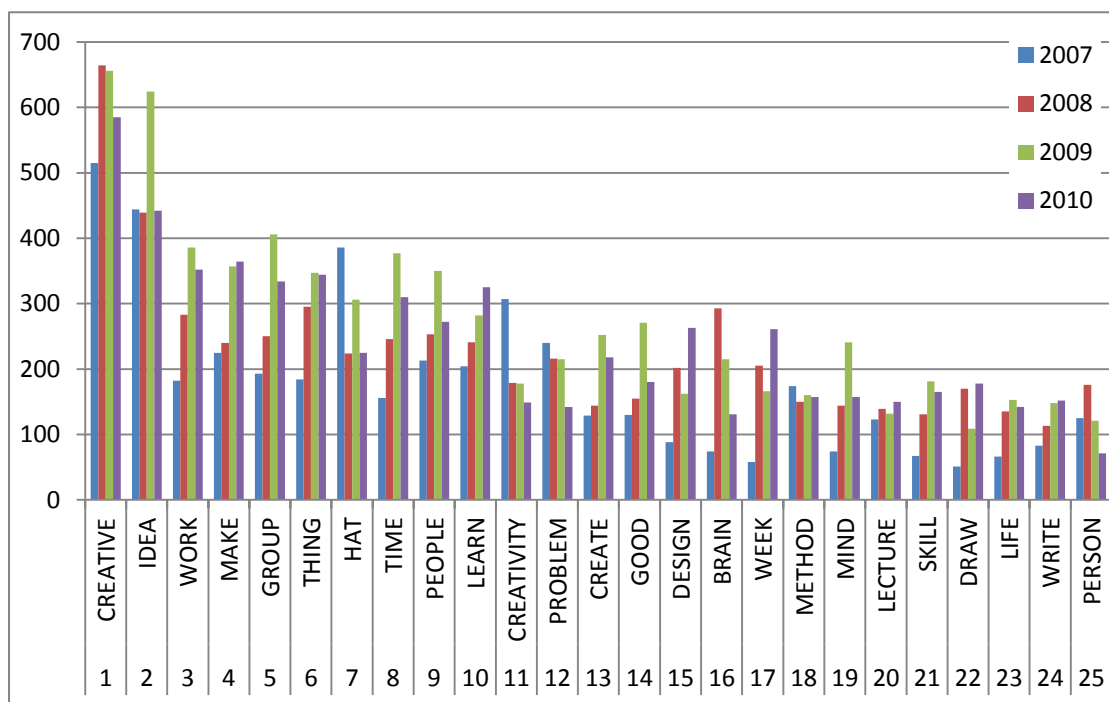
Figure 6-10 Histogram of top 25 keyword frequency across the four cohort years

6.3.1 Keyword Frequency Analysis for Gender Groups

Figure 6-11 exhibits the top 25 keyword frequency by the gender groups. It is found that the keyword frequency of the top 10 words for the male group is higher than those of the female group. Also most of the words in the top 10 list are in "rational" which supports the observations from the word cloud analysis. That is the male group used more rational words such as "method", "idea", "skill" and "work" when comparing the word clouds for all postings of gender groups in cohort 2010.
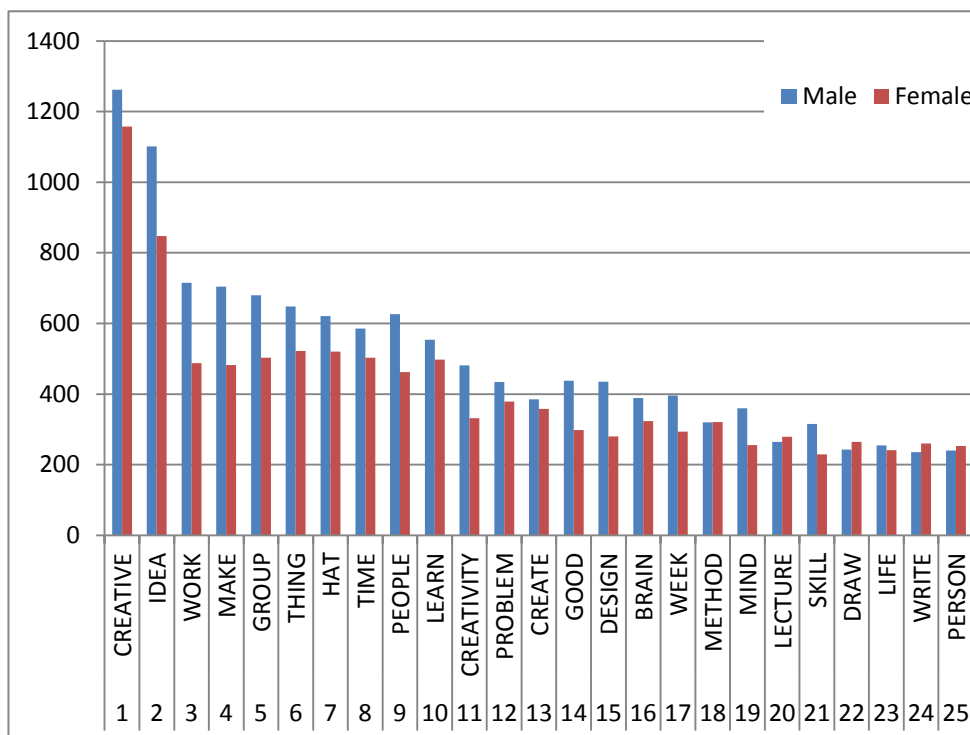
Figure 6-11 Histogram of top 25 keyword frequency by Gender

6.3.2 Word Cloud Analysis for Learning Approach Groups

When comparing the word clouds for learning approach groups, it is found that

deep approach group got a higher keyword frequency in all top 25 keywords than

surface approach group. Figure 6-12 exhibits the top 25 keyword frequency by

the learning approach groups.
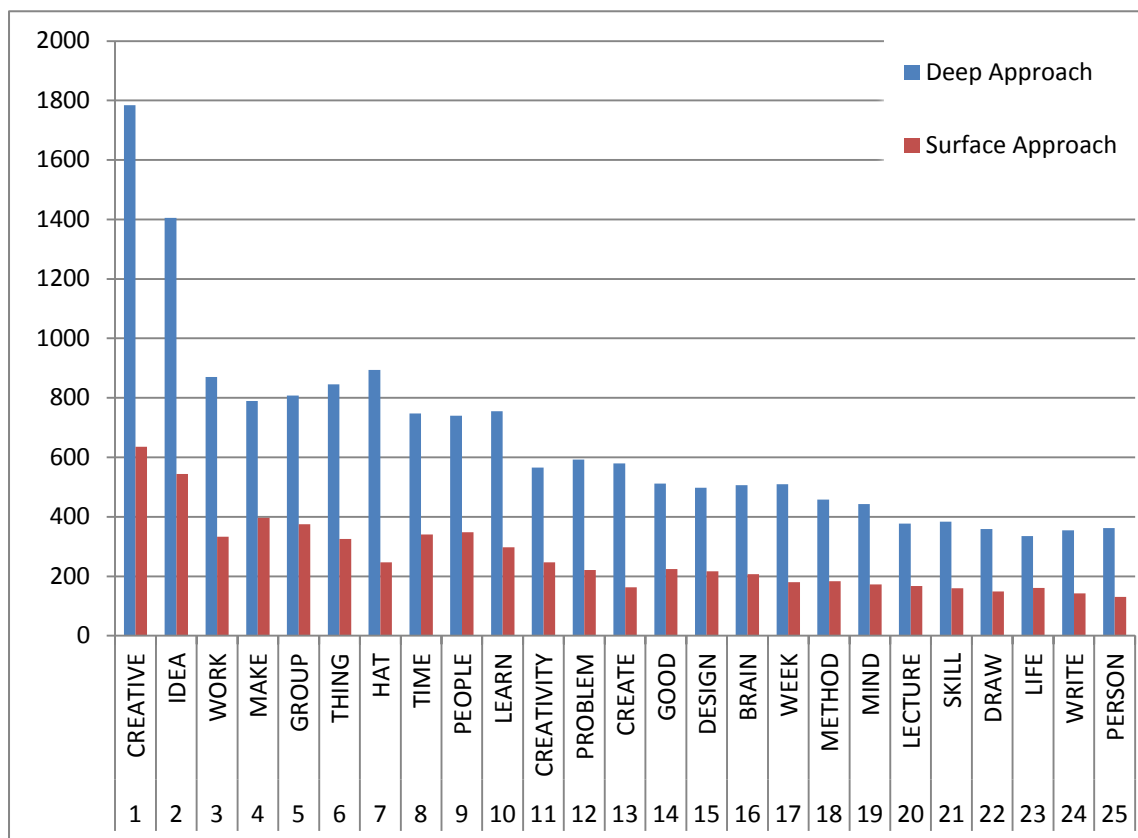
Figure 6-12 Histogram of top 25 keyword frequency by Learning approaches

