Group Characteristics and Learning Styles: An Interpretive Case Study

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The University of Manchester
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Doctor of Philosophy

Group Characteristics and Learning Styles: An Interpretive Case Study

Abstract

This study aims to provide strategies for blended learning situations which combine supervised on-line courses with traditional classroom lectures in order to take into account the different learning styles of particular groups of students. Most studies, to date, on learning styles have focused on the individual level. This research proposed that commonly preferred learning styles and leanings towards certain media presentations can be identified in whole groups that share some common group characteristics.

An interpretive case study was chosen as the methodology to reach the research goal because it collectively combines the benefits of a case study and multiple data collections from students who studied on a required on-line course in the same learning context. The students, who participated in this study, were majoring in either Science, Social Science, or Management.

Various data collection techniques included a survey of 576 students who studied IT courses, personal interviews of 34 students, participatory and on-line observations, and reference to institutional documents. Qualitative analysis of the data employed a concept synthesis coupled with a template analysis to compare and contextualise all the facets of reality depicted by the data (King, 2004). This approach was necessary due to the extensive theoretical background required to generate the initial template and the need to completely comprehend the group learning phenomenon. The research discerned that students in specific major academic fields have common preferences for on-line media and activities that assist the learning process because they process and perceive information differently. A model is proposed to identify the interactions between the learner, the media and activity content, and the context of learning. The design of on-line course materials should take into account group learning styles to propose a holistic picture for effective learning. This is a valuable resource for the teachers and designers of compulsory on-line courses and for those who determine educational policy and strategy.

Keywords: Learning Styles, Higher Education, Group Characteristics, Interpretive Case Study, Blended Learning
Declaration

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The Author

Sasalak Tongkaw has worked as an assistant professor at computer department at Songkhla Rajabhat University, Thailand. She has always been very interested in all aspects of programming, especially Web programming and Web-based designing. In 2002 she completed an Master of Science (Intelligent Knowledge-Based Systems) at University Utara Malaysia with a dissertation project involving the Intelligent Agents for News Collection. The study was supported by Thai Government. From 2003, she lectured at Songkhla Rajabhat University where she supervised several work projects involving the Web programming and Web-based designing. She will continue her work in Web programming and Web-based designing for education purpose.

Publications


Abbreviations

BL  Blended Learning
CMS  Course Management System
DOC  Document File
DTP  Desktop Publishing
EMAR  Educational Management Action Research
IS  Information System
IT  Information Technology
LMS  Learning Management System
LS  Learning Styles
MBTI  Myers-Briggs Type Indicator
NLP  Natural Language Processing
OL  On-line Learning
PDF  Postscript File
PPT  PowerPoint File
RP  Rich Picture
SSM  Soft System Methodology
TL.T  Thailand Learning Technologies
VAK  Visual-Auditory-Kinaesthetic
VLE  Virtual Learning Environment
WBL  Web-Based Learning
1 Background and Motivations

1.1 Introduction

The arrival of on-line learning is part of the modern transformation of higher education but it is not the only transforming factor and must be carefully considered alongside other important aspects of change, such as globalisation and the rapid growth of higher education in many countries. Educational development and improvement has an important potential for integrating traditional classroom (face-to-face) teaching with on-line learning. This research makes suggestions about the likely evolution that these combined changes may cause in the future and the likely issues for those working in higher education.

Traditional classroom teaching and learning on-line using a computer are very different paradigms of learning. Classroom teaching allows students opportunities to interact with those of varying abilities, cultures and ages, which should enhance the learning process. The unique benefit of on-line learning is that course content can be provided on-line in many different formats so that motivated students can work more productively and independently of their teachers who function as facilitators holding high expectations for all students and respecting their opinions and viewpoints. The instructional strategies and methods used on-line can be more easily tailored to reach students in the way they learn best. Higher level thinking skills can be emphasised and students can be encouraged to become more responsible for their own learning. If on-line learning can somehow be combined with classroom teaching then students should be able to find ways to assist each other in constructing further meaning.

Many types of digital learning technologies are now provided through institutional on-line learning management systems (LMS). These systems contain a virtual learning environment (VLE) where students can gain access to digital resources and also communicate with each other and with their teachers. Many VLEs contain multiple communication and assessment tools, such as on-line discussion forums, chat rooms, quizzes, and highly interlinked on-line learning pathways that can be customized for individuals and groups. However, the wide availability for these tools says nothing about how useful they are in reality and how well the course materials are being organised by the teacher to take advantage of the VLE.
Learning through on-line media limits the interaction that normally occurs in the classroom. Moreover, on-line learning limits the teacher’s ability to, momentarily, adjust the strategies and the course plan which can happen normally during a teaching course. This means that anticipation and preparation of good on-line material and course design becomes the important key to delivering on-line course content effectively. The designers of on-line courses need to recognise the importance of tying new knowledge to prior learning, using relevant learning activities, and anticipating the individual needs of students, their learning backgrounds and diversity, and their personal learning styles (Musa & Wood, 2003).

Digital teaching material and resources are widely perceived to be more sharable and reusable than the traditional printed versions (Tamara & Melissa, 2001). The future of higher education includes a vision of on-line learning supported by a large body of open access learning resources available to universities to be used together with classroom based training (Hylén, 2005). Digital material has more potential to be re-used and adapted and has the potential to produce measurable and sustainable diffusion of e-learning within the organisation (Littlejohn, 2003). Course content can be designed to take account of the learners and, therefore, teachers should consider reorganising existing material from the learner’s perspective (Song et al., 2004; Stodel, 2006).

Total on-line learning (total on-line delivery) is a method for delivering courses totally on-line with little or no face-to-face contact although students and tutor(s) are advised to meet at least once in the process i.e. during induction or encounters on other related studies (Bach et al., 2007). Learning and teaching methods will need to be especially carefully selected and applied, with excellent guidance to students on time management and clear navigation and it is necessary to organise the course or unit of study into sessions. Songkhla Rajabhat University have never provided any courses totally on-line. Most basic courses, such as Information Technology, are provided on the LMS server in a blended learning context which is a method of teaching divided into two distinct sections: traditional classroom teaching and supervised on-line laboratory sessions. Blended learning, which attempts to combine face-to-face teaching with on-line learning, has been tried, uniquely, in Thailand. In the blended learning situation the students attend a traditional classroom lecture followed, in the same week, by a supervised on-line laboratory session as a support to the classroom activity. It offers opportunities for contact between students and between students and teachers, interspersed with on-line
learning. This gives the students an opportunity to clarify any unresolved issues face to face. Moreover, if the teacher understands the individual learning styles of the students they have met in the classroom, and the way they interact as a group, they can be informed more effectively about how to enhance the materials, and the forms of presentation, which are presented on-line (Jairak et al., 2009).

Strategic planning and design of on-line courses are the major consideration of this research. Concentration only on the individual learning styles may not be the most efficient way to design the course content because the course is studied by groups of students who, collectively, may all share a common learning style due to the fact that the group all come from the same major academic field or discipline. This research considers a new approach in which students use the on-line materials in a laboratory setting with the teacher present where the students are also working alone on-line. This approach is the main theme of this research which aims to help the teachers currently engaged in the blended learning situation and any others who are, generally, engaged in design for on-line learning situations (Pagram & Pagram, 2006). Moreover, this research should provide a new knowledge base that could be generally useful in Education and Information Systems research.

1.2 Reasons for Conducting the Research

Web-based learning courses have been increasingly developed and widely used in many academic universities in Thailand. Many of them are efficiently used by learners but some are not (Ainley et al., 2003). Many research publications have focused on learning styles but only a few have applied this to web-based learning. Moreover, much research into learning styles is focused on individual learning or in traditional classroom settings but has not been much applied to learning styles in the unique group setting where students are working on-line in the presence of the teacher and other students. This kind of group activity is unique to Thailand and throughout this thesis it is simply called “group learning”. This research focuses on learning styles that are found to be common to whole groups in group learning situations and how this leads on to the design of on-line learning materials for an IT course (Introduction to IT) which is taken by students from a wide variety academic fields such as science, social science and management.
The geographical basis of this research is Songkhla Rajabhat University in Thailand. The university has several compulsory courses such as Introduction to Information Technology (4000107) which aims to increase the knowledge skills required in Information Technology (IT) for all undergraduate students. E-learning materials have already been offered through a Learning Management System (LMS) module named Moodle. For success in these courses, the students need to attend at least two lectures and two laboratories per week. The laboratories are taken in the group learning setting defined above but the teachers have not yet been able to organise the on-line materials fully because they need more help and training.

The learning activities for this IT course could be designed to fit the basic IT course description taken from the University course guidelines as follows:

This course aims to study the importance of Information Technology (IT) and Information systems for searching and retrieving knowledge in a Digital Society and Intellectual Society that effects human beings and life. Moreover, the course teaches about how to collect data, store data and how to use database management systems. The course in detail covers computers and networking; for example, LAN, WAN, internet, intranet. Furthermore, the course provides details about multimedia such as video on demand and virtual reality. Finally, the course contains management information systems about knowledge discovery and information retrieval for developing careers which are information society (Appendix B).

The available on-line systems already contain a large amount material and activities applied to the relevant academic fields. The difficulty is that, generally, teachers do not have the experience to select relevant material from what is available. In the university there is a strategic plan, to test IT skills when students enter the first year and also when they graduate from the university, but these are not yet able to show an effective improvement in the results of the tests. This means that the IT courses are not being effective and need improvement because it is required that all undergraduates are to become efficient in computer skills. This author believes that if the IT materials available on-line were better organised it would improve the IT course and make it more effective to the students. The teachers responsible for the IT courses develop content by following the course outline. The teachers need to be totally responsible to decide what materials the course should be based on and how that knowledge that should be transferred to the students. Teachers are, therefore, responsible for organising the course material and, in the context of on-line courses, the teachers have a potential
opportunity to organise the instructions to suit their group of students because most on-line courses are programmed have a flexible structure of instructions (Hatakka, 2009).

The IT course requirements concentrate on giving, in any particular academic field, a good foundation for teaching students very important basic skills to enable them to enjoy using computers productively. They need confidence in knowing how computers work, how to use the various parts e.g. the mouse, how to navigate around a screen, and how to ensure that work is saved and kept safe within Microsoft Word. The basic IT course also includes the use of Microsoft Publisher to produce customised stationery and to complete a desktop publishing project. Moreover, the course requires an ability to make PowerPoint slides shows which are widely used in business and classrooms, and is very effective for training, talks and displays. PowerPoint presentations can also be made into photo albums, with music or narrations, on CDs or DVDs or email for friends and family.

There are seven basic skills that undergraduate students should have to be able to succeed in any computer course offered by the university IT strategies plan (K. S. Kim & Moore, 2005). These are; How to use a computer, How to use a word processing package, How to access the Internet, How to use e-mail, How to use a discussion board, Internet Access and Computer Specifications. This research divides IT skills into two types; desktop skills and web-based skills. To reach the criteria successfully, those skills should be addressed at the beginning of the course.

There is no lack of resources and activities supporting student learning skills on the IT courses. However, there is a often a mismatch of materials and activities that relate to the needs of the different academic fields of our students and this applies whether they are learning in an individual or a group learning setting and this mismatch often reduces the effectiveness of student learning. Students on the IT courses have plenty of access to a wide range of materials on-line but this is not helping them because there is almost too much available. This complex situation in Songkhla Rajabhat University needs to be understood in order to identify the root problems. Consequently, this research has aimed to identify appropriate resources that can support students in group learning situations. Following on from these issues this research also attempts to understand how different students take in information (e.g. visual, textual, etc.), why
this relates to their personal learning style, and how learning style preferences affect both individual and group learning (McPherson & Nunes, 2004).

1.2.1 Areas of Concern

There are many reasons why web-based learning has become popular in the past few years, for example: (i) increased learner accessibility, (ii) ease of updating the learning materials, (iii) increased learner effectiveness, (iv) increased resources and references, and (iv) the changing nature of knowledge (Jolliffe et al., 2001). Many people, especially in the new generation of computer users, are finding it easier to access the rich knowledge content and interactivity of the Internet. Some use the web only for socialising while others additionally include the potential for studying. Amongst these learners, understanding of the following areas would improve the effectiveness of their studies and these are, therefore, considered in this research.

1.2.1.1 Learning Styles

All students learn in different ways and each individual has his or her own preferred learning styles (D. A. Kolb, 1984). Although students are all individually different in the way they prefer to learn, Kolb’s research argued that it is possible to categorise students into ‘types’. Markova (1996) also showed different types of learning styles. Familiarity with their personal learning style can assist learners to understand the way in which they learn most effectively and this awareness will certainly enable the tutor to design effective learning experiences so that a variety of learning styles can be accommodated.

Multiple intelligence (Gardner, 1983) and natural intelligence (Markova, 1996) are learning style models that offer relatively simple and accessible methods of understanding and explaining people’s preferred ways of learning and developing. Generally, it is true that people combine a mixture of styles and preferences in learning situations. Both multiple intelligence models and the VAK model are aids to understanding the personality, preferences and strengths which all combine to make up each individual person. The natural intelligence described in Markova’s work may be useful in understanding learning in a particular situation (Markova, 1996).

Understanding individual learning styles may also help to understand how they apply, more widely, to whole groups of learners who may share certain learning characteristics in common. However, the researcher is aware that using any methodology or tools, multiple intelligence
concepts, VAK or other learning style ideas should be approached with care, especially when applied in contexts different from their original research basis, and when they are interpreted according to the needs of the situation.

More than ever before, understanding the mind and identifying the learning process (D. A. Kolb, 1984) plays a paramount role in the ever-changing communities of the twenty-first century. These two emerging factors need to be robust and intelligent enough to meet the future challenges of the Information Age. As learners increasingly work and solve problems together, the reconstruction of an environment appropriate to their learning lies at the heart of transforming the collective learning process. The success of this enculturation into a new age is most important. However, other factors which are significant for an understanding of learning include an analysis of the devices used, the learning processes themselves, the necessary abilities learners must bring to the classroom, and the emotional and intellectual requirement learners need to develop specific goals in learning. The major criticism of Kolb’s Learning Style Inventory, as a measurement of learning styles, is its lack of objectivity, reliability and validity. Other criticisms are that it has only been used within a fairly limited range of cultures (J. A. Anderson, 1988). For its broader use, wider and further studies are needed.

Previous research has focused on identifying the several learning styles that students have used to approach their learning goals (Felder & Silverman, 1988). This indicates that learning style techniques play an important role for students interacting with on-line learning. This leads the author to believe that web-based content design must be related to the learning styles and the learning processes of the learner.

1.2.1.2 Interest in Media

A computer screen can present several forms of media such as text, graphics, pictures, movies etc. Learners with different skills and learning styles will find some natural attraction to one or more of the media presented on the screen. When media is referred to in this thesis it means the visual and textual media in on-line web-based systems. When instructors do not make use of the full range of media available there can be mismatches between students and the selected media and this limits effective learning. It still difficult to find any research studies in this area. Effective on-line courses require careful planning by experienced educators who can strategically choose a range of media types for instruction and delivery. The ingenuity and
imagination of teachers will be key factors in the selection of appropriate media and the way in which it is used (Minocha & Sharp, 2004).

1.2.1.3 On-line Course Design

Those who are responsible for preparing on-line courses need to understand that the media and activity choices for the course can be chosen to suit the learning style needs of whole groups of learners who share certain common learning styles.

An important feature of group learning situations is that the learners communicate with each other during the laboratory session while the instructor provides guidance, learning activities, and resources as appropriate. As Hillman et al. (1994) states, the learning interface is important to the learner’s experience. While the use of a variety of media and formats may often make educational sense, it is for financial or practical reasons that designers do not always have the full range of media available to them. Each medium has its own specific characteristic which impacts on the different interactions that are possible in the design of the instruction. The designer needs to choose from the media available on each on-line system those that will best meet the instructional goals of the program under examination.

Using a web-based course often allows many different media to be accessed through one interface. A significant amount of technology-enhanced learning is now being transferred to digital format and delivered via the web. However it is not just a case of using the technical opportunities because learning performance is also affected by how these are matched to human perceptions. In web-based learning courses, both students and instructors must be more open and skilled in new methods to make e-learning a more social activity. Further research is needed, which investigates the relationship between student characteristics, learning experiences, satisfaction in web-based courses (K. S. Kim & Moore, 2005; Simon, 2000) and the use of a learning style model which relates with the on-line environment. The in-depth investigation of learning style characteristics could, pedagogically, improve in the performance of personalized learning.

Since pedagogy is basically concerned with the methods of teaching and learning, the effectiveness in the selection of the media or educational activity can influence the performance of the learning objective. Previous research such as Felder and Silverman (1988)
tried to analyze the existing learning style models, but an in-depth analysis of learners requires yet more studies (Graf et al., 2007).

1.2.2 Problems in the Research Area

New technologies enable changes in teaching and learning methods. Under the right circumstances, teaching through technology has several advantages over traditional classroom teaching as learners are able to access high-quality information at any time and in any place.

The basic Information Technology course at Songkhla Rajabhat University is now taught in the unique context of blended learning which is a mix of e-learning options and classroom learning activities. Blended learning strategies at the institutional level include offering courses which are fully on-line or mixed. Web-dependent studies can be presented using media and activities which are suited to the different academic disciplines of the students. The course is provided for all undergraduate students in the first or second semester and is divided into both classroom teaching and on-line learning laboratories each week.