6.3.3 Word Cloud Analysis for Reflective Thinking Groups

When comparing the word clouds for reflective thinking groups, it is found that habitual action group and reflection group got a higher keyword frequency than the other two groups in all top 25 keywords. Figure 6-12 exhibits the top 25 keyword frequency in the reflective thinking groups.
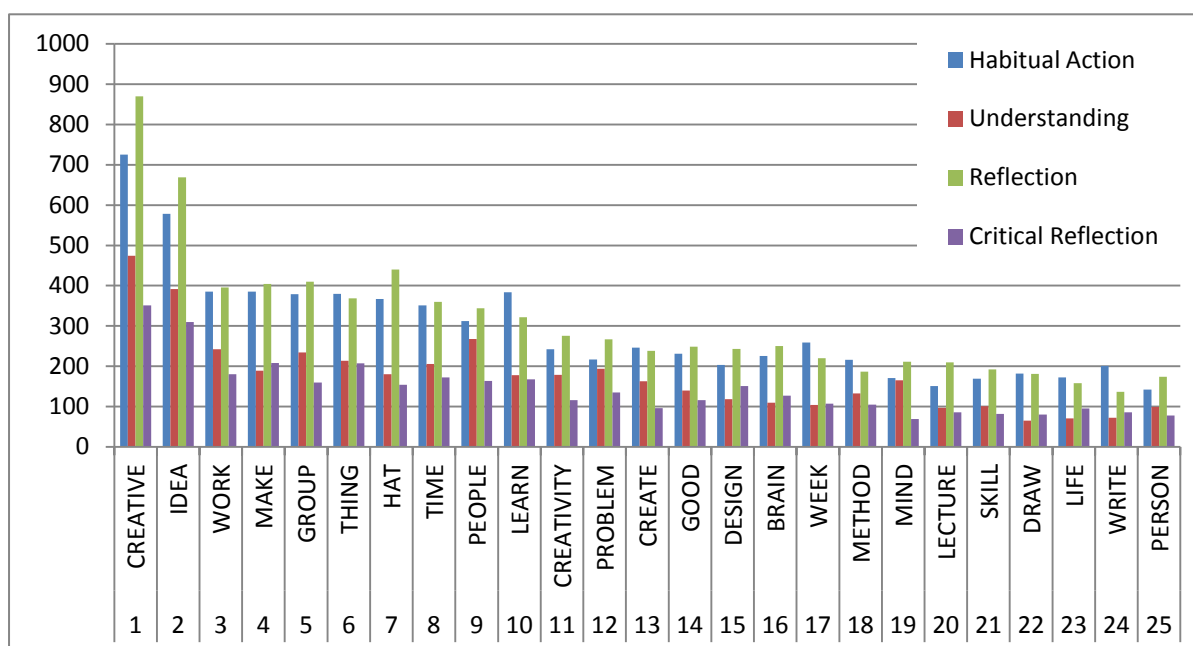
Figure 6-13 Histogram of top 25 keyword frequency by Reflective Thinking Groups

6.4   Student Interview

This section mainly focuses on the user experience in using blogging tool for reflective

writing for the course (DCO10701 Creative Thinking in Media Design) of the associate

degree level students in Division of Computer Studies at Community College of City

University (CCCU). The students were asked about (1) the blogging experiences in

DCO10701, (2) their use experiences in using the blog, and (3) their suggestions on the

blogging tool.

Personal interviews were held with twelve students involved in the main study regarding

their comments on the blogging assessment. Two students were randomly selected from

each of the learning approach groups (the deep and surface approach groups) and each of

the four types of reflective thinking groups (habitual action, understanding, reflection and

critical reflection groups). Table 6-13 provides the details of student profile for the

interview.

Subject ID	Gender	Total mark		Total scores for each questionnaire subgroup					
		Portfolio	Course	DA	SA	HA	UN	RE	CR
200708001	M	17.55	66.8	39	16	5	14	**17**	16
200708037	M	18.8	62.3	**33**	25	11	12	13	13
200708007	M	13.25	57.75	23	**26**	14	12	14	10
200809030	F	24.25	73.25	31	23	12	13	**14**	12
200809011	F	29.25	86	**26**	22	12	13	13	12
200809060	M	8.5	48.75	38	19	13	**19**	14	11
200910064	F	25.2	74.95	34	33	**15**	12	13	9
200910045	M	21.9	71.9	38	40	12	12	11	**14**
200910041	F	25.7	68.45	39	39	12	8	13	**14**
201011050	M	25.1	70.35	23	**40**	15	10	8	13
201011059	M	24.3	69.05	38	21	15	**17**	17	13
201011079	M	34.5	85.75	35	29	8	15	**18**	12

Table 6-13 Background information about students participated interview

The interviewer asked the students the following questions:

1. How do you find using blog in DCO10701?

2. Do you think it helps you to understand the matters of DCO10701?

3. Tell me some good features and bad features?

4. Any other suggestions?

6.4.1 User Experiences in Using Blog

Most students told the researcher that unless it is required by the lecturer or some

assessments that required them to, they seldom use the blogging tool in

Blackboard. They viewed Blackboard as a tool for them to download the learning

materials. They prefer to use Facebook or Xanga for blogging. Reasons for not preferring the blogging tool in Blackboard are as follow:

Since I used the wiki function in Blackboard, it actually restricted me to create a good looking portfolio. The application only has a limited amount of tools, also I found it difficult to upload a file or image (big size, >5MB) to the wiki. (200708037)

If the blog is not in the Blackboard, it may be attractive to edit. Login to the Blackboard is just like doing the homework but not expressing my own view. It is how the students feel! (200809011)

No technical support for using the blog. I think my limited technique is really (limiting) my creativity of the blog. I need time to know more about how to use the blogging tool. (201011079)

Furthermore, students found it difficult to recall what was going on in the class unless they start writing their journals right after the class.

We need to write our journals immediately after the lectures because it is very difficult to recall the memory after a few days when we finished the lectures. (200910064)

I didn't record some words and photos, so when I did my portfolio, I cannot show all things. Also I forget what exactly the time and the activity. It made me difficult to perform all data in my portfolio. (200809060)

Hard to recall details of my reflection. Some deep inside feelings are hard to say. (200910041)

Although they were forced by the lecturer to blog, some students still realised the benefits of using blogging tool in teaching and learning activities.

Creating a reflective journal is more convenient than make one by hand. You can quickly update or upload a piece of information. (200809011)

I can submit my works anytime and anywhere. I can get other's comment easily and also get someone's comment. (201011059)

6.4.2 Learning Experiences in DCO10701

The students generally felt positive about their study. They enjoyed learning reflection as it serves as a record of their learning achievement. They found they have learnt a lot from the reflective writing exercises.

It can help me to know my weaknesses of learning and skills to express myself. Get used to think of reflections after having lesson. (200910045)

I can summarise all my works and the quality of my works can be improved next time. I can also reflect myself and look what I have done in this year. (200809030)

There are some barriers such as language barrier that discourage students writing reflective journals and insufficient information for the requirements.

[The reflective blog exercise should be] Less text needed. No need to use English compulsorily. (200910064)

Not enough information of what exactly I have to do. No technical support. (200910041)

6.4.3 Suggestions to the Blog/ DCO10701

Throughout the interviews, students had made some suggestions on using blog in DCO10701, which are listed as below.

- *I think we should have more different ways to do the portfolio, like video portfolio, hand made portfolio. For some people, reflective journal (typing words) maybe difficult to them, so they cannot elaborate things they want to say. (200809060)*

- *Templates of reflective journal can be posted for reference (200910064)*

- *The lecturer can provide some photo then it can help me to remember what we had learned in the course and also help me to write the journals. (200708007)*

6.5   Summary

This chapter reports the qualitative findings of the present study. A focus group was selected for content analysis of blog postings based on 13 coding categories, using a framework combining the revised coding scheme on reflective thinking (Kember et. al., 1999) and a revised version of Bloom's taxonomy (Anderson and Krathwohl, 2001). It is

found that students were not reflecting deeply and hardly demonstrate higher order cognitive skills in their blogs. When comparing the learning approach groups, more codes in particular to the categories of Kember's habitual action, introspection, content and process reflection, and premise reflection, as well as the apply and analyse skills from revised Bloom's taxonomy were found about twice as often for the deep approach group than for the surface approach group. For the reflective thinking groups, reflection group are found to have the highest coding frequencies in all the coding categories except Kember's content reflection and the evaluate skill from revised Bloom's taxonomy. These results support the findings from the survey that a positive association between a deep approach to learning and higher levels of reflective thinking scales.

In addition to the content analysis, keyword frequency analysis in terms of word cloud was generated for all blog contents in the focus group, and another keyword frequency analysis of all 1350 blog postings was carried out for the main study. It is found that text mining method may be one of the possible ways to analyse the blog postings and is faster than the traditional content analysis.

CHAPTER 7   DISCUSSION AND CONCLUSION

Using the blog for promoting reflective writing as an assessment is a common practice in the tertiary institutions of Hong Kong. The present study attempts to provide a systematic exploration of the effects of using blog as an online platform for self-reflection and knowledge construction among the associate degree level students studying in Division of Computer Studies at the Community College of City University of Hong Kong. The main aims of this study are to answer the following questions:

RQ1.   How well do the students use blog in their study?

RQ2.   Students with which learning approach reflect deeper with the blog?

RQ3.   Is there any significant change in students' learning approaches and level of reflective thinking before and after blogging?

RQ4.   To what extent does the actual use of blogging enhance the student's reflective thinking and knowledge construction?

This chapter opens by providing a summary of the major findings and implications of the study. Reflections on the practice and the professional development of the researcher herself are included as well. The next section probes the constraints and limitations of the study while recommendations and suggestions for future action and development are presented in the last section.

7.1 Major Findings of the Study

The major findings of this study are discussed under four different aspects: (1) the relations between learning approaches, reflective thinking and the learning outcomes, (2) comparison of learning approaches with reflective thinking habits, (3) the changes of learning approach and reflective thinking habits, and (4) blogging experiences.

7.1.1 Summary Findings on the Relations between Learning Approaches, Reflective Thinking and the Learning Outcomes

The present study used simple correlation and standardised regression analysis to explore the association between learning outcomes (assessed in terms of the total mark of the course and the marks for the personal portfolio), learning approaches, and the habits of reflective thinking of the students. It was found that the portfolio mark is positively associated with both a pre-teaching and post-teaching deep learning approach, while the total mark of the course is positively related only to a pre-teaching deep learning approach. Similar results were also found for habits of reflective thinking. Both portfolio mark and total course mark are positively associated with all pre-teaching reflective thinking scales - especially for understanding and reflection categories, while the total mark and portfolio mark are found to be negatively related to post-teaching understanding and reflection habits. The possible explanation for the negative relationship is the bad timing for

completing the post-teaching questionnaire. Students were invited to complete the post-teaching part in revision week or even later in examination week. The students might be examination-oriented at the time of testing, which may not do any favour to deep learning approach or higher order thinking skills.

All these findings were confirmed by the corresponding content analysis and keyword frequency analysis. In the content analysis of the focus group, most of the codes were found to fall into the introspection category of reflective thinking (37.9%) and the "apply" skill according to the revised Bloom's taxonomy (40.65%). The findings of the keyword frequency analysis of the main study also confirmed the results. It was found that the keyword frequencies of top 25 keywords for those students with a deep learning approach or reflection category are higher on than other groups. It is difficult to say which type of assessments will encourage deep learning. The most important thing is how the students see the assessments. Biggs (1999b) concluded that if students perceived essays as requiring higher level processes, then they were more likely to use them; and those who did not perceive the task it the same way, using surface approaches instead, did poorly.

7.1.2 Summary Findings of Relations between Student Learning Approaches and Reflective Thinking Habits

In order to explore associations between learning approach (both deep and surface) and the four levels of the RQ scales, simple correlation and regression analysis have been carried out. In the pre-teaching testing, the deep learning approach scores were positively associated with scores in the two levels of reflective thinking (reflection and critical reflection); while the surface learning approach of the control group is found to be negatively associated with the Understanding style in reflective thinking, but positively associated with the lowest level of reflective thinking (habitual action). These findings were confirmed by the content analysis which showed that the numbers of units of coding related to "content and process reflection" and "premise reflection" for the deep approach group were double of the numbers of units for the surface approach group. Aligned with the findings of previous studies (Phan, 2006; Leung & Kember, 2003), a surface learning approach is strongly associated with habitual action, while a deep learning approach is strongly associated with understanding and critical reflection.

7.1.3 Summary Findings of the Changes of Student Learning Approaches and Reflective Thinking Habits

This study has compared the pre-teaching data (SPQ and RQ scales) and post-teaching data by using paired t-tests. It was shown that there was a positive change in the mean scores on the deep learning approach scale - in particular of the mean scores of the "deep motive" subscale for those who were asked to blog in their study. Regarding the reflection scales, a negative change in the mean scores of "habitual action" was found whilst a positive change is found in the mean scores of both "understanding" for the experiment group and "critical reflection" for the control group. These results implied that using blog in DCO10701 might be possible to encourage a deep learning approach by having more opportunities to understand the subject matter.

7.1.4 Summary Findings of the Blogging Experiences

In order to explore differences in student learning approaches between students with different genders, the independent sample t-test was used. Because of the low responses of the control female group, the researcher had combined the experiment and control group for analysis. It was found that there is no significant difference in learning approaches for female and male students. This is confirmed by the content analysis which showed that there is no significant difference in the

number of units of coding with regard to the 13 coding categories between the genders. Using the keyword frequency analysis, male students tend to write more "rational" words such as "think", idea", "work" than female students. These findings are aligned with the works of Machado (2011); she has found that there is no statistically significant gender difference in the number of retrospective comments made on blog postings.

In order to form a concrete idea about the blogging experiences of students, interviews had been carried out. It was found that students generally agree that blogging in DCO10701 helped them understand the subject matter. However, some suggestions such as the provision of support on reflective writing and using the blogging tool in Blackboard have been made by the students.

7.2 Implications of the Present Study

The present study is significant as it helps the researcher understand if and how blogging can promote reflective thinking. This understanding encourages teaching staff in the Division of Computer Studies (DCO) to consider how the blog can be used in teaching and learning activities, which in turn is likely to motivate students to learn better. In addition to reflect on the learning process, the study indicates that there is a trend of using eportfolio combining various web 2.0 tools such as blog and microblog, in course level as well as in programme level for a diversified purposes. For instance, the universities in

Hong Kong promoted eportfolio as a showcase of the learning path to the students for recording all achievements of academic study as well as extra-curricular activities portfolio.

With the adoption of mixed method research, the present study has demonstrated the strengths and weaknesses of using mixed method research. It is also distinctive in that it is one of very few studies making word clouds and keyword frequency analysis as a method of exploratory qualitative data analysis in educational research. Word clouds and keyword frequency analysis can be used as the basis for assessing the success of curriculum reform, new teaching strategies and other attempts at improving teaching and learning.

The research extends e-learning work in a new direction by using blog in self-reflection and knowledge construction in sub-degree level computing-discipline education. The literature reviews also encourage teaching staff in any academic disciplines to investigate the possibility of using blog or other web 2.0 tools in teaching and learning. Nevertheless, it is challenging to extend the possibilities of blogging or reflective thinking to a diversity of disciplines. This is because the terms of blogging or reflective thinking may be new to the diverse disciplinary-based students and teachers. Extra training, sharing or other incentives may be required for teaching these students to reflect or blog and helping these teachers to value reflection or blogging in their own disciplines. Hopefully, this study will

serve as a catalyst for further research into the use of web 2.0 tools in self-reflection training in higher education.

7.3   Constraints and Limitations of the Study

The study explored students' usage of blog as a mechanism for self-reflection learning activities was confined to 260 students who studied in one course (DCO10701 Creative thinking in media design) of one programme (Associate of Science in Creative and interactive media production). These students participated in the investigation which lasted for thirteen weeks in four separate cohorts.

Both qualitative and quantitative data were collected for the study. Qualitative data were obtained by content analysis with the content of students' blog postings, word cloud generation and keyword frequency analysis. Qualitative methods are commonly used to explore the nature of personal experiences, including their reflections that are difficult to extract from quantitative data. Like any study using qualitative methods, this study did have some inherent limitations. First is the subjective nature in this study. The blog content data were analysed by a single rater who served as the teacher and course examiner of the course as well as the only researcher of this study. The views of the researcher were inevitably influenced by the teaching resources used and the teaching approach.   It is possible that the gains are attributable to the individual teacher as much as to the use of blogging (the use of a control group was an attempt to rule out this

conjecture). The main goal of the study was to explore the use of blogging technology in IT education; this may not be generalisable to greater population – for example to other two year degree courses in computing, to other two year degree courses, to three year undergraduate courses in computing in particular, or to three year undergraduate courses in general.

In interpreting the findings of the study, there are a number of factors that should be considered. While it is possible to generalise the findings of the study to other groups of tertiary students, it would be inappropriate to generalise the findings to other disciplines, other universities or those universities outside Hong Kong. Caution should be used because the sample selected for the study was restricted to a single course taught by the researcher thereby limiting the generality of the findings. Furthermore, as the control female group is very small, the findings regarding the gender effect were based on the analysis of the combination of experiment and control data. Attentions should be drawn on such gender-related claims.

Lastly, the present study encountered time constraints in the collection of data. Although the questionnaires were distributed at the beginning of the semester, (week 1) and the end of semester (week 13), the duration of the study might not allow sufficient time for changes in learning approaches to emerge it. A longitudinal study, lasting for two consecutive semesters (Semester A and B of year 1 study) for the same group of students,

was originally planned for this study. Both selected courses in semester A and B were taught by the researcher in year 2006 (the pilot study). However, because of the change of teaching duties of the researcher in year 2007 and the removal of the planned course in semester B from the curriculum since year 2009, data collection for semester B course was abandoned. Change of data collection strategy for the present research was made in year 2008, which only collected the data for one semester. Therefore, a longitudinal study of students starting in Year 1 through to their final year might be a more appropriate way to measure changes in learning approaches.

7.4   Reflection on Practice and Professional Development

The findings from the study, particularly the student comments and suggestions sought from the interviews, suggested that more resources and support on reflective thinking and technical issues related to using the blogging tool in Blackboard should be provided. The students also reported that they have difficulties in recalling what had happened in the classroom when they were writing the blog after the class. These findings indicate the necessity of an online system such as Blackboard for information dissemination and sharing in addition to the conventional teaching and learning activities. There should also be a wide range of support which satisfies students with different needs. For example, in the City University of Hong Kong, a resources web was established supporting both teachers and students in using various tools such as blog in self-reflection as well as other

purposes. Figure 7-1 exhibits a sample page of the ePortfolio resource web. It is also

suggested that CCCU establish a teacher blog for knowledge sharing of each lesson such

as photos for the students to recall what had happened in the classroom. Efforts should be

made in teaching the students to reflect or blog and training the staff to value reflective

thinking as well as latest technology in their own disciplines.