Understanding the rich social interaction required in blended learning should aid the teacher, instructor or course designer to organise and deliver existing resources more efficiently. However, most researchers have failed to address the question of how it is possible to achieve a tailoring of instructional approaches on anything other than an individual level (Robotham, 1999). In the compulsory IT course at Songkhla Rajabhat University, teachers and instructors currently have no guidance for organising on-line resources and therefore this has become the key focus for this research study.

1.3 Research Questions

The discussion on why this research is necessary should be clear, logical, and sufficiently focused in order to delimit the research area (Marshall & Rossman, 2006). The current status of on-line learning is the delivery of course material using only one main learning style and ignoring alternatives, to the detriment of students (Honey, 2001; Karuppan, 2001; Stephenson, 2001). Alexander and Boud and others make a strong recommendation for further studies to be carried out to investigate learning styles more thoroughly in order to help people learn more efficiently (Alexander & Boud, 2001; Gary & Palmer, 2001).
The purpose of this research is to provide strategies for the design of on-line courses within the blended learning situation taking into account the different learning styles of particular groups of students. The researcher has proposed that different people learn in different ways, and in this current research work and is seeking to employ the Markova (1996) Learning Style Theories (VAK learning styles model) applied to learning on the on-line course within this context.

The research will identify and explain the learning styles of whole groups of students and will examine the learning process the media and activity preferences in a single learning environment (Gary & Palmer, 2001; Karuppan, 2001). The main theme of the research can be summarised into questions such as: How to understand the group of students who learn in this particular environment? How to arrange the delivery media and activities for the course according to the learner’s preferences? This is further sub-divided into three questions which to delimit the research area, as follows:

1. **What are the different learning styles in particular groups of students that enable them to learn effectively on a required LMS course?**

2. **What are the appropriate media and materials that match group learning styles and why do learners prefer those materials?**

3. **What are the appropriate activities that are suitable for a particular group of students and why do the students prefer those activities?**

This research highlights the interaction between learning styles and the organisation of the media and activities of the Learning Management System (LMS). It [aims to] fill[s] gaps in our knowledge as academic educators and information system professionals and as a consequence will help us to facilitate “student learning for an unknown future” (Barnett, 2004; Bowden & Marton, 1998).

To answer the research questions, the researcher employed various methods of data collection, including a survey of 576 students who studied on the IT courses, personal interviews of 34 students, participant observations and institute documents. The research contributions are based on the analysis of all this systematically gathered data and aims to provide strategies for the design of on-line course materials that could be the most beneficial for any particular course of on-line study.
1.4 Overview of Research Design

The central research question determines the aims, research design and methods of inquiry into the group learning style characteristics of undergraduate students leading to better course design in blended learning. A case study approach was considered to be the most appropriate method for comparing three major academic disciplines (Science, Social Science and Management). The study commences with a literature review on the fundamentals of learning styles and web-based technologies. A qualitative research approach has been used to identify, explore, and resolve the central question, and the findings have been constructed in a reflective, critical, sceptical and imaginative manner.

Soft System Methodology was employed in this research to create a bounding picture of the research case as summarised in figure 3-3. It is normally done in situations that are under the process of change to do systems thinking but in this particular research, where there was no process of change, it was, nevertheless, used to draw a rich picture of the case and to identify the problem statement. This is described more fully in chapter three.

The interpretive case study used in this research illustrates how theory derived from the literature is applied in this specific situation. Interpretation of the data employed a qualitative template analysis and a concept synthesis approach to constantly compare and contextualise all the facets of reality depicted by the data (King, 2004). An extensive theoretical background was necessary to generate the initial template and there was a need to completely understand the group learning phenomenon. The data was coded and the transcriptions were organised according to categories leading to a finally agreed template using NVivo software. The researcher intended to understand how learners in each particular group of the three academic disciplines, learn in the same subject on a LMS. An interpretive case study could explain the connections across the disciplines. An emerging model of the relationship between the learner, the content and the context is the main research contribution.

1.5 Contribution to Knowledge

This research mainly focuses on the investigation of educational practice with the aim of developing new knowledge about blended learning. It seeks to improve an understanding of learning styles in any particular academic discipline. Moreover, it also develops a theoretical
framework for further explorations of group learning using on-line systems. This framework is necessary for designing on-line courses for training and any other purposes that are suitable for a group of people who have a similar background. There is also the potential for this research to further the understanding of the learning process, more generally, in the face-to-face situation as well as in on-line learning.

This study should support the requirements of course designers or teachers at department or faculty level who are responsible for enhancing the teaching and learning of existing course content in higher education. This study also aims to develop a model, which promotes the adoption of specific strategies over others. The recognition and adoption of a particular model and subsequent strategies by an institution would certainly be of significance to the staff and students at that university. Finally, this study extends the potential of using media to deliver on-line learning, by giving new meaning to knowledge acquisition and the ways in which knowledge is generated and transmitted in the information age.

1.6 Chapter Summary

This thesis is structured to provide a critical review of relevant information regarding learning styles and web-based instructional design. The research methodology, theoretical framework and research hypotheses are discussed and data gathered is analysed to support these hypotheses. The research findings, together with the research model being generated, are then used to derive implications that are important for the understanding of learning styles that may be common to particular groups of students and suitable media, activities and material that could be tailored for on-line learning. The thesis document is structured and summarised as follows:

Chapter 2 provides a background based on a literature review of learning with on-line systems. This research analyses the theories of learning styles, which may be applied to whole groups of educational disciplines. The majority of available literature focuses on the implications of using learning technology and attempts to understand the student learning context, drawing upon theories of learning and technologies.
Chapter 3 presents the research methodology and methods, together with the justification for choosing an interpretive case study method as the research approach. The chapter explains the research context deeply followed by a description of the research design.

Chapter 4 explains the process of the Template Analysis proposed by King (2004) and describes, in detail, the interpretive case study results. The purpose of this chapter is to describe the principles and the terminologies of qualitative data analysis as well as emphasizing the use of the template analysis theory and is followed by the details of the data analysis techniques, the applied procedures, and the qualitative data analysis software used. The research evaluation criteria used in the research are explained and justified.

Chapter 5 merges the results into one coherent whole, in an attempt to answer the major research questions and provide a systematic structure for web-based learning possibilities as a framework for learning in academic groups. This chapter also highlights the key findings and a model for group learning.

Chapter 6 summarises the theoretical, methodological and practical contributions and discusses the limitations of the study and suggestions for further research.
2 Critical Literature Review

2.1 Introduction

This literature review proceeds from problem statements to multi-disciplinary theories. The majority of available literature has focused on learning technology and trying to understand the context in which students learn, drawing upon theories of learning and the theories of information system technologies. This chapter also describes some of the widely accepted approaches and principles used in the learning process. This chapter also discusses the theoretical framework and the gap between the theories of information technologies and the practice of education by discussing the existing theories and methods.

![System Map of Literature Review](image)

Figure 2-1 A system map of the scope of this literature review (Bach et al., 2007)

The context of this study mainly focuses on the need for the strategic planning of media and activities when doing blended learning using on-line systems. Blended learning combines some face-to-face classroom teaching and also web based laboratories where a teacher demonstrates
from the front. Both the classroom and the laboratories only contain students from one academic discipline (e.g. social science). The major requirement for teachers in this context is to strategically organise the course contents for that particular group of students. Purposefully organised instructional design for a particular group of students needs to take into account four aspects which include (i) learning styles, (ii) the learning process, (iii) web-based learning, and (iv) the availability of suitable media and activities for web-based learning. Figure 2-1 shows the scope of the literature review within this chapter and the focus of this research which could be classified into the three main sections shown above which are the learners, the content and the context of on-line learning (Bach et al., 2007). In the appendix (Appendix A), the author has summarised some important research studies looking at learning styles, the learning process, media and activities, and collaborative learning and most of them are discussed in the following sections.

2.2 Learning Styles

For many years, researchers have been trying to understand individual learning styles by developing many theories (Coffield et al., 2004). However, most learning style theories have focused only on identifying the differences between individual learners and only a few researchers were interested in whole groups of learners. These following sections review the development of theories on learning styles and how they can be integrated with other theories to bring about successful learning.

Learning style is the method of learning used by a particular individual that is presumed to allow that individual to learn best (Reid, 2005; Riding & Rayner, 2000; Sims & Sims, 2006). There are a wide range of learning style theories. One report found seventy-one different learning style theories. Most of them used instruments to measure only individual learning styles (Coffield et al., 2004). Most of the traditional learning style models are out of date when considering new information technologies which use multimedia, hi-speed internet connections and large amounts of information (Kardan & Noorani, 2009).

Learning style theory research depends on a wide variety of instruments which have been created to access individual learning styles. James and Gardner (1995) define learning style as the “complex manner in which, and conditions under which, learners most efficiently and most effectively perceive, process, store, and recall what they are attempting to learn” (p.20).
There are various ways of classifying differences in learning style theories because many theories and models have been proposed in the last few decades. The models of learning style theories used in this literature review were classified by Brown (1998), following the theory of James and Gardner (1995), into three groups: Perceptual learning styles, Cognitive learning styles and Affective learning styles.

2.2.1 Three Learning Style Theories

2.2.1.1 Perceptual Learning Styles

Perceptual learning style theories concentrate on the physical and sensory elements by which learners receive the information. Perceptual learning style theories usually classify the learner into one major aspect of learning such as visual, auditory or tactile and kinaesthetic (VAK). Learning style research, generally, has shown that most people prefer learning by experiencing and doing. In recent years, many researchers have tried to expand the views of the perceptual theorists by expanding their research to include cultural and gender differences. However, one research argued that neither ethnicity nor gender influences student performance (Boatman et al., 2008).

The Visual, Auditory and Kinaesthetic (VAK) learning styles are based on the concepts of Multiple Intelligence. They offer reasonably simple and accessible methods to understand and explain people’s preferred ways to learn. Markova (1991) stated that each person usually possesses visual, auditory and kinaesthetic aspects of learning but does not equally use all three. For example, a visual learner will have a strong preference for using of visual means more than auditory and kinaesthetic means. The researcher used this model to identify learning styles on an individual basis. Some “inventory questions” were formed out of her theory that, generally, people conformed to these specific learning modes and the questions then tested each individual to find out their main learning preference. It is important to note that these concepts are just an aid and not a dogma to be followed and applied rigidly.

It has been argued that most of the popular learning style theories have not been fully validated through independent research because they were developed in a specific context and their validity is strong only within that context. However, the VAK learning style theory is the only acclaimed tool to determine individual perceptual learning that can be used in a general population, even including disabled people.
The VAK multi-sensory approach to learning and teaching was originally developed within the context of the teaching of dyslexic children and other learners for whom conventional teaching methods were not effective. The early VAK specialists recognised that people learn in different ways. For example, a child who cannot easily learn words and letters by reading (visually) might, for instance, learn more easily by tracing letter shapes with their fingers (kinaesthetic). The VAK theory is also a favourite of the accelerated learning community, and continues to be dominantly used, although not nearly as strongly as it should be, in the teaching and education of young people. The VAK model provides a perspective for understanding and explaining a person’s preferred or dominant means of acquiring information. It is interesting to note that Gardner’s definition mostly only talks about processing information.

According to the VAK model, most people possess a dominant or preferred learning style. However, some people have an even balance of the three styles and no one of them dominates.

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Description</th>
<th>Common pursuits and phrases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visual</td>
<td>Seeing and reading</td>
<td>Let's look at it differently.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>See how this works for you.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I can't quite picture it.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Let's draw a diagram or map.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I'd like to get a different perspective.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I never forget a face.</td>
</tr>
<tr>
<td>Auditory</td>
<td>Listening and speaking</td>
<td>That sounds about right.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>That rings a bell.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>It's coming through loud and clear.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tune in to what I'm saying.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Clear as a bell</td>
</tr>
<tr>
<td></td>
<td></td>
<td>That's music to my ears.</td>
</tr>
<tr>
<td>Kinaesthetic</td>
<td>Touching and doing</td>
<td>That feels right to me.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I can't get a grip on this.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stay in touch.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Get in touch with</td>
</tr>
<tr>
<td></td>
<td></td>
<td>That doesn't sit right with me.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I have good feelings about this.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>My gut is telling me.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I follow your drift.</td>
</tr>
</tbody>
</table>

Table 2-1 Learning style descriptions (Kuhns, 1994)

Visual learners use images, pictures, colours and other visual media to learn. Together with text-based information, visual learners prefer graphics to support learning. To reach a visual learner an on-line course should incorporate a number of images into their visualizations. Not only do graphics and pictures play an important role in optimal learning in an on-line course,
but themes and colourful backgrounds are also important for visual learners. Visual learners also prefer to look around the on-line course structures and scan through the course contents. Moving images have a combined benefit for both visual and kinaesthetic learners. When visual learners interact with moving images such as drag and drops they start to cross over into the category of kinaesthetic learners. In that situation visual learners and kinaesthetic learners are related.

Auditory learners use sounds, rhymes, and music in their learning. They focus on using aural content in their association and perception. Other than inserting sound files or video clips into a web-based course, background sounds can also be effective for auditory learners. Chat rooms and bulletin boards help auditory learners to communicate with all other types of learners.

The kinaesthetic learners use their body and the sense of touch to learn. When kinaesthetic learners face a new topic, they prefer to “jump in” and play with physical objects as soon as possible. The thought of sitting in a lecture listening to someone else talk is repulsive for kinaesthetic learners. Kinaesthetic learners like to click the mouse and move things around. Flash Technology with lots of drag and drop activities or interactive tasks that provide time control, such as games, work well for kinaesthetic learners. This theory applies directly to the use of the multimedia that are used in on-line course contents.

Table 2-2 shows a summary of previous research related to VAK learning styles. All participants took the learning style inventory questionnaire, which contained about 20 questions used for classifying learners into three categories: visual learner, auditory learner and tactile/kinaesthetic learner.

<table>
<thead>
<tr>
<th>Authors/year</th>
<th>Participants</th>
<th>Visual</th>
<th>Auditory</th>
<th>Tactile/Kinaesthetic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Renou (2001)</td>
<td>65 students University French course</td>
<td>61.53%</td>
<td>29.23%</td>
<td>9.23%</td>
</tr>
<tr>
<td>Santally (2003)</td>
<td>102 students 1st year University of Mauritius</td>
<td>48%</td>
<td>36.3%</td>
<td>15.7%</td>
</tr>
<tr>
<td>Beck (2007)</td>
<td>97 students, a science method course Midwest university</td>
<td>47%</td>
<td>10%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Table 2-2 Relative Percentage of Learning styles from some different research papers
As shown above, in these cases visual learners contribute the highest percentage of all three types of learners. In two of the three studies, the lowest percentage, among these three styles are the tactile/kinaesthetic learners. However, Beck (2007) obtained a different result, with auditory learners being the smallest group. This may be because the students were in a different context of learning and, therefore, it could be implied that different students in different contexts and different situations may manifest different priorities of learning styles.

The interaction and delivery methods used in on-line classes are dramatically different from traditional classes. Therefore, understanding how students learn is an essential part of on-line course design in terms of media and activity choices. This knowledge can help learners improve their study habits and become successful in their specific educational setting, regardless of which type of learners they are.

Markova (1991) proposed a theory that learners possess VAK learning styles in different orders of dominance. Her theory of learning styles is based generally on the concept that there are three perceptual pathways to learning: visual (sight), auditory (sound), and kinaesthetic (body, sensation, motion); and, additionally, three states of consciousness: conscious, subconscious and unconscious. To my knowledge only Markova has reclassified the VAK styles into six learning styles.

Markova’s theory can be explained in terms of sensory systems and Natural Language Processing (NLP). Dawna Markova explores the details of how people use sensory modalities. Working first with children with learning disabilities, and later with thousands of workshop participants, she discovered that people learn and interact in radically different ways depending on how they process visual, auditory, and kinaesthetic information. In addition Jan (2000) noted that Markova has developed a number of distinctions that make her model more useful using NLP to recognise patterns. Table 2-3 identifies a person as falling into one of Markova’s six learning styles.

<table>
<thead>
<tr>
<th>Learning Styles</th>
<th>Descriptions</th>
</tr>
</thead>
</table>
| AVK: great communicator | • Speaks logically; likes to discuss ideas  
• Connects best by talking  
• Organizes by talking about what needs to get done  
• Learns easily via discussion, lecture  
• May interrupt others, monopolize conversations  
• Likes to help others understand |
• Can attend details and “big picture” simultaneously
• May have sketchy sense of own body, move awkwardly, find physical activities frustrating
• Shy about touch; private about feelings

AKV: natural leader
• Speaks with feeling and rhythm; likes to tell others what to do
• Connects best by talking
• Organises by talking about what needs to get done
• May interrupt others, have difficulty listening
• Physically energetic; good coach
• Sees the whole of things; may be inventor or systems thinker
• May have problems with reading, writing, spelling
• “Eye shy;” cannot maintain eye contact

KAV: competent doer
• Acts logically; likes working with hands
• Connects best by doing, touching
• Organises in piles
• Learns easily by doing or discussion
• Can articulate emotions and body sensations
• Good at story telling, teaching movement and activities
• Sees the whole of things
• May have problems with reading, writing
• “Eye shy;” cannot maintain eye contact

KVA: perpetual student
• Acts logically; likes to do things
• Connects bet by doing, touching
• Organises in piles
• Learns easily by doing and watching
• Many diverse interests (like drawing and scuba diving)
• Can attend details and “big picture” simultaneously; sees pictures in 3-D, from many perspectives
• Difficulty expressing feelings in words
• Speech may have long pauses, go in circles; rarely speaks in groups; asks lots of questions

VAK: show and tell
• Writes logically; shows and illustrates ideas
• Connects best by eye contact
• Organises in list
• Learns easily by reading, then discussing or teaching
• Loves visual details and possibilities reads everything
• Persuasive speaker; likes to teach, explain, tell stories
• Talks out loud to sort ideas and make decisions
• May have sketchy sense of own body, move awkwardly, find physical activities frustrating

VKA: great collaborator
• Write logically; may like to draw and design
• Connects best by eye contact
• Visually meticulous; organises in lists
• Learns easily by reading or watching, then doing
• Learns sports easily; likes competitive sports
• May get others’ feelings confused with own
• Talkative one-on-one; uncomfortable speaking in groups;
Table 2-3 Six learning styles from Markova (1991)

One researcher used Markova’s theory of “VAK” learning styles to identify the way medical students learn (Lujan & DiCarlo, 2006). The research suggested that knowing the students’ preferred learning styles could facilitate the introduction of more appropriate instructional methods. The research concluded that medical students, generally, possess a multiple balance of learning styles and most students would be able to learn more effectively if the teacher provided a blend of visual, auditory, tactile and kinaesthetic activities. Moreover, some students preferred one of the modalities over the other three so strongly that they struggled to understand the subject matter unless special care was taken to present it in their preferred mode. However, the research was based on only one particular group of learners (medical students) and it does not provide any further answers as to how to introduce appropriate instructional design in other groups.

Songkhla Rajabhat University, like most educational institutions, divides groups of students into specific academic disciplines. This brings a natural opportunity for courses taken by different groups of student, who learn on-line using a Learning Management System (LMS) course, to be tailored to their own order of learning styles. Understanding that student learning styles may vary according to particular academic disciplines might help for adapting course contents not only for face-to-face learning but also on-line learning (Buerck et al., 2002). Although, learning styles play a vital role for efficient learning on on-line courses, there are other, equally important, aspects, such as the learning process described later, to be concerned about.

In conclusion, the “VAK” system normally focuses on only one aspect of learning style namely sensory preferences (visual, auditory or kinaesthetic) to absorb and process information. However, it is precisely this aspect of learning that we want to focus on in this research study. Using a “VAK” questionnaire the instructors at Songkhla Rajabhat University can identify students’ specific learning preferences and be able to select discipline appropriate media to be included in on-line courses.
2.2.1.2 Cognitive Learning Styles

The cognitive learning style theories are based on the ways in which learners process information, which includes receiving storing, retrieving, transforming and transmitting information. Cognitive learning styles also involve research into brain physiology and function quoted by Brown (1998) based on the original work of Merriam & Caffarella (Merriam & Caffarella, 1991, p. 159). The next section reviews the theories and models related to Cognitive learning styles.

2.2.1.2.1 Learning with different hemispheres

In the last two decades, research has revealed that the two hemispheres of the brain perform different functions. Each hemisphere has its own critical function. The right hemisphere is the initial receiver of all incoming information, while the left side, the dominant hemisphere, is responsible for language and speech (J. J. Myers & Sperry, 1985). The dominant hemisphere performs a linear, rational and sequential type of processing, while the right brain uses a global process in which the various data are perceived, absorbed, and processed.

Although each hemisphere is dominant in each particular activity, they are both involved in almost all thinking. Both sides of the brain can reason, albeit with different strategies, and one side may be dominant. The difference between the hemispheres has a major implication for how we learn.

Some experiments have shown that the two different hemispheres of the brain are responsible for different aspects of thinking. Table 2-4 illustrates the differences between left-brain and right-brain thinking.
Predominantly left-brained people prefer a slow step-by-step build up of information; they are sometimes called ‘linear’ learners.

Predominantly right-brained people need to see the big picture, to have an overview; they are the ‘global’ type of learner.

Successive Hemispheric Style

Sequential

Processes information linearly

Responds to logic/Logical

Rational

Objective

Analytical

Plans ahead

Recalls people’s names

Speaks with few gestures

Punctual

Looks at parts

Prefers formal study design

Prefers bright light while studying

Verbal

Responds to word meaning

Sequential

Processes information linearly

Responds to logic/Logical

Rational

Objective

Analytical

Plans ahead

Recalls people’s names

Speaks with few gestures

Punctual

Looks at parts

Prefers formal study design

Prefers bright light while studying

Visual

Responds to tone of voice

Random

Processes information in varies order

Responds to emotion/Intuitive

Holistic

Subjective

Synthesising

Impulsive

Recalls people’s faces

Gestures when speaking

Less punctual

Looks at wholes

Prefers sound/music background while studying

Prefers frequent mobility while studying

Table 2-4 The differences between left-brain and right-brain thinking adapted from McCarthy (1981, 1987)

Different learning styles require different learning methods. Some people like to read books and listen to lectures, using the cerebral-left brain. Others rely on doing exercises, creating summaries, and reviewing the material, using the limbic-left brain. Cerebral-right-brain thinkers prefer visual aids, metaphors, and experiments, while the limbic-right-brain thinkers like group projects, discussions and experience sharing (Snee, 1993).

One research paper (Karagiannidis & Sampson, 2004) proposed three ways that right-brain and left-brain thinking makes its impact on learning in terms of the curriculum, instruction and assessment. *Curriculum*—in order to increase “whole-brain” thinking, instructors need to provide balanced activities to include art, creative work and skills that require imagination and synthesis. *Instruction*—to encourage a more whole-brain educational experience, instructors
should use instructional methods that connect with both sides of the brain. Right-brain learning activities in the classroom could be improved by including various patterns, images, analogies, role-plays, visual work, and some mobility of the hands during reading, calculation, and analytical activities. Assessment— for a more accurate whole-brain evaluation of student learning, instructors must put new forms of assessment that make use of right-brain talents and skills.

2.2.1.2.2  **Kolb's learning styles**

Kolb’s learning styles, first published in 1984, is also linked with the Myers-Briggs Type Indicator (MBTI) and the Honey and Mumford Learning Style. Kolb’s theory on learning styles embraces both perception and processing. According to Kolb, learners perceive and process information in a continuum from concrete experience, reflective observation, abstract conceptualization and active experimentation. From this continuum, Kolb divided learners into four different types based on their learning styles: converger, diverger, assimilator, and accommodator.

Convergers are individuals who can accumulate ideas and turn them into concrete situations. They use Abstract Conceptualization and Active Experimentation to learn. These people mostly structure their knowledge by hypothetical-deduction reasoning. Most engineers have these learning style characteristics and prefer performing tasks to dealing with people.

Divergers are individuals who have active imaginations and can view a concrete situation from a variety of perspectives. They use Reflective Observation and Concrete Experience. These people often generate ideas by thinking about the big picture. They can also be full of emotions. This style includes those who are interested in culture and arts, such as counsellors, organisation development consultants and personal managers.

Assimilators are individuals who are best at understanding huge amounts of information and summarising into a concise concept or logical form. The assimilator’s greatest strength is the ability to create theoretical models. They are less focused on the social aspects of learning and are more interested in Abstract Conceptualization and Reflective Observation. Similar to the convergers, assimilators like to deal with abstract concepts more than people. However, they
are less concerned about the practical use of theories. People with these characteristics include those involved in the basic sciences and mathematics rather than the applied sciences.

Accommodators are individuals who use Concrete Experiences and Active Experimentation, or any attempt to make a situation concrete. They are better at adapting themselves and making decisions than people in other three learning styles. People in business tend towards this learning style.

2.2.1.2.3 **McCarthy's theory**

Another model that links with Kolb’s learning styles is the 4MAT model developed by McCarthy (1981, 1987) which classified learning styles into four types: concrete, abstract, reflective, and active. This model incorporated Kolb's four learning styles and other recent research on right/left brain hemispheric processing. It is important to note from McCarthy’s work that people’s learning styles are a combination of both perceiving and processing information.

McCarthy's theory says that the fact that a student may have a preferred or comfortable mode of learning does not mean she/he cannot function effectively in other modes. In actual fact students who have multiple modes of learning style can be flexible according to each learning situation and, therefore, have an advantage over their peers who are limited to only one style of thinking and learning. The four learning style modes or types that divide particular learners in McCarthy’s theory are: innovative learners, analytical learners, common sense learners, and dynamic learners.

Innovative learners are mainly interested in reasoning which is their main concern in learning. To make new information meaningful they connect new information with previous experience using their own reasoning. Cooperative learning, brainstorming and integration of contents are effectively useful for these learners. According to McCarthy people studying social studies and arts tend to be these kind of learners. Activities that they tend to find stimulating include showing an image, a phrase, or a sound and asking them to reflect on what it means to them.

Analytical learners are mainly interested in facts and concept formulation. This type of learner needs to have deep understanding of the concepts and processes. Lectures are the most efficient way to convey information to them. Analytical learners enjoy independent study,
analysing of data and listening to experts. Therefore, they do well in traditional education. They also tend to excel in traditional tests. In contrast, they dislike being in noisy environments, participating in active tasks, working in groups, role playing, and talking about their feelings.

Common sense learners are mostly interested in how things work. They want to do things by themselves and physically test what they have learned. They also enjoy competition. These learners like active problem solving, learning through discovery, touching, manipulating, constructing, and spatial tasks. Although they are comfortable with change, they have difficulty with open-ended tasks and prefer to be given deadlines. They dislike reading as a primary method of instruction and are uncomfortable with verbal complexity.

Dynamic learners prefer to learn by self-discovery and work independently. This type of learner will integrate both the application of knowledge and experience by analysis. Sometimes, they are able to apply their knowledge to new or more complex situations. They tend to enjoy open-ended tasks that involve risk-taking, simulating role playing and gaming. They dislike routine work, visual complexity, and time management. They are neither able to ask questions nor do well on tests.

From McCarthy’s work it can be inferred that students have different learning styles, and thus, need a different approach to maximise learning. The 4MAT system was developed by McCarthy in order to provide every student with tasks that match their learning styles or characteristics. McCarthy summarised these different learning characteristics in an eight part circular diagram shown in figure 2-2 and the idea is that a lesson should include a cycle of instruction which includes all the different learning styles so that each individual learner will experience some learning within their own preferred style.

The diagram also shows Kolb’s four kinds of learners in positions corresponding to McCarthy’s descriptions around the circumference.
Several papers reported using the 4MAT system to design web-based instruction courses (Alessandro et al., 2005; Gray & Palmer, 2001; Huit, 2000). Instructional courses, based on the 4MAT system, can generally be divided into four modules: orientation, presentation, practice, and extension/evaluation. One other researcher employed the 4MAT system and Kolb’s learning styles for creating design guidelines for on-line courses and designing the sequence of web-based presentations (Polhemus et al., 2004). However, further research is still needed to investigate learning styles in the on-line environment. According to Huit (2000), the 4MAT system offers an excellent model to guide the development of Web-based materials because it systematically identifies specific activities for different types of students. Moreover, it also demands that teachers engage all types of students and stimulate all of them to higher levels of thinking. Developing instructional designs which take into account different learning styles can only benefit the teaching/learning process.
2.2.1.3 Affective Learning Styles

Affective learning style theories are concerned with the learner’s personality. In these theories, personality traits are the basis for how a learner receives and interprets information. The two most prominent affective learning style theories are the Wikin’s Bipolar Construct of Field Dependence and Field Independence (Witkin et al., 1977) and the Myers-Briggs Type Indicator (MBTI) which will be further described below.

MBTI is the most famous learning style inventory tool used to identify learning styles (L. Myers & McCaulley, 1985). The model is based on Jung’s theory of four bipolar scales, producing 16 possible personality ‘types’. Affective learning style theories encompass social and cultural experiences, environmental influences, genetic influences, and interpersonal experiences. Coffield et al. (2004) confirmed that the MBTI tool is a valid measurement of learning style and an aid to pedagogy. Other studies have used MBTI to identify cognitive styles for distance education (Liu & Ginther, 1999). MBTI can also be used to assess the relative strengths of; introversion versus extraversion, sensing versus intuition, thinking versus feeling, and judging versus perception (Brown, 1998). Beyler and Schmeck (1992) used MBTI to assess individual differences in preferences of holistic and analytic strategies. However, McCrae & Paul T. Costa (Mar 1989) proposed that the MBTI is unusual among the personality assessment devices. McCrae's research showed that there was no support for the view that the MBTI truly measures dichotomous preferences or qualitatively distinct types; instead, the instrument measures for the relatively independent dimensions which provide the taxonomy for studying individual differences (McCrae & Paul T. Costa, Mar 1989).

Shih and Gamon (2001) proposed using the Wikin’s bipolar learning styles test to assess the relationship between web-based learning and the attitudes of student towards motivation, and achievement. They obtained data from students from two fields of study; zoology and biology and found that the type of students, the number of previous courses taken, their ability to access computers, the number of hours they studied per week, and their gender had no association with their web-based learning achievement. Moreover, in other fields, students with different learning styles and backgrounds learned equally well in web-based courses. They noticed that the students were motivated and stimulated in web-based learning by competition and other high expectations, such as announcing mean scores of class tests for comparison and stating clear expectations for assignments and tests.
2.2.2 Why Choose Perceptual and Cognitive Learning Styles

Several studies proposed that learning systems should be adapted based on students’ learning styles (McNutt & Brennan, 2005; Solvie & Kloek, 2007; Tóth, 2004). Perceptual learning styles define the individual differences in the way learners acquire new information while cognitive learning styles define differences in the way individual’s process information.

According to research on the relationship between perception and learning (Lee & Lodewijks, 1995) it has been noted that perception is partially the result of the environment and partially the result of the learner’s style. Therefore, perception is linked with the environment. The aim of this study is mainly to use, in the on-line laboratory context, perceptual learning style theories to highlight that learning styles in acquiring information could be applied to the environment of whole disciplinary groups just as much as they can be applied to an individual student. When teachers are aware of learner differences they will be able to provide appropriate learning materials suitable for that particular disciplinary group.

2.2.2.1 Perceptual learning style links with media

Tóth (2004) confirmed that electronic teaching material can be improved by reliance on different types of media (such as text, graphics, video etc). Teachers have to recognise that different perceptual learning styles require reliance on different media and this is why perceptual learning style is linked with the choice of media. Conversely, other research has shown that hypermedia (e.g. a video that combines all media such as text, sound and graphics all in one) has more effect on the learning process and is, therefore, linked more to the cognitive learning styles (Ford & Chen, 2001). Kozma (1991) confirmed that some students would learn a particular task regardless of the delivery device, while others would benefit from a specific medium to help construct their knowledge.

2.2.2.2 Cognitive learning style links with process and context

Although there are many learning style models, only a few of them focus on the process of the learning and the context. Vermunt (1998) found that there were four components of learning which consistently produced four dimensions using a four-factor principle component analysis solution with oblique rotation as follows: meaning-directed, reproduction-directed, application-directed, and application-undirected. Vermunt’s model emphasises not just individual
differences in learning, but considered also the whole teaching-learning environment (the context). Cano-García and Hughes (2000) found that students’ academic achievement is related to students’ thinking style. In addition, Boyle et al. (2003) proposed a study to test the generalisability of Vermunt’s model of learning. The results confirmed that different learning environments influence the precise characteristics of each learning style.

Kolb (1981) looked at learning styles amongst undergraduate students. The results suggest that undergraduate education, itself, was a major factor in shaping individual learning style, whether by the process of selection into a discipline, or by socialization in the course of learning in that discipline, or both. However, Kolb’s model only includes learning strategies, motivation for learning and preferences for organizing information, but excludes preferences for representing information and the interpersonal context of learning (Coffield et al., 2004).

Therefore, this research suggested that various aspects of the learning process are influenced by the cognitively relevant characteristics of the media. For example, some learners rely on pictures to help construct a text-based and map it onto a model of the situation, while others can formulate this model using information from memory without the need of pictures or other audio or visual aids. In general, common learning styles and media preferences may be shared by a group of students in one academic discipline or group.

2.3 Learning Process

2.3.1 Learning Styles in Learning Cycle

Almost all research to date has investigated learning styles according to the characteristics of individual and this research aims to start out in this same way. However, it is eventually intended to research how on-line learning could be matched to suit the common learning styles that appear in groups of students. On-line learning usually has strong congruence in people’s minds with autonomous and active learning but, in the special Thai context that students are using on-line materials and courses in the laboratory as a group, those teachers will have to work at making the course accessible to the whole group at one time. Even though this research aims to help teachers to modify on-line courses to suit the general learning style of the group, there are good educational reasons why, sometimes, students should also be encouraged
to develop new learning styles as well. A student’s assessment of their learning styles may be an important part of the learning process (Cano-Garcia & Hughes, 2000).

This section focuses on some of the most widely recognized approaches and principles that are used in the learning process. Kolb developed a way of looking at the learning process called the Experiential Learning Cycle, shown in figure 2-3 (D. A. Kolb, 1984; McCarthy, 1981, 1987). Learning is the acquisition of new knowledge, skills and attitudes. Learning is seen as happening in a cycle made up of four stages: Concrete Experience (CE), Reflective Observation (RO), Abstract Conceptualisation (AC), and Active Experimentation (AE).

Based on this experiential learning cycle, David Kolb developed a Learning Style Inventory that is frequently used to identify an individual’s preferred way of learning. Concrete Experience and Abstract Conceptualization are located as opposite learning styles in the model. However, Felder and Silverman (1988) argued that Kolb’s findings, which separate them, have been inconsistent and contradictory. Felder and Silverman (1988) suggested that in engineering education, the teachers should consider both types together. Moreover, they also suggested that materials presented in classrooms should be a combination of both concrete and abstract. For learning and training to be effective, each activity should take the learners through all stages of the learning process.