Figure 7-1 Resources Web for ePortfolio

Recommendation I follows directly from these findings.

RECOMMENDATION I

1. Enrich the content - in particular of the Resources function in Blackboard

2. Make wide choices of different good-looking templates available for the student

   blogs. Also suggested is the inclusion of some standard components such as word

> cloud in the student blogs so that students can have a brief idea on the blog content density
>
> 3. Establish a teacher blog for providing information or photo of a particular class

The majority of students are Chinese and the interviewed students reported that the language barrier issues did restrict their expression of ideas and feelings freely and comfortably in blogging, because of the requirement they were required to write in English. One possible approach to consider is using digital stories for reflection. Digital Storytelling is the modern expression of the ancient art of storytelling. A digital story is a 2-to-4 minute digital video clip, most often told in first person narrative, recorded with the student's own voice, illustrated mostly with still images, and with an optional music track to add emotional tone. Researches were found to support using digital story for self-reflection (Barret, 2006). Recommendation II follows directly from these findings.

> **RECOMMENDATION II**
>
> **1.** Consider allowing the use of mother language in reflective journals
> **2.** Investigate the possibilities of allowing different formats of the reflective journal such as digital story telling

One disadvantage of using the blogging tool in Blackboard is its accessibility. Comparing with Blogger[5], where there are different means of blog posting such as the Blogger Mobile service which allows a user to post an entry to their own blog via a mobile device

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[5] Blogger is a commercial blog service provider (www.blogger.com)

without any login procedures. For the students of this study, they could only add a post

into their own blog after several login steps - which made the students feel

inconvenienced when using it. Recommendation III follows directly from these findings.

RECOMMENDATION III

1. Consider allowing students to use different blogging platforms at their own
   convenience to increase the accessibility of the student blogs.

7.5 Recommendation and Suggestions for Future Development

In the past, writing reflective journals as an assessment has been a common practice in

only a few disciplines. These include in-service teacher education and medical science

education. With the shifting of focus to student-centered learning and life-long learning in

the higher education sector, there is an increasing need for helping students to

self-understand and self-reflect upon their own values, and to equip them to put that

self-understanding and reflection to work in their communities (Cambridge, 2010).

Much of the research on the student learning approach and reflective thinking in tertiary

education has focused on the first year of study or has occurred at a single point in time.

Less is known about the student learning approach and reflective thinking over a program

if the students were asked to reflect throughout the whole period of study. Some studies

(Biggs, 1987) have compared the approaches to study between students in different year

levels and found little to distinguish between them. Biggs (1987) commented that there

was a general decline in deep approaches to learning from first year to final year as a result of institutional pressures but he did not elaborate further.

It is very time consuming to carry out content analysis on a large sample. This study could be methodologically strengthened by using data mining methods. It will be helpful to find the content density, textual pattern and their relationships to each other on a big sample. This research attempted to explore the possibility of using data mining and found that the results were consistent with those found from content analysis. Future research could study the use of data mining methods in depth.

7.6   Conclusion

This study primarily looks at blogging technology in promoting student reflection and knowledge construction. It focuses on using the emerging blogging technology in promoting reflection and self improvement. The study also investigates the change of student learning approach mediated by the adoption of blogging technology. Both qualitative and quantitative data were collected for the study.

The major two aims of the study are looking at (1) the extent of changes in student learning approaches and reflective thinking after using the blog, and (2) the blogging experiences themselves. The study produced the encouraging results that the blog for reflective journals are well received by the students (who also produced some

constructive suggestions for improvement) and help them to learn deeply. Overall, these findings provide useful pointers for the researcher and the Division.

For all students in the Division, they spend about two years (over 10,000 hours) to complete their study. Therefore, students certainly have a great interest in what they are going to do in their classes and their educational experiences are important. In Hong Kong, most people, even the teaching staff themselves, have relied heavily on the assessment of the academic achievement and other learning outcomes. Although no one would dispute the worth of achievement, it is just one of the components in the entire education process. A constructive educational atmosphere is important, and the education practitioner should pay attention to the learning processes, and student intellectual dispositions, as well as to outcomes.

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Appendix A - Final version of questionnaire

University of Durham
Doctor of Education
Student perceptions and learning approaches of using Blog in IT Education for Reflection and Knowledge Construction
Post-teaching Questionnaire

The purpose of this questionnaire is to help us understand your perceptions of and learning approaches of using BLOG in DCO10701 course. Such information will be valuable in providing information on how to enhance teaching and learning quality through the development of web-based teaching and learning in any IT program.

There are no 'right' or 'wrong' answers as there is no *right* way of studying. Your opinion is what is wanted. Your feedback on the questionnaire will not affect your performance or assessment result. Do not worry about projecting a good image. It is accordingly important that your answer each question as honestly as you can. Your answers are **CONFIDENTIAL**.

The study will maintain anonymity in analysis and reporting. Each participant will be assigned a number. However, you are invited to provide your student's identity number and contact number on this questionnaire because this information will be useful for subsequent analysis and for selecting students for further interview.

If you have any queries regarding to this study, you can contact Mrs. Rose Chang (2788-7476; dcrosefo@cityu.edu.hk). Please feel free to give your precious opinions. Thank you very much for your co-operations.

Part A: Demographic Data
Please indicate your demographic data by filling in the box as appropriate.

1. Student id : _____

2. About how many years have you been an internet user?
   ☐ Less than 1 year   ☐ 1 – 3 years   ☐ 4-6 years ☐ More than 6 years

3. Please tell me if you ever use the internet to do any of the following things.
   ☐ Create "blog" that others can read on the web
   ☐ Look online for news or other information
   ☐ Send or receive instant messages
   ☐ Read someone else's blog
   ☐ Download material you find online – like songs, text or images
   ☐ Post a comment to someone else's Blog
   ☐ Share something online that you created yourself, like your own artwork, photos, stories or videos

4. Please tell me if you ever get news or information from the following sources.
   ☐ Newspapers ☐ Television   ☐ Magazines   ☐ The radio
   ☐ The Internet ☐ Email/ newsletters   ☐ Discussion Forum   ☐ Blogs

5. About how many years have you been blogging?

☐ Less than 1 year   ☐ 1 – 3 years   ☐ 4-6 years ☐ More than 6 years

6. BEFORE you started blogging, did you have a personal website, or not?
   ☐ Yes   ☐ No

7. How many blogs do you have online?
   ☐ None ☐ 1   ☐ 2   ☐ 3   ☐ More than 3

For my next few questions, please think only about your MAIN blog, the one you spend the most time on.

8. Are you the only author on that blog, or are there multiple authors?

   ☐ I am the only author   ☐ Multiple authors

9. Do you wish to assist in further interview for this study?

   ☐ Yes   ☐ No
   If yes, please leave your name and contact number.
   Name: _____
   Contact number: _____

Please circle the appropriate choice on the right hand side of the question. The letters alongside each number stand for the following response.

A – this item is *never or only rarely* true of me
B – this item is *sometimes* true of me
C – this item is true of me about *half the time*
D – this item is *frequently* true of me
E – this item is *always or almost always* true of me

1.	I find that at times studying gives me a feeling of a deep personal satisfaction. 我發覺讀書有時能給我強烈的滿足感。	A	B	C	D	E
2.	I find that I have to do enough work on a topic so that I can form my own conclusions before I am satisfied. 我察覺到自己要就一個課題下一番苦功，直至自行得出結論才會感到滿足。	A	B	C	D	E
3.	My aim is to pass the course while doing as little work as possible. 我的目標是能夠合格，而下的功夫則越少越好。	A	B	C	D	E
4.	I only study seriously what's given out in class or in the course outlines. 只有上課時派的講義或在課程大綱裡提到的內容，我才會認真學習。	A	B	C	D	E
5.	I feel that virtually any topic can be highly interesting once I get into it. 我認為只要我能投入，幾乎所有課題都可以是非常有趣的。	A	B	C	D	E
6.	I find most new topics interesting and often spend extra time trying to obtain more information about them. 我覺得大部份的新課題都很有趣，也經常為此多花時間去找有關資料。	A	B	C	D	E
7.	I do not find my course very interesting so I keep my work to the minimum. 我認為所讀的課程不大有趣，故此將要下的工夫減到最少。	A	B	C	D	E
8.	I learn some things by rote, going over and over them until I know them by heart even if I do not understand them. 我靠死記硬背學習。即使不明白，也會一遍一遍地背誦，直至熟記為止。	A	B	C	D	E
9.	I find that studying academic topics can at times be as exciting as a good novel or movie. 我覺得在學習學術性課題時，有時候會跟閱讀一本好小說或是看一齣好電影一樣刺激。	A	B	C	D	E
10.	I test myself on important topics until I understand them completely. 我會測試自己對重要課題的了解，直至確認自己完全明白為止。	A	B	C	D	E
11.	I find I can get by in most assessments by memorizing key sections rather than trying to understand them. 我發覺大部份的測驗和考試，不需要完全明白課程中的重要內容，只需要強記便能合格。	A	B	C	D	E
12.	I generally restrict my study to what is specifically set as I think it is	A	B	C	D	E

unnecessary to do anything extra. 我通常只學習老師指定的範圍，因為覺得沒有必要多下額外的功夫。

A – this item is *never or only rarely* true of me
B – this item is *sometimes* true of me
C – this item is true of me about *half the time*
D – this item is *frequently* true of me
E – this item is *always or almost always* true of me