Honey and Mumford (1992) suggested four types of learning styles, including Activist, Reflector, Theorist and Pragmatist. There is arguably a strong similarity between the Honey and Mumford styles and the corresponding Kolb learning styles viz: Activist corresponds to Accommodating, Reflector corresponds to Diverging, Theorist corresponds to Assimilating, and Pragmatist corresponds to Converging. Both Kolb and Honey and Mumford used a learning style questionnaire to obtain these categories.
Manochehr (2006) found that the learning styles identified above are particularly important when people are doing web-based learning or e-learning. His research showed that students who are Assimilators and Convergers achieved a better results when doing web-based learning.

Nevertheless, Kolb’s model’s has been criticised by Atherton (2009) in that Concrete Experience and Reflective Observation are too abstract and pointed out that they are essentially the private and personal parts of the cycle, whereas Abstract Conceptualisation and Active Experimentation are more public and noticeable to others. Hence, behavioural theories of learning tend to concentrate, almost exclusively, on the visible Active Experimentation processes.

In 1987, Kolb investigated forty-five academic fields and found that there were common learning styles within each academic discipline. This is the only research work, known by this researcher, that has reported this point.
It has been demonstrated that it is not only preferred learning styles that are important but that teaching styles should be considered (Felder & Silverman, 1988).

Learning outcomes are the direct results of the learning process and should be assessed from different perspectives, which include effectiveness, attitude, perception, and satisfaction. Felder and Silverman (1988) also considered perception as a dimension within the preferred learning style and corresponding teaching style.

<table>
<thead>
<tr>
<th>Preferred Learning Style</th>
<th>Corresponding Teaching Style</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensory</td>
<td>Concrete</td>
</tr>
<tr>
<td>Intuitive</td>
<td>content</td>
</tr>
<tr>
<td>Visual</td>
<td>Abstract</td>
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<td>Auditory</td>
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<td>Inductive</td>
<td>Visual</td>
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<td>Deductive</td>
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<td>Active</td>
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<td>Reflective</td>
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<td>Sequential</td>
<td>Active</td>
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<tr>
<td>Global</td>
<td>Reflective</td>
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<td></td>
<td>Passive</td>
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</tbody>
</table>

Table 2-5 Dimension of Learning and Teaching Styles  (Felder, 1998)

### 2.3.2 Collaborative Learning

Collaborative learning is a method of teaching and learning in which students team together to explore a significant question or create a meaningful project (Dillenbourg, 1999). A group of students discussing a lecture or students from different disciplines working together over the Internet on a shared assignment are both examples of collaborative learning.

Cooperative learning, which forms part of this research, is a specific kind of collaborative learning i.e. in this case it could be students using the LMS work together on structured activities so that they learn to work as a team. They are individually accountable for their work even though some tasks, which require working face-to-face, may be assessed by the group through an on-line discussion board. In small groups, students can share strengths and also
develop their weaker skills. They develop their interpersonal skills. They learn to exchange ideas and deal with comments and conflicts. When cooperative groups are guided by clear objectives, students engage in numerous activities that improve their understanding of subjects explored.

In order to create an environment in which cooperative learning can take place, three things are necessary. First, students need to feel safe, but also challenged. Second, groups need to be small enough that everyone can contribute. Third, the task must be clearly defined (Vanessa Paz & Trena, 2005). Most studies of cooperative learning provided results by observing the students in their learning context. Moreover, Bosung et al. (2005) showed that collaborative had a positive effect in face-to-face learning environments. The author believes that working collaboratively in a particular discipline provides the potential of a quality outcome and improves their personal learning styles.

“The way that the learners interact with each other differs from previous generations.” (Tongkaw et al., 2009b)

In South East Asian countries, face-to-face participation is still a preferred interaction during teaching or training. It should be noted that numerous studies have attempted to explain the utilization of social software tools in distance education where undergraduate students still preferred on-line study with interaction and personal contact touch to just interacting with a computer (T. Anderson, 2006; Berg et al., 2007). Most researchers agree that we should shift away from impersonal Learning Management Systems or Virtual Learning Environments towards social software technologies (Tongkaw et al., 2009b).

Tongkaw et al. (2009b) found that students preferred participation using social network technologies much more than the forums provided by the discussion board on the Learning Management Systems. The main concept of the LMS is to provide direct knowledge and activities to the students and learners. Social software technology also adheres to this concept. Several features of the social software web and LMS are similar, for example; the notice board, photos, profiles, activities and comments. Tongkaw et al. (2009b)’s original research found that there was an opportunity for students to be provided with educational knowledge and activities by using social software technologies. Implementing some social software tools into the LMS or similar education-based websites may encourage learners. For example, all social software
tools can feed information to individual students by using RSS feeds to collect up-to-date information relating to his/her courses and interests.

Different opinions were found concerning the successful use of social software in education. The results from Anderson (2006) indicated that the functionality of the current generation of social software tools could be duplicated using existing LMS and e-mail systems. There are, however, still some obstacles and software incompatibilities between the older and newer technologies.

Successful knowledge exchange in a social network setting depends upon the interactive nature of the tasks and the ability to make and receive comments. Distance learning students can be helped by providing them with immediate, regular, concise and clear feedback and dialogue. One-way communication, through media such as lectures or broadcasting, lacks this kind of feedback.

2.4 Instructional Design and Web-Based Learning

2.4.1 Web-Based Learning and Learning Styles

Web-based learning is often referred to as on-line learning. In this study, web-based learning can be described as the delivery of and access to a co-ordinated collection of learning materials in an electronic medium. The following sections highlight many studies that focus on learning styles and web-based learning.

Hutchins (2003) said that most research in the learning area focused on improving or facilitating the student’s situation by using information technology. Several researches believe that studying on-line is different from studying in the traditional face-to-face situation (Aragon, 2002; Bordia, 1997; McLellan et al., 2004; Neuhauser, 2002; Summers, 2005). Many research papers delineate the technologies currently available to support traditional and non-traditional methods of learning in order to help learners learn best. Federico (2000) also tried to identify student attitudes and learning styles in distance education. The research showed that students with assimilating and accommodating learning styles have significantly more agreeable attitudes towards different aspects of web-based instruction than students with convergent and divergent learning styles. Valenta et al. (2001) showed that understanding student opinions, may be useful to design and provide instruction for web-based courses.
McNutt and Brennan (2005) proposed work that is in progress which relates learning styles and e-learning. The research described an experiment designed to explore the relationship between a student’s learning style and their success in an on-line module. The on-line module contained a variety of media to address the preferences of the auditory, kinaesthetic and visual learners. Each student was directed to a particular version of the module depending on his/her learning style. The students involved in this experiment are those studying for a higher diploma or Bachelor of Science in Computing. The research focused on only the particular field of students who were familiar with computer interaction skills.

Robotham (1999) said “most researchers have failed to address the question of how it is possible to achieve a tailoring of instructional approaches on anything other than an individual level”. It is, therefore, noteworthy that only one study was found that deliberately structured groups in a learning situation according to their learning style (Standing & Shevels, 1994). However, this study did not mention the outcome of their learning nor the type of learning tasks learners were confronted with, even though the research designed suitable interfaces to the on-line courses and evaluated students’ learning styles by doing a pre-test and a post-test where the result showed positive improvement. Wang et al. (2006) described that both using preferred learning styles and formative assessment strategies are significant factors affecting student achievement in the web-based learning environment.

A study by Diaz and Cartnal (1999) compared students in a distance learning situation to students learning on-line in an on-campus class. The investigation assessed how social learning styles could affect student achievement in these two different learning environments. Student’s social learning preferences were divided into six learning styles categories: independent, avoidant, collaborative, dependent, competitive, and participant. The results showed that students who enrolled in an distance on-line class have different learning styles from those who enrolled in an equivalent on-campus class. Distance on-line students generally possessed an independent learning style and on-campus students generally possessed a more dependent learning style. The on-campus students in a traditional learning environment are more likely to and participate and learn from each other when compared to distance on-line students. Recently, several tools have been developed to help facilitate distance on-line learning, such as wiki, discussion boards and the virtual classroom. Collaborative learning in distance on-line courses should be investigated more deeply.
Sabry and Baldwin (2003) argued that learning styles in web-based interaction could be classified into three categories: learner-tutor, learner-learner, and learner-information. Students still need interaction and discussion during the learning period (K. S. Kim & Moore, 2005; Valenta et al., 2001). There are some relationships between learning styles, strategies, and outcomes. Learners and instructors should be able to facilitate web-base by adding on-line discussion modules for participating on-line.

For web-based learning courses, students and instructors must modify traditional ideas and learn to interact with the course activities as a social learning activity. However, further research investigating the relationship between student characteristics, learning experience and satisfaction in web-based courses is needed (K. S. Kim & Moore, 2005; Simon, 2000). It should be noted that learning styles have influence on the effectiveness and outcomes of technology-assisted learning (Aragon, 2002; Hu et al., 2007).

Although previous research tried to analyse existing models of learning styles such as the work of Felder and Silverman (1988), deeper analysis is still required (Graf et al., 2007). Previous research focused only on identifying individual students’ learning styles (Felder & Silverman, 1988). This researcher, for the current thesis, found that there is a gap in the literature between focusing on only individual learning styles and learning styles that whole groups of students possess in common. This research aims to understand the relationship between the common learning styles in student groups and the academic disciplines that have formed those groups.

By investigating the relationships between student motivation, attitudes to learning, learning styles, and achievement, Baker (2005) suggested that there were no significant differences in achievement between groups formed from only one academic field and groups formed from a mixture of students from various academic fields. The research concluded that the use of visuals, feedback, and presentation medium can provide the achievement in learning to any group.

Shih and Gamon (2001) showed that students with different learning styles and backgrounds learned equally well in distance web-based courses. Providing only one preferable learning style did not guarantee good learning outcome because students need to use several learning styles to become successful in learning. They also suggest that higher education administrators and instructors should understand student learning. Learning styles of students are different and
changing, and this problem must be continually addressed to facilitate students who learn on web-based systems. More importantly, knowing how students learn must be given high priority. For instructors, understanding the learning process and having the skills needed to facilitate individual and group learning by tailoring courses to learning preferences is more important than just having the skills or knowledge of the subject matter.

Walters et al. (2000) found that a correlation between learning style differences and performance outcomes can be used to determine whether it is important to provide materials on the web in visual and/or auditory formats. Therefore, an in-depth investigation related to the relationship between learning styles and the media used in web-based systems is needed, and has become one of the objectives of this research.

Most learning research has been focused on the individual learner because that is the smallest learning unit. However, even if teachers knew all the individual learning preferences of their students they would still have difficulties catering to each individual student’s need. However, classrooms are naturally organized into relatively large groups of students who are studying in the same academic discipline and it can be supposed that these students may share some common learning patterns or styles. This research attempts to capitalise on this opportunity and to identify learning patterns or styles that are possessed in common by particular academic disciplines.

How students react to the varying learning situations depends on the student personality traits that affect learning styles. There are several factors which affected students’ satisfaction and their learning experience and these include their personalities and their interactions between their classmates and instructors. This interaction also impacts on student satisfaction on web-based courses (K. S. Kim & Moore, 2005). Future research suggested by this study is to investigate the relationship between student personalities, previous learning experiences, and satisfaction on web-based courses.

2.4.2 Learning Skills, Styles and Activities

When using web-based learning, the following five factors are important considerations: computer skills, learning styles, the available resources, the learner’s desired outcomes and prior learning experiences (Dupin-Bryant & DuCharme-Hansen, 2005). Lack of skills (such as
using word processing) in using computers must be identified as soon as possible so that students may be provided with various activities suitable for improving their skills prior to or during the course. There are several methods for assessing the lack of students’ skills. Introductory observations, focus groups, student interviews and survey instruments are frequently used to assess computer skills. Computer skill development for students is highly important and is linked to succeeding on the course (Dupin-Bryant & DuCharme-Hansen, 2005). If the students are required to interact with the instructors via different tools, the skills required to use these tools should be addressed at the beginning of the course. The instructor should incorporate individual assignments or supported tutorial tools for individuals or small groups of learners who lack the basic and necessary computer skills. One study suggested that on-line learning skills improves when individuals or groups frequently use on-line discussion, receive and listen to feedback, stay motivated, directly communicate with the instructor and make close connections with friends on the course (Roper, 2007).

The computer skills that students on web-based courses should have include basic computer operation, file management, web browsing, and email operation. Of all the students who take basic IT courses at Songkhla Rajabhat University, 93.24% have taken at least one previous computing course. Therefore, it is assumed they have the basic skills for IT learning.

Although Songkhla Rajabhat University have provided effective and efficient IT services for all students to enhance learning skills, understanding about how students learn has received very little ongoing and explicit attention. The mismatch between how students learn and just providing facilities lies in a lack of understanding about the importance of the student learning process itself.

Assessing student learning styles can be important in planning course activities that complement student learning requirements. Developing higher education systems ideally requires instructors’ deep understanding about how individuals and groups of students learn. Understanding learning styles can help the instructors recognize how each student learns in a variety of ways. Moreover, learning style assessment can help instructors integrate an assortment of activities that match learning styles.

There are several frameworks that have been proposed to organise the various approaches to assessing learning styles. Cook (2005) confirmed that teachers should develop Web-Based
Learning (WBL) activities by assessing how they can be adapted to accommodate learners. Instructors should try to provide resources and activities that are matched to learning style. This thesis suggests a method for organising existing on-line resources for use with particular groups of students with common learning styles. For groups of students within the same discipline, the instructors can focus on adapting activities to match their specific needs. For example, if the students prefer learning by doing, instructors can begin the course with kinaesthetic activities in order to build a foundation for a successful course. The final contribution of this research is to provide a strategic plan to match students’ learning needs with the course plan by providing relevant learning styles, and activities that will efficiently facilitate learning in the web-based environment.

2.4.3 Instructional Design

This research focuses on the instructions that are needed for a web-based course (called instructional design) as a process by using learning style theories and focusing on students in three different academic disciplines. Instructional design is the systematic development of events using learning and instructional theory to ensure the quality of instruction. It is the entire process of analysing learning needs and goals, and the development of a delivery system, such as an LMS, to meet those needs. It also includes the development of instructions in how to use the materials and activities and the subsequent trial and evaluation of all the instructions and learner activities. Learning theories and instructional strategies can provide course designers with principles and guidelines to produce effective instructions for web-based learning. The value of a specific on-line course is determined by its usefulness to the group that will use it. The course designer (class teacher) may generate instructions by looking at other specific models such examples from other on-line courses or structures that have already been used. A good instructional design example will help the course designer to give structure and meaning to when designing instructions for the tasks and activities.

2.4.3.1 Instruction Design Components

Instructional design prescribes the set of necessary events and activities for learning and provides the function of guidance towards achieving specific objectives for learners. Instruction consists of the following three steps: information presentation, eliciting responses from the learners, and providing feedback to the learners (Sarasvathi et al., 2009). A complete
instructional package contains four components that are related to these three steps. The four instructional components are:

(a) Intent – learning objectives and outcome

(b) Content – information: i.e. the inherent structures that gives the course its characteristics and meaning within the contextual sense

(c) Activities – learning procedures, exercises, and questions

(d) Assessment – progress check and student evaluation

Good instructional design involves the aligning all these four components. Missing any one of these components will lead to incomplete understanding and thus the learning objectives are needed to provide the focus for selecting instructional content, strategies, tactics and media (Sarasvathi et al., 2009).

A number of factors should be considered in the design of materials for learning. One of the factors when planning e-learning content is the following six design elements:

(a) Activity – Rich learning activities in e-learning provide an experience which leads students to achieve the desired new understanding and knowledge.

(b) Scenario – An interesting example or scenario makes the activity more meaningful.

(c) Feedback – Experience creates knowledge through reflection with the use of appropriate criticism or feedback. Provision of feedback amplifies the learning from the experience.

(d) Delivery – The aim is to maximize the engagement of the student with the activity and feedback and reflection with the proper technical infrastructure.

(e) Context – Includes the instructional objectives of the e-learning program, the role of the instructor and the longevity of the resources.

(f) Influence – Influence of the design includes how it affects the learner and to what extend the content benefits them.

These six elements pave the way to designing effective and flexible instructional strategies for the course content that suit learner’s needs and provide a better balance between content and
the learning process. The core elements stated above can reduce the gap between educational intent and the reality of the learner’s experience (Sarasvathi et al., 2009).

Moallem’s (2001) research also confirmed that there is a wide range of individual differences in the way that learners’ interact with both the learning outcomes and the instructional pathway. It is easier to provide proper conditions for learning by identifying learning styles and considering students’ prior knowledge and experiences when designing web-based systems.

Kolb’s (1984) learning style cycle and associated learning styles have been described with a view to providing instructional design guidelines which accommodate (i) each stage of the learning cycle, and (ii) individual differences in the way learners process and present information. McLoughlin (1999) confirmed that instructional designers have turned to research on learning styles to inform them in the design of adaptive learning material. He recommended that in designing courses for diverse disciplines, the research literature on learning styles should provide advantageous insights that have the potential to improve instructional design.

2.4.3.2 The Instruction Design Process

Merrill (1994) proposed a theory on the instruction design process by dividing it into three major phases: design, production and validation. The instruction design process involves an instructional developer or evaluator finding a blueprint. The different stages of learning require instructions should be associated with different learning styles. This research emphasises the strategies required before designing instructions and then the process of investigation leading to the design of the instructions leading the audience through appropriate course contents and activities.

Selection of good instructions requires the course designer to do a learning styles inventory of the target audience and then also to find out from them what presentational material would be suitable.

The learning content should be presented in a manner consistent with students’ individual learning styles. The course designer should pay attention to the various learning mechanisms that are involved when processing information. This research addresses how the instructors’ role will change when course contents and structure are changed by design according the suggestions in this research.
2.4.3.3 Reusability

Reusability is defined as the independence of the learning content so that can be used in several learning environments and for many different learners. One set of instructions written, for example, for course IT1 can be re-used as the same set of instructions for course IT2 and so on. Instructors could be motivated to write on-line instructions that can be used over a number of different courses because, even if the course contents are changed, the instructions written to run the course remain the same. This is reusability in action. In on-line learning, instructors make the pedagogical decision relating to reuse. Even if the whole course cannot be reused, a module or some learning materials within it should be reused (Mohan & Greer, 2003).

2.4.4 Learning Media

In the transition from epistemology (knowledge) to ontology (meaning) media and technology can be employed to develop learners capable of participating in complex environments. Factors that determine the selection of media need to be examined from the students’ perspective and if used properly, media can improve all the levels of learning objectives, learning activities, and learning outcomes. Instructional methods and the design of learning experiences is likely to receive increased attention in the future as media opportunities in distance learning environments continue to grow.

Currently, there is a great opportunity for accessing up-to-date information through internet access. Updating contents on the internet can be done faster and easier than in books. In addition, instructors can make choices as to which technology should be integrated into their classrooms from a large pool of resources available in many kinds of tools, for example CD-ROMs, DVD-ROMs, application software, multimedia applications, communication application and sky drives. Moreover, the instructors and learners can communicate using e-learning technologies like discussion boards and e-mail. They meet virtually during content delivery for example video conferencing for educational purposes.

There is much research which discusses the positive and negative aspects of information technologies. In traditional systems information is often inefficiently recorded and also lost. In contrast, information technology is helpful for automatically capturing information and then keeping it in a way that is easy to access and recall. There is also more potential for active
learning which requires different approaches from using it just for knowledge acquisition (Kanuka & Anderson, 1999).

Sadler-Smith (1996) argues that individual learners will focus on those elements of the learning materials that are most matched to their learning style. When they are required to undertake activities that they do not like or doesn’t suit their learning style, they will still do it, albeit reluctantly, to fulfil the learning. Learning styles are usually linked directly to media and the choice of media therefore does influence learning as the media has have certain inherently relevant characteristics that may influence cognition and the ways learners represent and process information (Kozma, 1991). Some research has proposed investigation into the relationship between learning styles and particular academic disciplines (A. Y. Kolb & Kolb, 2005; D. A. Kolb, 1981). Only Kolb (1981) was able to show, in published work, any results showing that certain trends of common learning styles could be identified across a whole group of learners in one academic discipline. Kolb had researched many thousands of students in many hundreds of institutions across 30 or more disciplines and therefore his work is felt to be significant. This research thesis will aim to gain a more detailed understanding of the possibility that common trends of learning styles can be identified within particular academic disciplines and, therefore, the possibility that certain media selections will be appropriate for the common learning styles in those disciplines.

2.5 Rational for the Research Questions

The use of the Learning Management System (LMS) as a tool for web-based learning has caused educators to re-think the way that on-line instruction is administered to students. Web-based communication creates a variety of ways to deliver instructions and provides electronic resources for student learning. A major advantage over traditional sources of knowledge is that the Internet also allows the use of multiple media pathways into the knowledge using media elements, such as sound, video, and interactive hypermedia.

To be successful in implementing educational technology, course designers and educators must balance learning needs, the learning context (classroom or autonomous situations) and affordability of the tools. Simply, selecting or emphasising one media format or technology over another is neither appropriate nor sufficient. A holistic view of media and the learners and context are required. This thesis focuses on an analysis of media choice based on the
context in which learning is delivered, to find strategies suitable for particular academic disciplines.

It is a well-known fact that learners with different learning styles prefer different media to engage with when learning on-line. Media types play a determinative role in improving access to the electronic teaching materials. Therefore this research aims to study the influences that learning styles have on perception. Briggs (2000) noted that there are very few qualitative research studies that have explored learning styles on a group, rather than an individual, basis. Even Briggs (2000)'s own research only considered individual students’ learning styles as being the key to effective learning and teaching. His work used an Action Research method into the practical applications of Inclusive Learning, including strategies for work with learning styles and had been done within the context of post-16 education in the UK.

Although the philosophical literature includes theories on the content, structure and purpose of explanations over three decades, very little of this work, at least since Kolb (1981), has been referenced in the research on the topic of learning styles as determined by different discipline groups of learners. It is clear that there may still be other issues outside those mentioned especially the concept of the learning in groups and the design of blended learning situations; a key feature of this current thesis. This problem has not been generally identified so far, but the discussion on this topic is still continuing. Moreover, new viewpoints keep appearing which will very likely address issues missed here. The significance of identifying individual learning styles is that we can deliver the course contents individually. However, as noted previously, it is important to deliver the course content using media and activities appropriate to the learning styles common to a whole academic discipline group. To use the LMS effectively, the teachers need to determine group learning styles or group characteristics. Thus the main theme of this current research is: to understand how groups of students learn in one specific environment and how media and activities may be designed according to their learning preferences. This is further expressed and sub-divided into three questions that delimit the research area, as follows:

1. What are the different learning styles in particular groups of students that enable them to learn effectively on a required LMS course?
The university learning and teaching system, as defined above, includes the formal structures of the university as well as the organisation of the curriculum. Answers to this research question could be beneficial to the teachers in the university who recommend group learning but also can build a knowledge base for other researchers to conduct the research in fields which lie between Information Systems and Education.

2. What are the appropriate media and materials that match group learning styles and why do learners prefer those materials?

3. What are the appropriate activities that are suitable for a particular group of students and why do the students prefer those activities?

Answers to these questions help to build a deeper understanding of group learning styles and the media and activities preferences of particular groups of students. These questions need to be identified because question 1 alone does not, alone, cover the main theme of the research. Identifying the media and activities preferences will help the teacher to select the right choice of media and activities to support students learning styles.

The researcher needs answers to all three research questions above in order to understand the main theme of the research. In attempting to answer all of the above research questions, the researcher provided an analysis of the areas of concern within the case study. The participants of this study were the large group of students who learn on a compulsory IT course in the university. These three research questions aim to produce a combined interpretation of this unique case study situation allow the researcher to understand the situation better.

2.6 Chapter Summary

The literature surveyed in this chapter highlights on-line course design, taking into account the perceptual and cognitive learning styles of the students. Those styles are used to identify preferred or dominant patterns by which students individually perceive and process information. There are well reported relationships exploring learning styles and web-based design and learning styles and the media used to present the materials. However, in this specific context, there is still a need for further understanding of those relationships and in particular the possibility that common learning styles can be identified for a whole group of students in one academic discipline. All the literature discussed in this section seems to suggest
that it is necessary to consider the whole process of learning for students in a specific work situation. The particular context of this thesis is the unique case of undergraduate students in Thailand doing on-line courses in a blended learning situation.
3 Research Methodology and Methods

This chapter constructs the philosophy of research underpinning the choice of methodology. The research in this thesis relies on the qualitative method and was based on an interpretive case study method. The rationale for choosing this method will be explained, followed by a description of the research design.

3.1 Methodological Issues

Methodology is the way research is carried out and this chapter describes the various conceptual approaches, kinds, and paradigms of methodology available. This overview may be helpful for new researchers in choosing the appropriate research methodologies and research instrument in Information Systems (IS). Qualitative research is a research strategy that usually emphasises verbal description rather than the quantifiable collection and analysis of data. The following section shows the rationale involved in choosing the methodology for this study followed by a discussion of the reliability, validity and generalisability of the case study.

3.1.1 Philosophy of Research

Guba and Lincoln (1994) suggested four paradigms for qualitative research, including positivism, post-positivism, critical theory and constructivism. The theory of knowledge, or epistemology, describes how we acquire our knowledge (Hirschheim, 1992). It refers to the ontology of knowledge and how it is to be obtained. In the Information Systems world, qualitative research may or may not be interpretive, depending upon the philosophical assumptions of the researchers (M. D. Myers, 1997). Myers explains that Information Systems research can be divided into three types: positivist, interpretive, and critical. Research can be classified as interpretive if it is assumed that the knowledge accumulates from social aspects or the multi perspectives from social stakeholders (Klein & Myers, 1999). The differences between positivist and interpretive research approaches can be characterised in a number of ways. This researcher believes that all knowledge is contingent on a specific context, and thus evaluative criteria have no meaning.
The interpretive epistemology relies on studies of people that associate with their own subjective and inter-subjective meaning as they interact with the world around them (Chua, 1986).

A positivist epistemology relies on the scientific method where objective reality exists beyond the human mind. Moreover, positivism has been very successful, particularly in its relationship with the natural sciences. Positivist studies generally try to measure and test a theory (M. D. Myers, 1997).

As Weber (2004) suggested, the differences between positivism and interpretivism are shown in the following table.

<table>
<thead>
<tr>
<th>Meta theoretical Assumptions</th>
<th>Positivism</th>
<th>Interpretivism</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontology</td>
<td>Person (researcher) and reality are separate.</td>
<td>Person (researcher) and reality are inseparable (life-world).</td>
</tr>
<tr>
<td>Epistemology</td>
<td>Objective reality exists beyond the human mind.</td>
<td>Knowledge of the world is intentionally constituted through a person's lived experience.</td>
</tr>
<tr>
<td>Research Object</td>
<td>Research object has inherent qualities that exist independently of the researcher.</td>
<td>Research object is interpreted in light of meaning structure of person's (researcher's) lived experience.</td>
</tr>
<tr>
<td>Method</td>
<td>Statistics, content analysis.</td>
<td>Hermeneutics, phenomenology, etc.</td>
</tr>
<tr>
<td>Theory of Truth</td>
<td>Correspondence theory of truth: one-to-one mapping between research statements and reality.</td>
<td>Truth as intentional fulfilment: interpretations of research object match lived experience of object.</td>
</tr>
<tr>
<td>Validity</td>
<td>Certainty: data truly measures reality.</td>
<td>Defensible knowledge claims.</td>
</tr>
<tr>
<td>Reliability</td>
<td>Replicability: research results can be reproduced</td>
<td>Interpretive awareness: researchers recognise and address implications of their subjectivity.</td>
</tr>
</tbody>
</table>

Table 3-1 The differences between positivism and interpretivism

The table compares positivism and interpretivism in seven dimensions: ontology, epistemology, the research object, the method, theory of truth, validity and reliability. First, we consider the ontological dimension, where positivists supposedly believe that the researcher is separate from the object of study or the reality. On the other hand, interpretivists believe that
the researcher and the object of research or reality cannot be separated. Secondly, in the epistemological dimension, positivists are supposed to build a knowledge of reality that exists beyond the human mind but interpretivists recognise that the knowledge they build reflects their particular goals, culture, experience, history and so on. Interpretivists believe that knowledge is built through a social construction of the world (Weber, 2004). Third, in the objective dimension, positivist research considers that the object has qualities that exist independently from researcher but, for interpretivists, the objects of the research are socially constructed. Fourth, in the methodological dimension, research methods are not bound to either positivist or interpretivist camps. Fifth, in the truth dimension, positivists believe that one statement made by a researcher may be true and corresponds to a theory of truth. However, interpretivists believe that truth is intentionally fulfilled and the interpretations of the research object match the live experience of object. Sixth, in the validity dimension, positivists believe that data truly measures reality but interpretivists believe that knowledge claims are defensible. Finally, in the reliability dimension, positivists believe that the research results can be reproduced but interpretivists address the subjective implications of their research object.

There are some difficulties experienced in IS research; for example the apparent inconsistency of results. Some authors argue that the major weakness in the field of IS research is the lack of breadth supporting theoretical diversity (Benbasat & Weber, 1996). Research in technology that is based on natural science methods is often considered positivist, and opposite to the interpretive methodologies. Interpretivist research challenges the determinist assumptions underlying the study of social phenomena (Klein & Myers, 1999).

Klein and Myers (1999) divided IS research into three types: positivist, interpretive, and critical. IS research can be classified as interpretive if it is assumed that our knowledge of reality is gained only through constructions such as language, consciousness, shared meanings, documents, tools and other artefacts. Interpretive research does not predefine dependent and independent variables, but focuses on the complexity of human sense for making the situation as it emerges and it attempts to understand phenomena through the meanings that people assign to them (Klein & Myers, 1999).
Weber (2004) believes that the contradiction between positivist and interpretive research has significant value. Moreover, Creswell (2007, p. 18) states that “With the epistemological assumption, conducting a qualitative study means that the researchers try to get as close as possible to the participants being studied”. Therefore, conducting research by using an interpretive case study requires careful social investigations in the fieldwork.

Understanding what these theoretical frameworks include and exclude has been an important aspect of this research. In the case of learning technologies there are clear grounds for needing to consider the learning characteristics and the learning process. It is also justified to consider the implications of the pedagogy and its influence in the educational sector. Some other distinctions remain to be made clear concerning the factors that influence the choice of qualitative research and these are set out in the following section, followed by a detailed description of the preliminary research design issues.

3.1.2 Factors that Influence Choices of Qualitative Research

Creswell (2003, p. 18) stated that “A qualitative [research] approach is one in which the inquirer often makes knowledge claims based primarily on [a] constructivist perspective or advocacy/participatory perspectives or both.” The constructivist perspective relies on multiple meanings of individual experiences constructed socially and historically, with the intent of developing a theory or pattern. The advocacy/participatory perspectives include political, issue-oriented, and collaborative or change-oriented perspectives. According to Trauth (2001), there are five main factors influencing the choice of methods. The following section describes the five main factors that influenced this researcher to choose a qualitative research approach.

3.1.2.1 Research questions and research outcome

Research methodology relies on research questions to provide a research outcome. The choice of a qualitative method in IS research depends upon the way in which the researcher conducts the research. Quantitative and qualitative methods are different in terms of research explanations and reasoning. The nature of the research problem has the most significant influence on the choice of a research methodology. Qualitative methods are appropriate when “a how and why question is being asked about a contemporary set of events, over which the investigator has little or no control” (Yin, 2003: p.9).
What one wants to learn determines how one should go about learning it. Both _how_ and _why_ questions are more explanatory and likely to lead to the use of case studies (Yin, 2003: p.9). The literature about qualitative methods is replete with the rationale for the choices that have been made. Chapter one showed that in this thesis the research questions are all about how to understand learning styles which affect the use of on-line systems and why this is useful. Because the key aim of this research was to find out strategies for the design of on-line courses suitable for classroom training taking into account the different learning styles in particular disciplines, an interpretive case study was used.

According to Denzin and Lincoln (2003), qualitative research stands where there are many ways of interpreting something. Qualitative research is used across many disciplines; it does not belong to a single discipline.

“In our study, the positivist lens and the quantitative analysis [only] told us _that_ people communicated. But it could not tell us _what_ they communicated or _why_ they communicated as they did.” (Trauth, 2001: p.7)

Since this research lies between the both the Educational Field and Information Systems some interpretation is needed which is why an interpretive cases studies was used.

3.1.2.2 Philosophical perspectives

The choice of qualitative methods in IS research depends on the theoretical lens. Most IS research is based on certain crucial assumptions about the validity of the methods used. The alternative choice of the suitable methodology to be carried out in this thesis depends upon several factors. The most crucial factors are the research questions and which approach will be the most appropriate one which can lead to answer the research questions. It is important to note that research based on a case study can be based on an underlying philosophical paradigm which is either: positivist, interpretivist or critical research (Chua, 1986; M. D. Myers, 1997; Trauth, 2001).

Interpretivism is the aspect of understanding the social context of an information system and the social processes by which it is developed and constructed by people and through which it influences and is influenced by its social setting. Interpretivism does not prove or disprove hypotheses, but tries to identify, explore and explain _how_ all the factors in a particular social setting such as a web development team or organization are related and interdependent.
Moreover, interpretivism looks at the perspective of how the people perceive their world individually or in groups (M. D. Myers, 1997).

3.1.2.3 Research process comparison

The context-specific, subjective and diverse nature of the information being sought requires a phenomenological rather than a positivist methodology. In contrast, positivist research underlies and seeks to design experiments that can test hypotheses based upon a defined theory. Interpretivists try to understand phenomena through the meanings and values that the people assign to them (Boland, 1991). This research focuses on learning phenomenon in the higher education context and therefore relies on an interpretivist process more than a positivist process.

The interpretive result creates a rich understanding of a possibly unique context and an organized discovery of how human agents make sense of their perceived worlds and how those perceptions change over time and differ from person to person or group to group (Walsham, 1993). The following five major aspects of the research process are significantly different when seen from positivist and interpretive viewpoints.

- **Role of the researcher.** The positivist researcher strives for objectivity and is separated from the data. The interpretive researcher is an integral part of the data. The data will not exist without the active participation of the researcher.

- **Design.** For a positivist, the design of a study is determined before the research process begins. In interpretive research, the design evolves during the research; it can be adjusted or changed as the research progresses.

- **Settings.** The positivist researcher tries to limit contaminating and confounding variables by conducting investigations in controlled settings. The interpretive researcher conducts studies in the field, in natural surroundings, trying to capture the normal flow of events without controlling the variables.

- **Measurement instruments.** In positivist research, measurement instruments exist apart from the researcher and another party could use the instruments to collect data in the researcher’s absence. In interpretive research, the researcher is the instrument; no other individual can substitute.
• **Theory building.** Where the positivist researcher tests, supports, or rejects theory, the interpretive researcher develops theories as part of the research process—theory which is “data driven” and emerges as part of the research process, evolving from the data as they are collected.