13.	I work hard at my studies because I find the material interesting. 我覺得課程內容有趣，便會用功學習。	A	B	C	D	E
14.	I spend a lot of my free time finding out more about interesting topics which have been discussed in different classes. 對於課堂上討論過的有趣課題，我會花上很多空餘時間作進一步了解。	A	B	C	D	E
15.	I find it is not helpful to study topics in depth. It confuses and wastes time, when all you need is a passing acquaintance with topics. 我發覺深入研究課題並無益處，這只會使人混淆，並浪費時間。我只需要對課題略有認識便可。	A	B	C	D	E
16.	I believe that lecturers shouldn't expect students to spend significant amounts of time studying material everyone knows won't be examined. 對於誰也知道不會考的內容，我認為講師不應該期望學生花太多時間學習。	A	B	C	D	E
17.	I come to most classes with questions in mind that I want answering. 我是帶着疑問上課的，希望在課堂上找到答案。	A	B	C	D	E
18.	I make a point of looking at most of the suggested readings that go with the lectures. 我堅持把講課時建議的大部分閱讀資料看完。	A	B	C	D	E
19.	I see no point in learning material which is not likely to be in the examination. 對於考試裡不會出現的內容，我不見得有學習的必要。	A	B	C	D	E
20.	I find the best way to pass examinations is to try to remember answers to likely questions. 我覺得要考試合格，最佳的方法便是牢記如何回答較有可能出現的題目。	A	B	C	D	E
21.	When I am working on some activities, I can do them without thinking about what I am doing.	A	B	C	D	E
22.	This course requires us to understand concepts taught by the lecturer.	A	B	C	D	E
23.	I sometimes question the way others do something and try to think of a better way.	A	B	C	D	E
24.	As a result of this course I have changed the way I look at myself.	A	B	C	D	E
25.	In this course we do things so many times that I started doing them without thinking about it.	A	B	C	D	E
26.	To pass this course you need to understand the content.	A	B	C	D	E
27.	I like to think over what I have been doing and consider alternative ways of doing it.	A	B	C	D	E
28.	This course has challenged some of my firmly held ideas.	A	B	C	D	E
29.	As long as I can remember handout material for examinations, I do not have to think too much.	A	B	C	D	E
30.	I need to understand the material taught by the teacher in order to perform practical tasks.	A	B	C	D	E
31.	I often reflect on my actions to see whether I could have improved on what I did.	A	B	C	D	E
32.	As a result of this course I have changed my normal way of doing things.	A	B	C	D	E
33.	If I follow what the lecturer says, I do not have to think too much on this course.	A	B	C	D	E
34.	In this course you have to continually think about the material you are being taught.	A	B	C	D	E
35.	I often re-appraise my experience so I can learn from it and improve	A	B	C	D	E

for my next performance.

36. During this course I discovered faults in what I had previously believed to be right.

A   B   C   D   E

END OF QUESTIONNAIRE

☺ THANK YOU FOR YOUR COOPERATION ☺

Appendix B – Coding Book of the Pilot Study

Kember_RQ

- KHA

  Habitual action. Habitual action is a unconscious act that takes place without thought and can be performed at the same time as another act. A description of an act performed without thought or having to focus could be, for example, writing using a keyboard (for a skilled typist). A description of the course of events can be categorized as habitual action.

- KTA

  Thoughtful action. Thoughtful action draws upon existing knowledge. The starting point lies in previously existing knowledge, and choices between different alternatives regarding how to perform the task are made either unconsciously or not at all. Why a certain choice is made is not questioned and no interpretation is made. No thought is given to the consequences of the act except according to the previously learned action.

- KI

  Introspection. Introspection refers to thoughts about oneself, one's own thoughts or feelings about performing a task. There is no comparison between the actual task and/or one's previous experiences, nor are there any thoughts as to why these feelings occur or what they might lead to. An example of this is a description of how it feels to learn something

- KCR

  Content reflection. Content reflection pertains to what one perceives, thinks, or feels, or how one acts when doing a task. There should be a questioning or an interpretation of behavior in order to be categorized as reflection, otherwise it is most often categorized as "2. Thoughtful action". Content reflection,

  on the other hand, is based on a person's previous knowledge or a previous experience and the person consciously thinks of what he/she does in order to solve the actual problem. They do not, however, reflect upon why the action taken works or how their own behavior developed. What effect the thought, feeling, or act may have should be discussed.

- KProR

  Process reflection. Process reflection refers to how one performs the functions of perceiving, thinking, feeling, or acting, and to an assessment of how effective the performance is. There should be a proposal for, or an interpretation of, behavior for a categorization as process reflection. For example, a person smiles to solve the problem, but also thinks further on how he or she thinks it might work out. They also consider how a kind reception from another person can reduce their own irritation. Reflection of process can also contain reflection of how they feel and act themselves when they meet the angry customer, and how this is considered as a problem, as well as how they handle their own feelings. One's thoughts and beliefs about how the thought, feeling, or act has an effect should be discussed in addition to how others apprehend the act.

- KCPR

  Content and Process Reflection: Combined both content reflection and process reflection

- KPreR

  Premise reflection (Theoretical reflection). Premise reflection relates to why one apprehends, thinks, feels, or acts the way one does and the consequences of that existing knowledge sets the framework for how

one acts in different situations. This should include an analysis of the whole situation/problem; "what" and "how" should be put into context. Consequences should be considered so that they can be included in a deeper understanding or reinterpretation of the problem. Alternative methods should also be considered, often leading to questioning of prejudice based on a theoretical reasoning. This could lead to a reinterpretation of the situation so that the starting point is different the next time the same kind of problem occurs, and thus the action becomes different. This can be very hard to identify in written essays; the behavior must be controlled the next time it happens.

AK_Bloom

- AKR

  Remember: Retrieve relevant knowledge from long term memory. Participant offers little to no explanation of concept; simply names, lists characteristucs of, or provides a simple definition of the object.
  KEYWORDS: IDENTIFY;LIST;DEFINE;REPEAT;NAME;RECOGNISE;RECALL

- AKU

  Understand:Construct meaning from instructional messages, including oral, written, and graphic communication. Participant begins to show understanding of the concept by offering an explanation or description and interpretation of the object, or the participant compares the object to another object (as in showing engineering progress over time).
  KEYWORDS: EXPLAIN;EXPRESS;DISCUSS;DESCRIBE;INFER;SUMMARISE;REPORT;INTERPRET;COMPARE;CONTRAST

- AKApp

- *Apply: Carry out or use a procedure in a guven situation. Participant indicates a process or procedure (as defined by illustrating a minimum of three steps).*
  KEYWORDS: APPLY;DEVELOP;USE;SHOW;ILLUSTRATE;IMPLEMENT

- AKAna

  Analyse: Break material into constituent parts and determine how parts relate to one another and to an overall structure or purpose. Participant goes beyond noting the function of the object (decribing) to explain the purpose (why the function is important to scoiety).
  KEYWORDS: DIFFERENTIATE;DEDUCE;ANALYSE;INQUIRE;SCRUTINIZE;DISCRIMINATE

- AKE

  Evaluate: Make judgements based on criteria and standards. Participant ventures a personal judgement or critque about the object (e.g. faster, better, easier) in reference to another object, or in reference to how the object has improved/ harmed society.
  KEYWORDS: APPRAISE;EVALUATE;DEFEND;JUDGE;ORGANISE;PLAN;SUPPORT;ARGUE;PROPOSE

- AKC

  Create: Put elements together to form a coherent or functional whole; reorganise elements into a new pattern or structure. Participant develops his or her own idea or hypothesis in reference to the photo. It could be a way to improve the object, new uses for the object, or an entirely new idea.
  KEYWORDS: ASSEMBLE;CONSTRUCT;CREATE;DESIGN;DEVELOP;FORMULATE;GENERATE;PRODUCE

Revised Coding Book after Pilot Study

AK_Bloom
- **AKAna**

  Analyse: Break material into constitutent parts and determine how parts relate to one another and to an overall structure or purpose. Participant goes beyond noting the function of the object (decribing) to explain the purpose (why the function is important to scoiety). For example, after using 5W2H method to analyst the news, we found that AD students who want to commit suicide, they have academic pressure and the further career. And they usually choice some public rental housing estate to be their suicide place
  KEYWORDS: DIFFERENTIATE, DEDUCE, ANALYSE, INQUIRE, SCRUTINIZE, DISCRIMINATE