3.1.2.4 Researcher skills

The qualitative researcher needs to develop active skills which include identifying the key issues, working out how they might be resolved, and understanding the intellectual, practical, moral and political implications of different ways of resolving them (Mason, 2002). This research was mainly focused on learning styles which occurred at Songkhla Rajabhat University in Thailand where the researcher had first-hand experience of the field context. The student’s learning situation is complex and difficult to explain and it is especially difficult to reliably judge how much they have been learning. Qualitative Research in Information Systems is a new method in the university and skills are generally lacking but this researcher believes she has learned sufficient skills to conduct this research and also to continue with this kind of research further into her career at the university.

“A researcher’s skill in using qualitative methods is an influencing factor not only during the dissertation but also throughout her or his career.” (Trauth, 2001: p.8).

As an individual researcher, in close interaction with the participants in the study in order to elicit and understand their individual learning styles on LMS, the intention is not just to gather already explicit information about their learning styles but also to elicit some of the underlying perceptions and satisfactions of students who learn on the LMS.

Much of the research, especially those about learning styles that have been done, are quantitative and requires several specific skills. This research is based on a social world perspective that is considered increasingly complex and multi-dimensional. By teaching and researching at Songkhla Rajabhat University for nine years, the author has obtained important skills from the multi-dimensional social aspects such as the LMS course design and teaching experiences both face-to-face and in laboratory on-line courses. The researcher believes that her own teaching skills have helped in understanding and interpreting the data collected about the students learning processes.
The strategies of the University aim to serve society in many dimensions. Qualitative research has great strengths for understanding social context, diversity, nuance and process and will be very useful in the University.

3.1.2.5 Academic policy

This research is sponsored by the Thai government and the context of the research is in Thailand where policies related to research often put some constraints on the researcher both in the macro- and micro-political sense. Some of those come from policy makers, such as sponsors and the education sector (Cohen et al., 2007). This researcher took care to establish links between the researcher and the Thai government sponsor. The research findings are owned by the researcher but these will then be utilized in many universities in Thailand. Trauth (2001) discussed that the country of origin of the institution may influence the choice of qualitative methods for IS research. A qualitative research method was chosen for this research, partly as a matter of academic policy, because it is a new and challenging method and many postgraduate curricula in the Social Sciences in Thailand now teach “Qualitative Research Methods”. These subjects cover in-depth study of theory and methods of qualitative inquiry, issues related to research design, data collection methods, data sources, sampling; criteria for rigor, applications of research strategies, generating and analyzing qualitative data, and reporting strategies. The researcher is confident that an interpretive case study, clearly structured in qualitative methods, is not only the right theoretical choice for this study but will be useful in guiding other research in the same field in the future.

3.2 Qualitative Research in Information Systems

Qualitative research is formed from various philosophical perspectives and so there are many varieties of qualitative research methods. A research method is a strategy of inquiry which uses underlying philosophical assumptions to design research and to collect data (M. D. Myers, 1997). Each research methodology has its own limitations and advantages in approaching the research goal. The four research methods usually conducted in Education and Information Systems discipline that will be discussed in this study are ethnography, action research, grounded theory, and case study research.
Qualitative research in Information Systems is a fairly new methodology in Thailand. Most IS research in Thailand has been done using the Soft System Methodology because the [global] trend of qualitative research in Information Systems has shifted from hard to soft system methodology (Avison, 1998). This research not only focuses on the hard side but also focuses on soft system side.

Information Systems covers topics related largely to organizational concepts, some of which are located in schools of business. All IS concepts are based primarily on the behavioural level of analysis such as the use and operation of technology and technology transfer. They also explore the concepts of systems and also software topics and how IS is applied in a variety of academic disciplines. For IS most of the evaluative published papers have been deductive and of the natural world (Glass et al., 2004). According to Avison and Fitzgerald (2003), traditional system design failed to meet the real needs of the business. Adapting the research methodologies may be critical to success in implementing IS in an organization. This researcher has suggested that the interpretive case study methodology is appropriate for IS research because it maintains the integrity of the developer, researcher, and the participants of the fieldwork. This research mainly relied on an inductive approach, which starts with specific observations, then forms broader generalizations and theories.

Qualitative researchers accumulate multiple research methods and multiple resources to answer research questions, for example, semiotics, narrative, content, discourse, archival and phonemic analysis and even statistics, tables, graphs and numbers (Denzin & Lincoln, 2003). Many of these methods, or research practices are also used in other contexts in the humanities. IS researchers also emphasise theoretical work and explore the relevance of theories extracted from other disciplines (Glass et al., 2004).

According to Clarke (1999), when constructing knowledge about any particular topic, the researcher should consider four key elements. Firstly, the researcher should consider an appropriate research methodology that logically relates to the research topic and the area of concern. Secondly, the researcher should select appropriate data collecting techniques and analytical procedures. Thirdly, the researcher should establish results that fit the reality of learning. Fourthly, the researcher should have an epistemological perspective that reflects on
what is already known in the area and the extents the knowledge required and the limits of the knowledge to be gained from the project.

The following methodologies have been used in the IS field and have demonstrated strengths and weaknesses. The selection of a suitable research approach for the purpose of validity and reliability of the research is also discussed.

3.2.1 Ethnography

Ethnography is generally used to study the development of Information Systems and aspects of Information Technology management such as system design or the investigation of information systems. Ethnography is a situationally based methodology. An example of how this problem was addressed is contained in the Creative Learning and Student Perspectives (CLASP) research project funded by the European Commission. Ethnography was used as a common text for a research project in which each partner retained his/her cultural web of significance. Partners were asked to provide empirical evidence for assertions and to analyse the perspectives of all the relevant people (Beach et al., 2004).

Some researchers have suggested that ethnography has become one of the most extensively used research methodologies in education discipline due to the fact that a coherent framework between the quantitative method and the qualitative method is carefully selected (Hardman, 2005). Ethnography is field-oriented and naturalistic and follows a process of examining the practices and behaviours of a group. It is suggested that ethnography could be the most important methodology for conducting research in education.

Ethnography is the best choice for this research if the researcher would like to make a deep study in particular personal learning styles. The research could be immersed within the learning situation and form a balance of insider and outsider perspectives of learning styles. The researcher can at the site for a considerable amount of time, observing, interviewing and participating in the learning events. Because this particular research focuses on a comparison of learning styles between different disciplines, it is important to investigate the situation as a whole picture rather than each individual representing his or her own perspective. However, the ethnographic method alone cannot answer all the research questions. In this research, the researcher has to focus on an explanation of the phenomena much more than an in-depth
interpretation of personal perspective and, thus it was decided not to use the ethnographic method.

3.2.2 Grounded Theory

There have been several research examples conducted in the education field that have been based on grounded theory, and in particular, the studies in learning styles by Huehls (2005). Grounded theory methodology has been employed not only in education research, but also in organisational situations. CASE Tools as Organisational Change (Orlikowski, 1993) is a good research example of grounded theory. The empirical study of two organisational changes suggested the successful use of the CASE Tools framework. The research considered the social context of systems development, the intentions and actions of the key players, and the implementation process followed by the organisation.

Grounded theory is a “general methodology for developing theory that is grounded in data systematically gathered and analyzed” (Strauss & Corbin, 1994, p. 273).

Grounded theory talks about the relationship between concepts, categories and evidence. The process of grounded theory includes: the collection and interpretation of data, forming the abstract concepts and presenting the theory. The interpretation should be presented back to the original informats, to ensure that it is an honest representation of the participant accounts. The interpretation is abstracted onto a conceptual level and therefore can become less meaningful to the individual. A narrative report from those findings is based on the extent of the data analysis and can be put into a diagram to illustrate the theory or contrast it against existing theory (Creswell, 2007). Researchers who use grounded theory have an obligation to abstract the data and to think theoretically rather than descriptively. However, grounded theory has the danger of placing too much emphasis on identifying codes as the exclusive feature of the process, without much reference to existing theory. It is also hard to explain how the codes relate to each other (Glaser, 1978, 1992; Stern, 1994; Strauss, 1991). Grounded theory may be suitable for future work if the researcher has adequate data collected from a longitudinal study that could possibly form a new and original theory. However, there are many existing learning theories that are already useful for the limited time scale of this Ph.D. and thus grounded theory would not be an appropriate approach to use in this research.
3.2.3 Action Research

Action Research has been accepted as a valid research method in many applied fields especially within organizations. A good introduction as to how action research might be used by IS research has been demonstrated by Baskerville and Wood-Harper (2002). Action research is an approach to improve education by changing something and learning from the consequence of the change. In an action research study, the researcher should follow four main stages: planning, acting, observing and reflecting. The main concept of action research requires that the researcher must have the power to take action in every cycle of research, or the people in the context have a commitment to change something together. Action Research tends to be the most perfect research and development tool for educational research in university teaching. It allows for cycles of action, data collection and analysis, reflection and planning. The cycles of action can be matched with successive academic sessions or terms in which a course is run through an LMS. For classroom-based training, the action research will make observations during the teaching term, followed by some reflection and planning for the next term.

Much of the research into student learning in higher education focuses on the individual; some research on individual learning is focused on measured outcomes (objective), while there are some examples which have focused on meaning and values (subjective) (Baskerville & Wood-Harper, 2002). Where the focus is on structures and social systems the research approach is objective. Where the research approach is subjective, the focus is on discourse, traditions and different ways of understanding. Action research may have either a fluid or a rigid structure. Research goals may vary between organizational development goals, systems design goals, individual goals or theory development goals.

Educational Management Action Research (EMAR) is a method for course improvement, tutor development, management strategies maturation and infrastructure evolution (Nunes & McPherson, 2003). This researcher confirmed that Action Research could be highly appropriate for the development of e-learning because the researcher’s experience suggested that this would allow significant modifications from the traditional paradigm of higher education supply. The EMAR process supports continuously changing requirements in every cycle of the Action Research method. Each cycle consists of diagnosis, action planning, action taking and action evaluation. It takes a long time to process each cycle and this must be allowed for in order to succeed in Action Research. Action Research might be used if the
researchers are in a position that can take action within the field of study and some research requires consistent collaboration between researchers, managers and knowledge workers (Shah et al., 2007). This researcher did not, eventually, consider Action Research suitable because the researcher, having taken a research sabbatical, was not in a position to take any actions within the context. In addition, Action Research would have required too long a period to take any action that the researcher would want to make within the limited funding and time available. The researcher, instead considers Action Research as a possible research method only for any future aspects of this research.

3.2.4 Interpretive Case Study

The case study is explained by Creswell (2007) page 73 “… case study research involves the study of an issue explored through one or more cases within a bounded system.” The concept of case study research is different from the word ‘case’ which is represented, in general research papers, as a unit of analysis (M. D. Myers, 1997). This research uses the terminology “case study” as meaning a research methodology. Case study research involves the investigation of a contemporary phenomenon in a social context in which the boundaries of the context are not obviously divided.

The case study method was chosen for this research because it aimed to study the contextual conditions where the students were learning in a real world and the researcher had been working in the context for a considerable period of time. “The longer [a] researcher [is] involved in the field to understand in the field, the more researcher build[s] reliability from [the] first resource” (Creswell, 2007: p.18). In this case, the experiences of this researcher before the recent investigations in the field have produced a better quality of data collection. The research style required substantial involvement in the research situation as a participant, in overt or covert mode, over a period of time.

Yin (2003: p.13) also stated that “…A case study is an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between [the] phenomenon and context are not clearly evident.” The case study method suits this research well because the research is aimed at organizational issues rather than technical issues in a complex situation. Moreover, IS researchers emphasise that their work is theory-based, and, as well as using theories based in IS, researchers in this realm also explore the
relevance of theories extracted from other disciplines (Glass et al., 2004). The researcher cannot be assumed to be free of their own interpretations, and considerations (Weber, 2004).

Critics of the case study method believe that the study of a small number of cases can offer no grounds for establishing reliability or generality of findings (Yin, 2003). Others feel that the researcher’s intense exposure to the case of study biases the findings. Some dismiss case study research as useful only as an exploratory tool. However, researchers continue to use the case study research method with success in carefully planned and crafted studies of real-life situations, issues, and problems. Eisenhardt (1989) suggested that the case study theory may be useful in three ways: as an initial guide to design and data collection, as part of an iterative process of collecting data and as a final product of the research. Reports on case study research from many disciplines are widely available in the literature. This research has made a general attempt, as follows, to explain the theory, in an attempt to increase the predictive understanding of phenomena.

The advantage of the case study methodology is that it can offer a general understanding of the phenomena under investigation. Case studies can recognise the complexity of culture and sociality from a large archive of descriptive data analysis. Case study methods can involve different types of data collection techniques or analyses, which can be either qualitative or quantitative or both.

According to Stake (1994), much of the qualitative research is based on a holistic view that the nature of cases is situational and influenced by happenings of many kinds (Denzin & Lincoln, 2003: p.141). Stake (1994) identified three types of case studies: Intrinsic, Instrumental, and Collective. This research used the Collective i.e. a number of cases studied jointly in order to understand a phenomenon, population or general condition, often referred to as a multiple-case study In this research, the rich context of learning strategies would be captured by the case study method, from many students in the various particular academic fields. The case study boundary in this case is undergraduate students, from many academic disciplines, who are all studying the same Information Technology course.

The boundary of this case is unique. An interpretive case study means to understand phenomena through the eyes of the learner (Walsham, 1995). In this research case the researcher understood how students learn by being in the situation with them. Interpretive
research methods in IS also aim understand the context of the information system. The researcher, therefore, believes that an interpretive case study can make a valuable contribution to Information System (IS) theory and practice.

The specific context of this research is the study of Information Systems teaching in Thailand. The on-line IT course, using the Learning Management System was taught by many teachers in the Computer Department. Activities and assignments were randomly given to students by teachers without taking into account the student characters. Multiple resources of research information including interviews, observations, and also electronic discussion of different aspects were collected during different semesters. The observations of preferred learning styles and media that reinforced the learning paradigm provided the qualitative data. The research not only focused on collecting qualitative data alone but also required some quantitative data, such as questionnaires, so that a whole interpretation could be made to achieve the research goal. An interpretive case study was considered the best tool to have accomplished the research goal. The questionnaires gave a general idea about the current situation of e-learning in Thailand. The in-depth interviews were the main qualitative data collected for this research. The method of data collection is described later.

Further reasons for choosing an interpretive case study methodology are suggested in the following section.

3.2.5 Comparison of Methodology Choices

Qualitative researchers are concerned primarily with the process, rather than just the outcomes or products. Within qualitative research, the research assumptions, from the researcher's philosophical perspective, guide the adoption of the research design, the analysis of data and the final finding of research (Creswell, 1997). Qualitative researchers are interested in meaning—how people make sense of their lives, experiences and the structures of their world. Qualitative data are mediated through a human instrument, rather than through inventories, questionnaires, or machines. Qualitative research involves fieldwork and observations. The researcher physically goes to the students setting, site, and institution to observe and record behaviour in its natural environment. This research paid attention to descriptive data through the process of understanding meaning from the documents. The process of this qualitative research is inductive in that the researcher builds abstractions, concepts, hypotheses and
theories from details. It delineates the meaning of interpretive description based on qualitative data.

Qualitative data is a well grounded method using, rich descriptions and explanations of processes in identifiable local contexts and follows the research design. Observations were used to emphasise the importance of the human meanings, interpretations and interactions that would add value to existing knowledge and behaviour. The following table compares four research methods, in terms of focus, data collection and data analysis, that were considered before the case study methodology was chosen.

<table>
<thead>
<tr>
<th>Research Methodology</th>
<th>Ethnography</th>
<th>Grounded Theory</th>
<th>Action research</th>
<th>Case study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focus</td>
<td>Describing and interpreting a cultural and social group or an individual case</td>
<td>Developing a theory grounded in data from the field</td>
<td>Diagnosing and evaluating</td>
<td>Developing an in-depth analysis of a single case or multiple cases or comparison between cases</td>
</tr>
<tr>
<td>Data Collection</td>
<td>Primarily observations and interviews with additional artefacts during extended time in the field</td>
<td>Interviews with 20-30 individuals to “saturate” categories and detail a theory</td>
<td>Questionnaires Interviews focus groups</td>
<td>Multiple sources – documents, archival records, interviews, observations, physical artefacts</td>
</tr>
<tr>
<td>Data Analysis</td>
<td>Description Analysis Interpretation</td>
<td>Open coding Axial coding Selective coding Conditional matrix</td>
<td>Description Interpretation</td>
<td>Description Themes Assertions</td>
</tr>
</tbody>
</table>

Table 3-2 Research methodology comparison

3.3 Research Design Evaluation: Reliability, Validity, and Generalisability

Reliability and validity is concerned about the quality of data and the appropriateness of methods used in social science research. A research document needs to justify the quality of the data and the appropriateness of the methods used because all researchers have different philosophical and methodological approaches to the study of human activity in different
contexts. The knowledge gained in social science research comes from multi-disciplinary sources, [observed] human activity and interactivity (Black, 1993).

### 3.3.1 Reliability

The interpretations of the cases in this research are subjective. Qualitative researchers cannot separate their own feelings and opinions from the research question and the data (Weber, 2004). Increasing the reliability of qualitative methods usually requires conducting research through several methods. This research was based on an interpretation of the data through multiple sources of acquired information. The researcher used a survey method for pre-study and interviews and observations for the main study. The research was based on the real situation in which the learners learned together in a classroom. The research interest is studying the relationship between learning styles and media used on LMS and the learning process.