- **AKApp**

  Apply: Carry out or use a procedure in a guven situation. Participant indicates a process or procedure (as defined by illustrating a minimum of three steps). For example, We define problem of the task first, and define what the material can get or receive. Second step was prepare 衫架 [hanger]，the first round we use a 木片 [a peice of wood] ... which find in the happening area and 衫架 [hanger] to move the wallet, but it is not successful, then we think the other method we 丟 木 片 [remove the piece of wood] car, and use the 繩 [string] to the wallet it is successful.
  KEYWORDS: APPLY, DEVELOP, USE, SHOW, ILLUSTRATE, IMPLEMENT

- **AKC**

  Create: Put elements together to form a coherent or functional whole; reorganise elements into a new pattern or structure. Participant develops his or her own idea or hypothesis in reference to the photo. It could be a way to improve the object, new uses for the object, or an entirely new idea. For example, if every time your show your painting to others and they throw it on the floor, may be just draw it on the floor directly, it may have surprise! and May be next time i can draw picture on the rubbish bin because my drawing is really poor, it may have surprise and i will become a great and special painter hahaha
  KEYWORDS: ASSEMBLE, CONSTRUCT, CREATE, DESIGN, DEVELOP, FORMULATE, GENERATE, PRODUCE

- **AKE**

  Evaluate: Make judgements based on criteria and standards. Participant ventures a personal judgement or critque about the object (e.g. faster, better, easier) in reference to another object, or in reference to how the object has improved/ harmed society. For example, i think those quizzess is not trustable because i think some quize are too simple and some quiz i think is not suitable for Chinese because of different culture and the difficulty of understanding.
  KEYWORDS: APPRAISE, EVALUATE, DEFEND, JUDGE, ORGANISE, PLAN, SUPPORT, ARGUE, PROPOSE

- **AKR**

  Remember: Retrieve relevant knowledge from long term memory. Participant offers little to no explanation of concept; simply names, lists characteristucs of, or provides a simple definition of the object. For example, 5W2H Analysis (七何 檢 討 法), that is why, what, who, when, where, how and how much/many.
  KEYWORDS: IDENTIFY, LIST, DEFINE, REPEAT, NAME, RECOGNISE, RECALL

- **AKU**

  Understand:Construct meaning from instructional messages, including oral, written, and

graphic communication. Participant begins to show understanding of the concept by offe an explanation or description and interpretation of the object, or the participant compare the object to another object (as in showing engineering progress over time). For example the game allows you to change the overall visual aspects of most of the cars, creating the perfect image of your dream car. This allows you to use your imagination and creativity. KEYWORDS: EXPLAIN, EXPRESS, DISCUSS, DESCRIBE, INFER, SUMMARISE, REPORT, INTERPRET, COMPARE, CONTRAST

Kember_RQ

- ### KCPR

  Content and Process Reflection: Combined both content reflection and process reflection. For example, I think creativity is unique, it depend on personal experience, if you know more, u will more difficult to be a creative person, because u won't think that something you already know or see is creative, for example, the tv we watch everday, I think it is not a creative idea or productin morden city, but if you bring a tv to somewhere very poor and developing place, I think people in there will think that tv is a very creative product!

- ### KCR

  Content reflection. Content reflection pertains to what one perceives, thinks, or feels, or how one acts when doing a task. There should be a questioning or an interpretation of behavior in order to be categorized as reflection, otherwise it is most often categorized as "2. Thoughtful action". Content reflection, on the other hand, is based on a person's previous knowledge or a previous experience and the person consciously thinks of what he/she does in order to solve the actual problem. They do not, however, reflect upon why the action taken works or how their own behavior developed. What effect the thought, feeling, or act may have should be discussed. For example, I think that creativity is only for generate idea, I have never thought that creativity also can be used to solve problems, compile information, evaluate idea and develop plan.

- ### KHA

  Habitual action. Habitual action is a unconscious act that takes place without thought and can be performed at the same time as another act. A description of an act performed without thought or having to focus could be, for example, writing using a keyboard (for a skilled typist). A description of the course of events can be categorized as habitual action.

- ### KI

  Introspection. Introspection refers to thoughts about oneself, one's own thoughts or feelings about performing a task. There is no comparison between the actual task and/or one's previous experiences, nor are there any thoughts as to why these feelings occur or what they might lead to. An example of this is a description of how it feels to learn something

- ### KPreR

  Premise reflection (Theoretical reflection). Premise reflection relates to why one apprehends, thinks, feels, or acts the way one does and the consequences of that existing knowledge sets the framework for how one acts in different situations. This should include an analysis of the whole situation/problem; "what" and "how" should be put into context. Consequences should be considered so that they can be included in a deeper understanding or reinterpretation of the problem. Alternative methods should also be considered, often leading to questioning of prejudice based on a theoretical reasoning. This could lead to a reinterpretation of the situation so that the starting point is different the next time the same kind of problem occurs, and thus the action becomes different. This can be very hard to identify in written essays; the behavior must be controlled the next time it happens. For example, And I lastly found that we have used a good thinking process. The reason is firstly we defined the problem that the pu

  rse was stuck into the car. Then compiling relevant information and generate ideas that's mean decided using sanitary protection, rope and branches to try this mission. And what need us to do was evaluating ideas and developing plan thus we tried to use a rope to tie

two branches together and sanitary protection for sticking up the purse!!

- KProR

  Process reflection. Process reflection refers to how one performs the functions of perceiving, thinking, feeling, or acting, and to an assessment of how effective the performance is. There should be a proposal for, or an interpretation of, behavior for a categorization as process reflection. For example, a person smiles to solve the problem, but also thinks further on how he or she thinks it might work out. They also consider how a kind reception from another person can reduce their own irritation. Reflection of process can also contain reflection of how they feel and act themselves when they meet the angry customer, and how this is considered as a problem, as well as how they handle their own feelings. One's thoughts and beliefs about how the thought, feeling, or act has an effect should be discussed in addition to how others apprehend the act. For example, I think we should learn more, know more because I think creative need knowledge to support, for example, if I have a great idea of drawing however, I do

  n't know physics, is he possible to invent gramophone? I think no, so if we want to be a creative person we should enrich our knowledge, read more book and see more!

- KTA

  Thoughtful action. Thoughtful action draws upon existing knowledge. The starting point lies in previously existing knowledge, and choices between different alternatives regarding how to perform the task are made either unconsciously or not at all. Why a certain choice is made is not questioned and no interpretation is made. No thought is given to the consequences of the act except according to the previously learned action. For example, we came up with a number of ideas, which one of them involves begging for money. In the end, we all decided on the fishing idea where we would try hooking the wallet through the gap with some earphone wires. The supplies we used were a pair of drum sticks, some earphones and a whole lot of staples and a clip.

Revised Coding Book used in the Main Study

AK_Bloom
- **AKAna**

  Analyse: Break material into constitutent parts and determine how parts relate to one another and to an overall structure or purpose. Participant goes beyond noting the function of the object (decribing) to explain the purpose (why the function is important to scoiety). For example, after using 5W2H method to analyst the news, we found that AD students who want to commit suicide, they have academic pressure and the further career. And they usually choice some public rental housing estate to be their suicide place
  KEYWORDS: DIFFERENTIATE, DEDUCE, ANALYSE, INQUIRE, SCRUTINIZE, DISCRIMINATE

- **AKApp**

  Apply: Carry out or use a procedure in a guven situation. Participant indicates a process or procedure (as defined by illustrating a minimum of three steps). For example, We define problem of the task first, and define what the material can get or receive. Second step was prepare 衫架 [hanger]，the first round we use a 木片 [a peice of wood] ... which find in the happening area and 衫架 [hanger] to move the wallet, but it is not successful, then we think the other method we 圭木片 [remove the piece of wood] car, and use the 繩 [string] to the wallet it is successful.
  KEYWORDS: APPLY, DEVELOP, USE, SHOW, ILLUSTRATE, IMPLEMENT

- **AKC**

  Create: Put elements together to form a coherent or functional whole; reorganise elements into a new pattern or structure. Participant develops his or her own idea or hypothesis in reference to the photo. It could be a way to improve the object, new uses for the object, or an entirely new idea. For example, if every time your show your painting to others and they throw it on the floor, may be just draw it on the floor directly, it may have surprise! and May be next time i can draw picture on the rubbish bin because my drawing is really poor, it may have surprise and i will become a great and special painter hahaha
  KEYWORDS: ASSEMBLE, CONSTRUCT, CREATE, DESIGN, DEVELOP, FORMULATE, GENERATE, PRODUCE

- **AKE**

  Evaluate: Make judgements based on criteria and standards. Participant ventures a personal judgement or critque about the object (e.g. faster, better, easier) in reference to another object, or in reference to how the object has improved/ harmed society. For example, i think those quizzess is not trustable because i think some quize are too simple and some quiz i think is not suitable for Chinese because of different culture and the difficulty of understanding.
  KEYWORDS: APPRAISE, EVALUATE, DEFEND, JUDGE, ORGANISE, PLAN, SUPPORT, ARGUE, PROPOSE

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  Remember: Retrieve relevant knowledge from long term memory. Participant offers little to no explanation of concept; simply names, lists characteristucs of, or provides a simple definition of the object. For example, 5W2H Analysis (七何檢討法), that is why, what, who, when, where, how and how much/many.
  KEYWORDS: IDENTIFY, LIST, DEFINE, REPEAT, NAME, RECOGNISE, RECALL

- **AKU**

  Understand:Construct meaning from instructional messages, including oral, written, and graphic communication. Participant begins to show understanding of the concept by offering

an explanation or description and interpretation of the object, or the participant compare the object to another object (as in showing engineering progress over time). For example the game allows you to change the overall visual aspects of most of the cars, creating the perfect image of your dream car. This allows you to use your imagination and creativity.
KEYWORDS: EXPLAIN, EXPRESS, DISCUSS, DESCRIBE, INFER, SUMMARISE, REPORT, INTERPRET, COMPARE, CONTRAST

Kember_RQ

- **KCPR**

  Content and Process Reflection: Combined both content reflection and process reflection. For example, I think creativity is unique, it depend on personal experience, if you know more, u will more difficult to be a creative person, because u won't think that something you already know or see is creative, for example, the tv we watch everday, I think it is not a creative idea or productin morden city, but if you bring a tv to somewhere very poor and developing place, I think people in there will think that tv is a very creative product!