Consistency or dependability and applicability or transferability are the essential criteria for quality (Lincoln & Guba, 1985). To be more specific, the term reliability in qualitative research should be understood by the word “dependability” in this research, which is also the notion or meaning of “reliability” in quantitative research. Lincoln and Guba (1985) further emphasise that “inquiry audit” (p. 317) is one measure that might enhance the dependability of qualitative research and to ensure that the process of gathering data is consistent (Hoepfl, 1997). The consistency of data will be achieved when the steps of research are verified through examination of such items as raw data, data reduction products, and process notes (Campbell, 1996).

To ensure the reliability of the survey, the researcher repeated the same survey questionnaires with different participants. The researcher used a standard survey method to check for possible correlations between learning factors and disciplines. The results from the survey were used to guide the case study. After surveying students from many different disciplines for two semesters over two years, the survey showed that common learning style preferences could be identified according to three groups: Management, Science and Social Science. Moreover, common learning styles and media preferences were identified according to different academic disciplines. Results of the survey will be shown in following chapter. Reliability of the interviews was ensured by first transcribing and then analysing the interviews. The researcher
also included feedback from the pilot interviews to reduce any ambiguities in the interview questions, focus more on the central questions, identify areas in need of additional questions, and streamline the interview protocol and process.

Finally, for the overall reliability of the research, the researcher scrutinized the process of analysis and ensured it was followed consistently throughout the preparation and presentation of the results. Therefore, data from multiple sources within the same context was compared and interpreted within the same template. The researcher used a template analysis method (King, 2004) to be used in this research to increase the reliability of the interpretations.

3.3.2 Validity

Validity concerns the researcher’s ontological and conceptual framework in measuring and explaining the research. The judgment of validity involves measuring or explaining the researcher’s claim (Mason, 2002). This discussion addresses the validity of the interpretation of the data. Within a qualitative paradigm, interpretation is typically viewed as an unavoidable element of data collection (Yin, 2003: p.34-35). Interpretation is essentially implied within the rhetoric that the researcher uses to describe a situation and is mutually constructed between the researchers and the subject of interpretation.

In conducting an interview with the participants, the researcher attempted to ensure that bias was minimal in terms of attitude towards the interviewees. The researcher consulted many literature review papers to form the initial theme of the template analysis in order to interpret the data. Validity in the social science method can be further sub-divided into three categories: construct validity, internal validity and external validity (Yin, 2003: p.34). This researcher has tried to show evidence that these different sub-categories of validity have been addressed.

First, research is said to have construct validity if it contains multiple sources of evidence and establishes a chain of evidence. This researcher can confirm that this research was developed from a sufficiently operational set of measures to give construct validity (Yin, 2003: p.34). Moreover, this researcher can confirm that all the data were from the participants themselves. An open relationship between interviewees and researchers results in greater validity in the answers that the interviewees gave the researcher. Furthermore the validity was increased
because the researcher had direct experience of the situations in the research and saw the situation through the actors’ eyes (Cohen et al., 2007: p.138).

Construct validity was increased by also checking the method validity and content validity. The researcher identified the method validity of this research by conducting a pilot study. The pilot study was separated into two sections: the survey section and interview section. There were 32 participants for the pilot study in the survey section and 5 participants for the pilot study in the interview section.

To investigate the current situation of web-based learning for undergraduate students, the research utilised an electronic survey through the LMS at the beginning of the course in the first semester in 2007. The results provided an understanding of the current situation of e-learning at the university. The questionnaire was separated into four parts: basic background of using IT, IT learning skills, media/material preferences and Learning Styles Questionnaires. These questionnaires came from a literature review of previous similar work. For the first survey in 2007, the respondents were first year students studying the required basic IT course via the LMS. There were 394 valid responses (out of 412) to the survey with a response rate of 96.12 percent. All the questionnaires were collected from different academic disciplines of undergraduate students taking basic IT courses. The disciplines included Health Science, Chemistry, Information Technology, Social Development, Computer Science, Management, Communication, and Human Resources.

Based on the work done by Tongkaw and Wood (2009a), students’ academic disciplines can be grouped into three major disciplines because the results began to show that a common learning style could be uniquely identified for each of these three major disciplines: Science [SC], Social Science [SS], and Management [MT]. This researcher then repeated the survey questionnaires, after the survey reported in the above publication, with some small changes to the part of questionnaire dealing with background of using IT, IT learning skills, media/material preferences. No changes were made to main part of the Learning Styles Inventory Questions. 180 out of 194 questionnaires were valid, with a response rate of 92.8 percent. The results from this second survey again confirmed, with the first questionnaire results, that common learning styles be uniquely identified for each of the three major disciplines: The questionnaire survey was conducted through the on-line system at the beginning of the IT course. The
advantages of an electronic survey are the reductions in paper cost and response time. The respondents all responded to their questionnaires individually.

Content validity was checked by pre-testing the interview questions with a group of Thai Ph.D. students. The interviews were conducted in Thai to decrease ambiguity and possible eventual confusion when using the interview questions with local Thai students in Thailand who have never studied abroad. The pre-test interviews also included the process of asking unwritten probing questions to elicit a clearer response when the standard interview questions were not first understood. This was to ensure content validity over the principle of using probing questions.

When gathering actual data by interviews, five Management students from the same on-line class were randomly chosen to do a pre-interview. The purpose of the pre-interview was to ratify the interview questions. For the actual interviews, the researcher collected data from a selection of 29 students from the three groups, Management, Science and Social Science. These groups were identified by the previous work of Tongkaw and Wood (2009a) to represent learning styles common to that group. The interview transcripts from pre-interviews and the actual interviews were combined.

The series of transcriptions of the interviews taken from the electronic recording device confirmed the content validity. The researcher put all the transcriptions into an electronic form and confirmed the reliability and security by backing up the data and making the interviewee’s information confidential.

Second, internal validity is a concern when doing explanatory case studies and in this case the researcher tried to identify all factors that were related logically in the same situation (Yin, 2003: p.36). This research used a seven stage template analysis to interpret all the data in order to search for coherence in the results. In addition, the internal validity was increased by collecting together all the related events from earlier occurrences, which were based on both interview and documentary evidence as a part of this case study (Yin, 2003: p.36).

Finally, external validity involves looking at all the results that could be generalisable beyond the immediate case study (Yin, 2003: p.37). Research generalisability will be described in the next section.
3.3.3 Generalisability

The general criticism in case study research is how the case may be generalised. It is not an easy question, but this researcher suggests that the case can be generalised in a similar way as when doing experiments with quantitative rigor. However, this case study is only generalised into theoretical propositions and situations and not to populations or a whole universe (Yin, 2003: p.10). The primary goal of the current study was to gain an understanding of student learning in an on-line compulsory course. Each particular major discipline has their own learning style characteristics that could be usefully adapted in delivering on-line courses. The current research expands previous studies of learning style theories to see how the theories may apply to whole groups of learners which in this case compares the three major disciplines of undergraduate students in Songkhla Rajabhat University. The context in this particular situation is important for understanding the phenomenon. Thus a generalisation of results, problems or solutions from one context to another is possible if the context or situation is very similar to this research. The primary concern of this research study is with the unique situation in which on-line learning occurred with the LMS in a laboratory with the teacher. Therefore, generalisation in this case is based on similar situations:

- Using the same range of support materials and media
- Using similar or the same courses
- Using the same blended learning i.e. full participation with classroom teaching and on-line teaching through the LMS in a teacher-supervised laboratory
- Grouping within the same major disciplines

3.4 Ethical Considerations

In this research, the researcher considered that ethical considerations were a high priority. Although the research did not require a full psychological perspective, all precautions were taken to ensure that the research was conducted in an ethical and professional manner. Nevertheless, all necessary steps were taken when planning the research to ensure that the participant’s psychological and physical dignity, well-being, health and safety were preserved. The students were fully informed about the nature and progress of the study and the researcher applied the two key principles of participant consent and participant information so that participants should be allowed to freely consent to participate in the research and to be
able to withdraw whenever they wished. Participants had to be fully informed about the aims and objectives of the study and their role, prior to giving consent. The researcher had full permission to have access to the university because researcher was also a staff member who had been teaching and developing curriculum in the university. The results of the electronic questionnaire given to the students who study required courses on the LMS and the review process was strictly confidential. Anonymity of participants was ensured by following a standard set of protocols for dealing with sensitive professional information by giving each person a code which should in no way reveal their identity. The obligation to keep research data confidential is all inclusive. Each student was approached to become a participant in the study on a voluntary basis and they were asked to give written permission of their participation. All of the interviewed participants were asked, by email, to validate that interview transcripts and summaries were accurate.

3.5 An Overview of Learning Situation

3.5.1 National Context (Why Thailand?)

Thailand Learning Technologies 2010 (TLT 2010) focuses on distributing ICT at every educational level including primary and secondary schools. Moreover, implementing ICT into higher education and lifelong learning was also targeted by the strategy plan (Ainley et al., 2003).

The plan stated that the main objective of improving the ICT infrastructure in Thailand is equality of opportunity and to allow each learner, in any location, to gain access to education and training. This technological advance supports the major goals of the education reforms. In Thailand there is already an infrastructure for new technology to be distributed in existing community-based facilities such as the public libraries, monasteries, schools, colleges and universities (Ainley et al., 2003). The community information and communication technology centres are currently being developed and along with Songkhla Rajabhat University, they have a major role to support the communities in lifelong learning.

The Thai Learning Technologies 2010 (TLT 2010) have provided a distance learning model for distance education in Thailand. Figure 3-1 provides a framework for the selection of an appropriate technology mix for flexible learning and this should be adhered to by distance
education programmes. The model includes four criteria for decision-making: student characteristics, availability, accessibility, acceptability, and economic viability and validity. The TLT 2010 also stated that “The selected technology mix should take into account the preferred learning styles and other characteristics of students” (Ainley et al., 2003, p. 57). This research not only takes this framework into account but also uniquely looks at learning styles as observed in groups. In distance education, it is also essential to have an understanding of the learner’s preferred learning styles within their own context which includes course objectives, assessment demands, discipline matters, and instructional strategies.

![Figure 3-1 Framework for the selection of a valid technology mix at the level of a course of study](Source: Thailand Learning Technologies 2010 (TLT 2010), (Ainley et al., 2003, p. 59)
Distance education employing information technologies such as multimedia, interactive video, the internet, etc., can enhance the education and training of students in higher education. Moreover, it can provide opportunity for a continuing education necessary for adults to develop further skills and knowledge. Advances in IT also offer novel means to present and demonstrate difficult concepts and theories in more interesting ways to learn and can be easily understood. The National Information Technology Committee Secretariat in Thailand stated that they need support from professionals and experts in order to create high quality courseware on demand to home, school or university (Thajchayapong et al., 1997).

In addition, without a fundamental understanding of how to choose appropriate technologies to match the learning preferences in higher education, for learners on the LMS, it will be difficult to deliver the course and all its content.

Recent and emerging technologies and associated flexible learning techniques make it increasingly possible to provide for the different preferred learning styles of the students involved in Thai distance education. It is possible to design the distance education experience so that it mirrors the context of the laboratory based on-line learning. Just as in the laboratory, good instructional design and/or suitable activities can increase learning quality for distance learners, it is just as important that those responsible for program design and program delivery in distance learning are also able to draw upon a range of teaching and learning approaches and media, according to the needs and preferred learning styles of target groups of students.

In Thailand, there are different educational systems, different forms of academic community organisations, and different teaching and learning paradigms. However most Thai universities provide a blanket approach to learning and even those who take a more pragmatic approach to learning still ignore the possibility that students in different academic disciplines may have preferred learning styles which are unique to the type of student that chooses that discipline. Literature about learning pays significant attention to the social dimensions of learning whereas literature about learning styles tends to focus mainly on the individual learner and generally ignoring their social dimensions. However, there are some necessary connections between the social dimension and individual learners. Diversity in learning across the disciplines is inevitable because of the background of those who choose those disciplines. Cross-discipline networking increases the diversity of learning strategies that individuals, within those
disciplines, have available to them. However, students in the universities are generally faced with having to accept blanket teaching styles and materials because educational support has access to only a limited subset of teaching methods. Therefore, a university which is in that situation should be expected to conduct research to improve this situation.

3.5.2 Institutional Context (Why Songkhla Rajabhat University?)

Thailand’s higher education system has a variety of institutions including universities, technical institutes, vocational colleges, and specialized-training institutions. Songkhla Rajabhat University is a member of the group of Rajabhat Universities, whose primary goal is to be leaders who provide support to local education. The university mainly provides Bachelor Degree programmes, which normally require four years of study although some education programmes require five years. Songkhla Rajabhat University has seven faculties which include: Faculty of Arts, Faculty of Agricultural Technology, Faculty of Education, Faculty of Humanities and Social Science, Faculty of Industrial Technology, Faculty of Management Science, and Faculty of Science and Technology. The main strategies of the university are derived from the corporate Rajabhat system and therefore the curriculum, infrastructure, learning systems and educational management are very similar throughout the Rajabhat universities group. The university operates under a two semester system, each of which lasts approximately 15 weeks. The academic year runs from June to March, with a six-week break in the summer during April and May. This research, which has been funded by the Thai government aims to contribute practical contributions to teaching practice both at Songkhla Rajabhat University and other universities within the whole group.

3.5.3 The Learning Management System (Why Moodle?)

The Learning Management System (LMS) is an on-line knowledge delivery course in Information Systems available to all students in Songkhla Rajabhat University and the specific type of LMS application that has been implemented is called Moodle. There are more than one thousand students and twenty teachers involved in this course every semester. It has been proven that the use of computers in education can generally help to decrease the workload of teachers. Web-based courses can also be used to promote collaborative learning, including role-playing and group problem-solving activities (Khan, 2001). A Web-based delivery is the
way that the university has chosen to deliver its compulsory IT courses for all first year students in Songkhla Rajabhat University.

The purpose of web-based teaching and learning is to ease the learning and course management process. The LMS helps teachers to create, store, deliver and manage course content on-line (Chavan, 2004). The system displays a user interface in a web page format. Teacher or instructors have the authority to control, delete, organize and edit courses contents. Commercial tools all vary in terms of their characteristics and features, but generally the main common feature is that they all deliver knowledge. They generally include simple interfaces, easy functional navigation, communication forums, on-line assessment and course management tools. Songkhla Rajabhat University chose the LMS, named Moodle, and implemented it as their Virtual Learning Environment in 2004.

Moodle is an acronym for Modular Object-Oriented Dynamic Learning Environment. It is an Open Source Course Management System (CMS), also known as a Learning Management System (LMS) or a Virtual Learning Environment (VLE). The LMS contains many complex systems but the main ones include: a Course Management System (CMS), a User Management System, a Test & Tracking Management System and a Communication Management System. Moodle has had a significant number of users since 2005, with more than 43,585 registered validated sites in more than 200 countries across the world (Wikipedia, 2009). The LMS is rapidly becoming one of the major avenues for delivering courses to students. The key reasons for this are the rapidly increased effectiveness of knowledge delivery and that the LMS offers a means to support effective teaching and learning at a comparatively low cost (Nagi & Suesawaluk, 2008).

Moodle is designed to help educators create on-line courses with opportunities for rich interaction. Its open source licensing and modular design means that people can develop their own additional functionality. Development is undertaken by a globally diffused network of commercial and non-commercial users, streamlined by the Moodle company based in Perth, Western Australia.

Moodle is used as a program for efficiently creating course contents through web-based instructions. Moodle is considered as a learning tool rather than a management tool and it meets the pedagogical requirements of the providers who are teachers rather than senior
management or technicians (Beatty & Ulasewicz, 2006). Moodle allows access at three levels: system administrators, teachers and learners (Berggren, 2005).

Songkhla Rajabhat University has implemented the Learning Management System in all academic disciplines since 2004. The university employed Moodle, as a course management system (CMS), to help teachers and instructors create effective on-line learning communities. Today, Songkhla Rajabhat University uses Moodle version 1.4.1. Most of the courses were created under the Faculty of Science and Technology and the basic Information Technology courses were assigned to the Faculty of Science and Technology. Many other courses are also provided in Moodle as shown in the following table.

<table>
<thead>
<tr>
<th>Sectors</th>
<th>No. of Courses 2008</th>
<th>No. of Courses 2009</th>
<th>No. of Courses 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course for adult learning</td>
<td>4</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>Language Centre</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Faculty of Science and Technology</td>
<td>221</td>
<td>229</td>
<td>240</td>
</tr>
<tr>
<td>Faculty of Industrial Technology</td>
<td>3</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Faculty of Management</td>
<td>83</td>
<td>112</td>
<td>118</td>
</tr>
<tr>
<td>Faculty of Art</td>
<td>11</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Faculty of Agriculture</td>
<td>22</td>
<td>22</td>
<td>25</td>
</tr>
<tr>
<td>Faculty of Humanities and Social</td>
<td>114</td>
<td>114</td>
<td>116</td>
</tr>
<tr>
<td>Faculty of Education</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Faculty of Graduate</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 3-3 Amount of courses on the LMS under particular faculty in Songkhla Rajabhat University from 2008 to 2010

Source: http://vclass.skru.ac.th/moodle/

Songkhla Rajabhat University is a member of the Rajabhat University group of forty one universities and therefore the curricula in the same faculties are very similar. The Faculty of Science and Technology has two important Information Technology courses: Information Technology for Life and Information Technology for Learning. Each course is divided in two parts: a lecture for two hours and a laboratory for two hours a week. Both classes are compulsory for the whole undergraduate body in the university and they have the same contents and use same text book in class. The lecture class contains face-to-face teaching and the laboratory class contains the computer lab training. During the computer lab training, the instructors or teachers stand in front of the class and give directions and demonstrations while the students work on-line with the LMS, Moodle. In most cases teachers design the course instructions for the laboratory for several weeks in advance during the semester. To set up the
course contents on the LMS, teachers often face difficulty in creating and/or selecting existing media, materials and activities. However, these can be reused in next semester.