- **KCR**

  Content reflection. Content reflection pertains to what one perceives, thinks, or feels, or how one acts when doing a task. There should be a questioning or an interpretation of behavior in order to be categorized as reflection, otherwise it is most often categorized as "2. Thoughtful action". Content reflection, on the other hand, is based on a person's previous knowledge or a previous experience and the person consciously thinks of what he/she does in order to solve the actual problem. They do not, however, reflect upon why the action taken works or how their own behavior developed. What effect the thought, feeling, or act may have should be discussed. For example, I think that creativity is only for generate idea, I have never thought that creativity also can be used to solve problems, compile information, evaluate idea and develop plan.

- **KHA**

  Habitual action. Habitual action is a unconscious act that takes place without thought and can be performed at the same time as another act. A description of an act performed without thought or having to focus could be, for example, writing using a keyboard (for a skilled typist). A description of the course of events can be categorized as habitual action.

- **KI**

  Introspection. Introspection refers to thoughts about oneself, one's own thoughts or feelings about performing a task. There is no comparison between the actual task and/or one's previous experiences, nor are there any thoughts as to why these feelings occur or what they might lead to. An example of this is a description of how it feels to learn something

- **KPreR**

  Premise reflection (Theoretical reflection). Premise reflection relates to why one apprehends, thinks, feels, or acts the way one does and the consequences of that existing knowledge sets the framework for how one acts in different situations. This should include an analysis of the whole situation/problem; "what" and "how" should be put into context. Consequences should be considered so that they can be included in a deeper understanding or reinterpretation of the problem. Alternative methods should also be considered, often leading to questioning of prejudice based on a theoretical reasoning. This could lead to a reinterpretation of the situation so that the starting point is different the next time the same kind of problem occurs, and thus the action becomes different. This can be very hard to identify in written essays; the behavior must be controlled the next time it happens. For example, And I lastly found that we have used a good thinking process. The reason is firstly we defined the problem that the pu

  rse was stuck into the car. Then compiling relevant information and generate ideas that's mean decided using sanitary protection, rope and branches to try this mission. And what need us to do was evaluating ideas and developing plan thus we tried to use a rope to tie two branches together and sanitary protection for sticking up the purse!!

- **KProR**

  Process reflection. Process reflection refers to how one performs the functions of perceiving, thinking, feeling, or acting, and to an assessment of how effective the performance is. There should be a proposal for, or an interpretation of, behavior for a categorization as process reflection. For example, a person smiles to solve the problem, but also thinks further on how he or she thinks it might work out. They also consider how a kind reception from another person can reduce their own irritation. Reflection of process can also contain reflection of how they feel and act themselves when they meet the angry customer, and how this is considered as a problem, as well as how they handle their own feelings. One's thoughts and beliefs about how the thought, feeling, or act has an effect should be discussed in addition to how others apprehend the act.

  Example (1) I think we should learn more, know more because I think creative need knowledge to support, for example, if I have a great idea of drawing however, I don't know physics, is he possible to invent gramophone? I think no, so if we want to be a creative person we should enrich our knowledge, read more book and see more!

  Example (2) Why? I think I am too cautious with the practice. I use lots of time to think about how I can make the largest hole for us to pass through. I should "Don't think a lot, Just do it!". Some while, cautious is not a good thing. It will block our creative mind. I think I should have a mind likes the mind when I taking photo. "Don't think, just shoot". It will give an unexpected result.

- **KTA**

  Thoughtful action. Thoughtful action draws upon existing knowledge. The starting point lies in previously existing knowledge, and choices between different alternatives regarding how to perform the task are made either unconsciously or not at all. Why a certain choice is made is not questioned and no interpretation is made. No thought is given to the consequences of the act except according to the previously learned action.

  Example (1) we came up with a number of ideas, which one of them involves begging for money. In the end, we all decided on the fishing idea where we would try hooking the wallet through the gap with some earphone wires. The supplies we used were a pair of drum sticks, some earphones and a whole lot of staples and a clip.

  Example (2) Actually, I am a left brain people. I studied physic, pure mathematics and computer study in F.7. I am totally a "logical" and "systematic" person. Moreover, I am traditional and close-minded. This is an opposite of a creative person.

Appendix C – DCO10701 Course Information

DCO10701 Creative Thinking for Media Design
Course Description

This course aims at providing students with a comprehensive introduction to creative thinking and its application mainly in problem solving tasks and media design. The course will include a study of characteristics of a creative mind, the creative process, creative problem solving, assessing and increasing growth of creative potential. On completion of this course, students should be able to:

- demonstrate understanding of the nature of creative thinking;
- apply the techniques of creative thinking in problem-solving tasks and media design; and
- reflect the self-change in attitudes conducive to creative thinking.

Lecturer & Tutor

Rose Chang

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Consultation hours: Anytime at P6957, when I am free and the door is open

Course Materials

No textbook is required to purchase. All learning materials will be distributed and available in Blackboard. Also, there are HUGE amounts of web resources available

Assessments

Coursework   100%

Evaluation in a course on creativity and creative problem solving is not based on absorption of subject matter. This course aims to improve attitudes and thinking abilities; therefore, evaluation is based on the degree to which students demonstrate such gains. In view of the course objectives, the evaluation plan involves the following activities:

Assessment	%
Personal Learning Portfolio The portfolio is providing sufficient evidences of your personal creativity and understandings of creative. It can be in form of any media, such as blog. It is suggested to have the following items A summary of your items, why they being presented, what special meaning to you? (500 words) 4 selected reflective journals that will be a compilation of	40

specific assignments to be addressed in weekly lectures and tutorials. A creative work in any media design that you've always wanted to do but until now have lacked courage, time, or motivation. This project does not entail learning something new, Rather it is based on some talent or interest area that you already have and but desire to do something new with it. A description of any creative Ps (person, product, process, performance and place... maybe there are other Ps, you name it). Other. This option is for those students who have their own personal agenda for this course and do not feel the other options are relevant. Plan to discuss your idea with me for final approval. Due in Week 13	
Group Project: Group size: 4 to 6 people Each group will be responsible for solving a problem given by your tutor. Your group is expected to propose a solution and present to other students providing appropriate content and initiating thoughtful questions and insights concerning the nature of creativity. Report due in Week 13 and present in Week 14	35
Online Quizzes There are about 3 to 4 online quizzes for testing your understandings on basic concepts and techniques of creative thinking.	15
Class Participation Students will participate in teaching activities that model various strategies to enhance creative and critical thinking such as brainstorming, attribute listing, creative problem solving, synectics, and designing inventions. Duration: Week 2 onwards	10

No Examination

Teaching Pattern

Lectures Two hours per week   Tutorial   One hour per week

Tentative Course Schedule

Week	Lecture (2 hrs)	Lab (1 hrs)
Week One	4 Sep Course introduction What is creativity? Own Definition	7 Sep Self-introduction by students/ Decorate name tag Group definition on Creativity Ex: Nine dots/ Buddha
Week Two	11 Sep How do our Brains work? Brain Structure Left vs Right brain/ self-test Ways to train Left/ Right brain, e.g sudoku Technique: Mind Map What is Mind Map & its purposes How to draw a mind Map/ Ex	14 Sep Sudoku Optical illusion: Old woman/ young woman Use your right Brain to draw Vase/ face Spatial training: make a big hole
Week Three	18 Sep Creative thinking & other types of thinking Divergent thinking. Creative thinking. Critical thinking. Lateral thinking. Vertical thinking, Six hat, Analogical	21 Sep Brainstorming/ Divergent thinking/ Random word
Week Four	25 Sep Are you creative? Tests for creativity	28 Sep Self-evaluation of creativity
Week Five	2 Oct (Monday) is public holiday No Lecture in this week	5 Oct Group Project Discussion Imagination exercise
Week Six	9 Oct Attributes for creative thinkers Sensitivity to problems. Fluency. Flexibility. Originality. Elaboration. Curiosity. Imagination. Complexity. Risk-taking. Barriers & Blocks	12 Oct Association Exercise Reformation Exercise
Week Seven	16 Oct Creative Problem Solving Process	19 Oct Game for Creative Problem Solving Process – the less point you touched the ground for warming up purposes
Week Eight	23 Oct Techniques for creative thinking (I) Reviews on Brainstorming & Mind Mapping Reversal Thinking Synectics: Analogy and Metaphor. Attribute Listing Checklists 5W2H Analysis	26 Oct Creative Problem Solving Process – Wallet in the car (I): Planning & design stages

Week Nine	30 Oct (Monday) is public holiday No Lecture in this week	2 Nov Creative Problem Solving Process – Wallet in the car (II): Action stage
Week Ten	6 Nov Techniques for creative thinking (II) Checklists	9 Nov Creative Problem Solving Process – Wallet in the car (III): Evaluation stage Techniques for creative thinking (I): 3 little pig story using SCAMPER
Week Eleven	13 Nov Techniques for creative thinking (III) 5W2H Analysis Product design	16 Nov Techniques for creative thinking (II) Product design submission Promotion of anti-suicides by using 5W2H
Week Twelve	20 Nov (Lab) Using Window Movie Maker Create group memory album	23 Nov (Lec) Creative thinking in media design
Week Thirteen	27 Nov Ethics and Legal Issues on creativity	30 Nov Self-reflection on creativity

Appendix D – User Profiles of Main Study

Subject ID	Gender	Type	Total mark		Total scores for each questionnaire subgroup					
			Portfolio	Course	DA	SA	HA	UN	RE	CR
200708007	M	HA_M	13.25	57.75	23	26	14	12	14	10
200708011	M	SA_M	16.8	63.8	25	33	14	15	15	7
200708014	F	UN_F	20.05	70.3	30	27	8	16	13	13
200708016	M	DA_M	17.55	68.8	41	13	6	16	18	16
200708020	F	CR_F	27.5	76.25	38	16	6	15	15	18
200708023	M	CR_M	19	63.5	31	20	9	13	13	14
200708026	F	DA_F	28.5	77.25	43	16	6	17	18	16
200708029	F	HA_F	14.25	54.25	28	27	15	13	13	10
200708032	F	SA_F	13.75	59.25	20	33	16	12	11	8
200708035	M	UN_M	20.75	66.5	34	16	10	16	15	12
200708039	F	SA_F	15.3	48.8	25	30	11	14	14	12
200708040	M	RE_M	31.75	80.25	40	14	6	12	19	15
200708045	M	SA_M	12.5	55	29	33	14	17	13	12
200708048	F	DA_F	27.25	73.75	41	14	6	14	17	16
200708050	M	DA_M	25.95	73.2	38	16	9	15	17	11
200708052	F	RE_F	27.95	64.2	43	13	5	13	17	15
200809001	F	SA_F	28.25	78	27	31	12	14	13	9
200809003	M	SA_M	30.7	74.2	24	27	14	11	12	14
200809006	F	DA_F	37.8	87.8	36	24	15	10	15	13
200809008	M	CR_M	28.5	75.25	32	33	15	13	14	15
200809010	M	RE_M	23.8	82.3	29	17	13	16	18	15
200809017	M	DA_M	26.55	76.05	40	19	10	13	16	10
200809018	M	SA_M	24.75	72.5	31	34	15	13	13	11
200809022	M	HA_M	26.05	82.3	31	29	13	12	12	11
200809032	F	RE_F	29.75	79.75	26	26	11	14	17	14
200809034	M	DA_M	29.3	87.55	43	22	13	12	16	12
200809036	F	HA_F	25.25	80.5	35	26	15	12	12	13
200809043	M	UN_M	28.75	74	31	21	13	16	12	12
200809047	F	UN_F	23.75	78.25	27	24	12	14	10	11
200809056	F	DA_F	29.55	78.3	31	16	14	12	12	12
200809058	F	CR_F	30.7	83.2	27	21	10	16	12	16
200809063	F	SA_F	22.8	73.55	24	36	14	10	14	11

200910002	F	RE_F	26.7	76.7	39	31	13	13	15	11
200910005	M	RE_M	31.8	79.05	33	27	14	14	16	15
200910008	F	DA_F	25.27	74.02	34	20	13	13	11	10
200910010	F	DA_F	26.4	82.65	41	24	13	13	12	12
200910012	M	SA_M	36.3	84.3	33	39	15	15	11	11
200910014	F	SA_F	27.4	76.65	32	34	14	13	14	11
200910020	M	CR_M	24.9	72.15	36	34	13	12	14	16
200910024	M	UN_M	25.4	74.15	39	39	11	17	12	11
200910033	F	SA_F	25.8	74.3	37	38	14	15	11	12
200910035	M	SA_M	30.17	80.42	33	36	13	11	13	13
200910040	M	HA_M	25.5	82	31	33	16	14	15	13
200910041	F	CR_F	25.7	68.45	39	39	12	8	13	14
200910042	F	HA_F	34.9	90.15	37	35	14	13	11	13
200910054	F	UN_F	29.07	78.32	30	30	12	15	13	11
200910057	M	DA_M	28.42	74.92	39	27	13	15	13	13
200910058	M	DA_M	32.47	89.22	33	17	14	12	15	14
201011003	F	CR_F	20.4	65.9	40	31	12	14	15	16
201011006	F	HA_F	22.1	68.85	26	29	12	11	11	11
201011009	F	UN_F	18.1	62.6	33	34	17	18	16	18
201011010	F	SA_F	23.2	69.2	24	40	15	13	14	15
201011012	M	SA_M	24.9	68.65	30	41	8	7	16	14
201011013	M	UN_M	21.6	63.1	40	17	8	20	20	10
201011021	F	RE_F	18.9	61.4	31	23	8	13	14	12
201011022	F	DA_F	17.2	64.7	45	16	7	16	19	17
201011025	F	SA_F	20	64	26	34	12	13	13	13
201011026	M	RE_M	19.3	67.05	36	19	12	14	18	15
201011034	F	DA_F	27.6	71.6	40	19	7	17	17	18
201011066	M	CR_M	20.6	69.35	28	23	12	17	12	18
201011071	M	DA_M	26.6	76.6	38	18	6	16	15	16
201011075	M	SA_M	21.7	71.45	28	34	13	11	11	13
201011080	M	HA_M	12.8	59.55	32	35	15	14	15	13
201011082	M	DA_M	22.5	73.25	39	17	10	16	17	11

Appendix E – Coding Frequency by Subject ID

Code SubjectID	KHA	KTA	KI	KCR	KProR	KCPR	KPreR	AKR	AKU	AKApp	AKAna	AKE	AKC
200708007	2	2	4	3	1					1	1		
200708011	3	3	7	1	1								
200708014	7	3	6	6	3	3							
200708016	3	1	8	2						1		1	
200708020	4	2	8	2	1	1				1			
200708023	3	3	3			1				1		1	
200708026	4		11	4	1	4	2		1	3	2	1	
200708029	3	1	4										
200708032	4	1	3	4	3								
200708035		1	6	3						1	1	1	2
200708039	3	2	2	1		2	1		1				
200708040	5	1	6	2	4	1		1	1	2	1		
200708045		6	8	1	1			2		1	1		
200708048	5	2	9	4	2			1		1			
200708050	2	3	7	4	2		1						
200708052	2	4	5	2	1	1		1		1		1	
200809001	3	3	6	2	7	1	1			1			
200809003	2	1	5	1					1			1	
200809006	4	5	8	3	2	1			1	2	1		
200809008	4	3	6	3						1			
200809010	2		9	1	1		1	1		3			
200809017	9	4	7	4	5	1		2	1	1			
200809018	4	3	4	4	2	1				3	1		
200809022	3	1	11	5	1	2				2			
200809032	7	1	7	3	4	5	3	1	1		1		
200809034	5	2	7	1	3	3	1			1			
200809036	2	2	7	4	4				1	1	1		
200809043	3	1	7	3	1	1	3	1				1	
200809047	4	2	6	1		1				1			
200809056	2	4	5	3	4	2							
200809058	4	5	6	4	4						1		
200809063	6	4	7	1	2	1							

ID													
200910002	2	2	6							2			
200910005	6	5	12	3	5	2	1	1	2		1		
200910008	5	4	13	3	2					1			
200910010	5	2	11	1	2	1			1	2			
200910012	4	2	6	3	4	5	2			2			
200910014	2	3	6		2	1						1	
200910020	4	1	8	1			1						
200910024	1	1	8	2	1	1							
200910033	1	2	4	1	5	1		1					
200910035	1	1	9	2	5				1	1			
200910040	5	2	3	2	2	3			1				
200910041	5	4	7	2	1				1				
200910043	4	2	8							1	1		
200910054	4	1	6	2	1			1	1				
200910057	3	3	7	3	2			1			1		
200910058	1		10	2	3		1			1	1		
201011003	1	1	5	1	4						1		
201011006	3	2	3		2				1				
201011009	3		5	1	1	1			1				
201011010	3	1	8	1	2				1				
201011012	4		7	2	1				1	2			
201011013	5	2	5	2	1							1	
201011021	7	2	7	2		1			1	1	1		
201011022	5	1	3	1	1	2			2				
201011025	2	1	4	2	1	1	1				3		
201011026	3		6	3	2			1	1				
201011034	4	1	5	3	1	2	1						
201011066		2	8	1									
201011071	4	1	7	3	2	1	1		2	3	1		
201011075	3	2	4	6		1				2			
201011080	3	2	6	1									
201011082	5	3	6	2	1	1			1	2	1		