The main reported limitation of Moodle is that it cannot be individually designed for each individual student in a class i.e. each account holder cannot have their own tailored interface of instructions and material/media choices. Although Moodle allows media to be re-used for another course, it is generally very inflexible when trying to modify the way an existing course has been written.

Bach et al. (2007, p. 100) suggests three extreme approaches to using an LMS in a web-design process. First, total on-line delivery: each unit is delivered totally on-line with little or no face-to-face contact. Second, a blended learning delivery: students and tutors proceed with the learning and teaching of the unit of study by an arrangement, whereby part of the learning and teaching is undertaken face-to-face and part on-line. Third, on-line learning supported by face-to-face delivery in the lecture classroom only: on-line resources are used to the lectures by giving course information, access to course materials in the form of notes or handouts and links to other information.

Songkhla Rajabhat University uses the LMS to teach the required Information Technology course in a blended learning situation for two periods per week with face-to-face classroom contact and for another two periods per week in the laboratory on-line.

### 3.5.4 Understanding the Situation

Gathering information about the interactions in complex situations throughout a whole system is a key element of “systems thinking and practice” which was developed by Peter Checkland (1981). Drawing pictures as a way of thinking about the whole issue is common in problem-solving methods because our intuitive consciousness communicates more easily by understanding the relation and interaction among issues. These pictures attempt to capture the real situation representing the relationships, influences, causes and effects relevant to the whole system. A key idea embedded in systems theory is that it can be used to understand phenomena and that this holistic emphasis will promote orderly thinking.

A practical application of the Soft System Method (SSM) was provided in an article by Huynh and Orwig (2006). The article suggests that to make distance learning effective, we need to
concerned about “real-world” situations. System thinking experts have proposed that not all problems are governed by logic and rationality, particularly those that involve issues of justices and fairness toward social groups and ethical consideration of the needs of that particular group (Mitroff & Linstone, 1993).

Systems thinking could provide a useful conceptual model that allows users of e-learning to look at how and why people and computers interact within that system. It is increasingly important that educators look at how and why the components of systems in the 21st century are influenced by the integration of technology (Proctor, 2009). Another paper confirmed that when developing courses or learning support processes, system thinking may be usefully and explicitly applied (Ison, 2000).

SSM provides a structured and systematic approach for analysing systematic human activities such as in the institution of education. Patel’s (1995) paper discussed that SSM can be used to conduct a self-audit of the teaching and learning strategies used to deliver academic subjects to students. A conceptual model had been created and compared with the real world situation. The same article demonstrated that the process of teaching and learning could be improved by using the soft system methodology for analysing the areas of concern. The context of the paper focused on the perspectives in three relationships viz. the lecturer, researcher and students.

Figure 3-2 The conventional seven-stage model of SSM (adopted from Checkland and Scholes, 1990 and Wilson 1984, p.196)
SSM outlines seven stages in the inquiry process. Figure 3-2 illustrates these stages adopted from Checkland and Scholes (1990), and Wilson (1984). Checkland (1981) stated that soft system methodology is a learning system, which uses system ideas to form fundamental thinking. Output from the Soft System Method gives a choice, a prediction, a comparison or a decision to be made. The output of the SSM is very different from other methodologies. The output is all about identifying improvements from which certain actions follow but which do not necessarily lead to a final solution of the problem. SSM output leads only to specific changes and understanding in a specific situation. Thus, SSM is very suitable for understanding complex and complicated problems in specific situations in the real world. The situation is based on what the researcher is aware of and has interpreted from his/her own views regarding standards and values.

The importance and elegance of the method of understanding influences in this study can be found in the use of this root definition of SSM. Urquhart et al. (2008) suggested that SSM is a very useful lens through which to view ICT projects in developing countries, especially because it provides a number of analytical frameworks that can be applied at the project level. The definition of SSM considers the relationships and interaction between the customers, the actors, the researchers as owners and the situation constrains. The analytic lens, generally, from on-line learning style theories can be presented in a rich picture format as has been done in Figure 3-3 in this research.

Figure 3-3 identifies the areas of concern related to IT courses within Songkhla Rajabhat University. For this study, systems thinking has provided a lens through which we can conceptualise and understand the sense of how the problem is constructed and educationally based on a compulsory course in the university. The idea is to emphasise the potential of adapting on-line LMS courses from the students’ perspectives. The context is undergraduate education and includes the teachers and the learners who are actively using LMS applications. The learning context is described as a combined interaction where students work on-line in a face to face laboratory session. This satisfies the demand for flexibility and convenience in their education.
Checkland’s systematic approach proposes a consideration of the whole, which leads to an understanding of the parts. The precise meaning of each part cannot be understood until the whole system is also understood. This research thesis attempts to look at the whole learning cycle of course design and delivery to give the teacher an opportunity to improve the learning outcome iteratively (e.g. semester by semester) for any one of the different academic disciplines. Thus, the research takes into consideration the additional understanding gained by the students when the course material is presented in their preferred learning style and media preference. Only first four main stages of the SSM will be used to address the research problem, which includes (i) finding out about a problem situation, (ii) formulating relevant purposeful activity models, (iii) debating the situation, and (iv) proposing the models.
Learning on an LMS requires the teacher to have a strategy for instructional design which has to be formed using knowledge and experience from both Educational and Information System rationales. This research aims to inform that strategy. The researcher will also aim to ensure that this strategy benefits the learning outcome from a student point of view. The use of the SSM framework offers helpful guidelines to help the researcher make sense of all the many different actions that can occur within the whole learning cycle. In this research case the researcher is also the problem owner who has been, and will continue in the future to be, responsible for academic progress, learning material development and student support within the university described in the research.

The first and second stages in the SSM identify and express the problem. The problem in this research study is to know how to provide suitable media and material which is compatible to the learning style of any particular group of students using an LMS. The context is a situation in higher education in Thailand where attempts are made to design and develop an effective strategy that allows teachers to design instructions and materials which will be appropriate for the common learning styles within three academic disciplines. The idea is to deploy this strategy for use, not only just for on-line learning but also for the particular case which blends face to face classroom teaching with on-line learning within a laboratory (blended learning). Following SSM terminology the “owner”, in this case, is the faculty who develops the curriculum and controls the on-line systems. The “initiators” or “actors” are the teachers who are actively involved in the design and delivery of the content (i.e. the materials and activities) of the on-line course and the “customers” are the learners who interact in a group learning setting.

The third stage of the SSM is to derive a root definition that captures the core purpose of the relevant system. CATWOE is an acronym derived by Checkland and Scholes (1990) to depict the interactions in the overall system. Using the CATWOE in this research the root definition is formulated for LMS learning as follows:
Customer: Learners
Actor: Teacher
Transformation: Course delivery to group learners
Weltanschauung (world view): Making LMS suitable for group of learners
Owner: Curriculum of course provided by faculty
Environmental Constraints: Blended learning, required course, material, media and culture

A root definition, for this research, could, therefore, be described as follows: “a learning management system (LMS) which delivers information in the media and materials which suit whole groups of learners.” The teachers ought to, eventually, become familiar with identifying the learning styles, learning processes and learner motivations of the students who take the required courses that they teach. The whole process of finding a strategy is potentially useful to the whole faculty for delivering any curriculum or course in a blended learning context.

Stage four of SSM focuses on a conceptual model that shows the essential activities involved in teaching using the LMS. While the root definition shows what an LMS is, the conceptual model shows what it does. This research uses the model as a source of questions to be asked of the problematical situation, by highlighting them from the students’ perspectives.

This research could also be continued by using the conceptual model in stage four to outline a further action research area but this is beyond the bounds of this current research. This researcher can, therefore, only provide an overview of the possibilities of how stages 5, 6 and 7 could be used for further research investigation. The possibilities are as follows:

Stage five of a SSM has the possibility of comparison with the real world of teaching and learning once the conceptual model has been completed. However, there can be no comparison between the conceptual model and the real world if the conceptual model is incomplete. The complete model needs to take account of the interactions between the student and teacher. In contrast, this current research is limited to only the interactions between the students and the system. The teacher acts as a stakeholder who can only support the system and be willing to provide the right kind of the materials and media. This current research cannot provide a comparison of the process and thus stage five cannot be completed.
Stage six of an SSM aims to bring about improvements to the situation. It is achieved by communicating and debating any changes that are needed. When the theoretical model shown in figure 3-4 is compared with the real world, it may introduce different procedures and information which are actually a personal reflection of the course designers. The information concerning student understanding, available teaching, learning resources (content), and the study environment (context) can be haphazard and a comparison of the conceptual model with the real world permits the analyst to debate any recommendations for appropriate activities which will make improvements in the area of concern.

Consequently, in any improvement of the process of on-line teaching and learning for a particular system for each academic group, the analyst is required to intervene in the actual process in the real world. The system designer then needs to implement the appropriate agreed actions to improve the area of concern. This is referred to as stage seven of the SSM.

In summary, a possible model of the learning process can be drawn up as shown in figure 3-4. The figure, based on an SSM, offers a unique perspective which reflects the real situation arising out of the theoretical perspective. It shows that an SSM can be a well-developed methodology for dealing with complex systems in which people are involved (Witkin et al., 1977). It can depict the different views of the particular stakeholders and show the concept of the whole process. The current research is contained within the theoretical perspectives, shown by the dashed rectangle, which look at how teachers could: (i) know about individual learning styles, (ii) determine learning styles common to whole groups or academic disciplines, (iii) know about their students’ activity preferences, (iv) know about their student media and material preferences and (v) know about how students learn on the LMS. Moreover, other factors may emerge in the process of this current research such as cultural considerations and learning backgrounds, and the students’ attitudes to possible obstacles and the challenges that may arise in using the LMS.
Yin (1994) suggests that there are three principles of data collection for case studies: using multiple sources of data, creating a case study database and maintaining a chain of evidence. The rationale behind the combination method of evidence is to collect multiple sources of data. The method can involve both quantitative and qualitative data collection and checking the reliability of the data and the process required in gathering them (Tellis, 1997). To justify the use of a case study approach this researcher had to ensure that the range of data that would be selected in each case was sufficient to explore the processes going on in the case and also sufficient to demonstrate any similarities or differences between the cases. The data set chosen should, therefore, be enough to test and develop a theory and give an explanation to account for any similarities and differences found within a particular context (Mason, 2002). The cases in this research were each selected from a different academic discipline to suit the main purpose of this research.
Figure 3-4 showed that five aspects are needed to establish a complete research answer. These aspects include (i) to know about individual learning styles, (ii) to determine whether learning styles could be common to whole groups or academic disciplines, (iii) to have an understanding about activities that students prefer in learning (iv) to have an understanding about their media and materials that students prefer in learning and (v) to understand how these students learn on the LMS. The objectives of the questionnaire survey (one category of the data set) were to identify the student’s individual learning styles and to explore further general information that could be relevant to a student’s learning process on the LMS. The questionnaire survey aimed to gather data relevant to aspects (i) and (ii), and some parts of (iii) and (iv).

The questionnaires were separated into two parts: (i) general questions, and (ii) Learning Style Inventory Questionnaires. The general questions section included general questions about desktop and internet skills\(^1\) and what media and activities they consider will be useful in an online course. The questionnaires were formulated on the basis of literature review of this research. The Learning Styles Inventory Questions came directly from Markova’s (1991) study which aimed to identify personal learning styles. The questionnaire survey alone cannot answer all the research questions and a further set of data was needed to provide more sufficient information to interpret the main focus of this research. Therefore interviews were used to elicit further information relevant to aspects (iii), (iv), and (v) above.

Similar to questionnaire survey construction, putting together an interview protocol demands careful consideration of what information is being sought from the interviewee(s) and how this information can be extracted (Fontana & Frey, 2000). The preliminary stage of the interview preparation began by outlining the theoretical basis of the study. This researcher interviewed students in three academic fields based the survey results from Tongkaw and Wood (2009a) who identified that students could be classified into three major discipline groups based on commonly identified learning styles. The researcher carefully developed a list of interview questions before conducting the interviews. The interview questions were directly informed by the literature reviews in the main areas: learning styles, learning process and media and

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\(^1\) The Desktop skills and Internet skills questionnaires were prepared by Masspro, the Medicare Quality Improvement Organization for Massachusetts, under contract with the Centers for Medicare & Medicaid Services (CMS), an agency of the U.S. Department of Health and Human Services. The contents presented do not necessarily represent CMS policy.
material. Students were openly invited to take part in the interviews by their class teachers and the interview cohort was then selected on the basis of those who responded.

There are differences between structured interviews and unstructured interviews. The structured interview is useful when researchers are aware of what they do not know and therefore are in a position to frame questions that will supply the knowledge required. In contrast, an unstructured interview is useful when researchers are not aware of what they do not know, and therefore, rely on the respondents (Cohen et al., 2007; Lincoln & Guba, 1985: p.269). The research employed unstructured interviews, which were designed to be essentially heuristic and seek information to develop a theory, rather than a collection of facts and numbers. All the interviews were conducted after students finished their laboratory class that the students were actually doing the on-line course. The interviewees were allowed to talk freely with candour, richness, depth, authenticity and honesty about their learning experiences on the LMS.

There were several recording materials used in this interview process. The researcher used an electronic recorder because it is more convenient and backups can be made easily. The researcher was concerned about the validity and security of all data collected from case studies and so a data backup was kept in order to protect the data from loss. Although interviews are one of the most important data acquisitions in case study research, this research also made use of participant observations made by the researcher during on-line learning sessions to gather a further set of data. These observations were made without any bounds and just formed a record of anything in the laboratory session.

These observations add richness to other collected data and may help to form the whole picture when thinking about learning preferences which distinguish one group from another. Thus the data set of participant observations may help in finding or confirming the important key of the research findings.

Marshall and Rossman (2006) noted that it is important not only to try to identify or discover important variables and to generate hypotheses for further research, but also to explain the forces causing the phenomenon in question. The purpose of this research is to explain the phenomenon of how students have certain preferences to learning styles when studying on-line using the LMS. This explanation is likely to be formed more confidently by depending on
the various data collection methods described above and the checks made by the researcher on their validity and reliability.

3.7 Data Collection

This research was conducted by using qualitative methodologies and here are various methods of data collection such as personal interviewing, telephone, mail and the Internet. The data collection was divided into two parts and in summary this researcher used an electronic survey questionnaire while the data collection interview was conducted by semi-structured interview method and was recorded electronically. Depending on the research methodology, data collection methods can be used separately or combined. Interviews and focus groups are the most common methods of data collection used in qualitative education research. In particular, interviews can be used to explore the views, experiences, beliefs and motivations of the individual participants.

Yin (2003) notes that a researcher may use multiple strategies in any given study; for example a survey within a case study or a case study within a survey. In this particular research surveys were proposed within the overall case study which is an understanding of the relationship between learning styles and the major discipline groups at Songkhla Rajabhat University. Research that is able to clarify situations using a specific strategy has a distinct advantage (Yin, 2003).

This researcher combined the results from questionnaire surveys and interview data for interpretation in the same template. According to Parikh (2002), two major sources of data may be used in a case study; a first data source and a second data source. The first data source is anything collected directly by the researcher and in this research includes the questionnaire surveys, the interviews and the observations. The second data source is material originally generated for a different purpose but becomes useful as a reference for the study such as a course outline which in this case gives an outline of the course instructions and this could provide benefits to the researcher when writing up and analysing data for each case (Eisenhardt, 1989).
3.7.1 First Data Sources

3.7.1.1 The questionnaire survey

In this research, the researcher had little control over the learning events along the course of the study and the research focused on the interpretation of phenomenon within a real learning process and therefore a case study is the most adequate method for investigating the research questions.

This research utilised an electronic survey, through the LMS, at the beginning in order to find out what experience the undergraduate students had in web-based learning.

The survey took place via the LMS in June 2007 and the results led to an in-depth investigation which increased the understanding about the current situation of e-learning in this university. The questionnaire was separated into three parts: previous background in using IT, previous IT learning skills and preferred learning styles. The survey responses were collected from undergraduate students who took the basic IT course over one semester. The survey respondents came from a variety of academic disciplines which were: Health Science, Chemistry, Information Technology, Social Development, Computer Science, Management, Communication and Human Resources. The researcher generated the questionnaire and put it on the LMS at the beginning of the course. The respondents answered all the questions individually and were required to answer all the questions. If all the questions were not answered that questionnaire survey was removed.

3.7.1.2 Interview

The interview is a valuable qualitative method. Walsham (1995), notes that, for interpretive case studies, interviews are a primary data source because the researchers can best access and interpret the direct actions of the participants in the situations. An interview is a flexible tool for data collection, enabling multi-sensory channels to be used, both verbal and non-verbal, spoken and heard. The order of the interview may be controlled while still giving space for spontaneity and the interviewer can press not only for a complete answer but also for responses about complex and deep issues. This researcher chose semi-structured interviews because the flexibility of the technique allows the researcher to probe synchronously, to clarify and create new questions at the time of the interview. This flexible structured style of interview
allows the researcher to recognise statements which suggest further new questions or new perspectives of experience under investigation (Westbrook, 1994).

This research employed a semi-structured interview technique with an adequately defined set of interview questions. The interview questions explore the personal experience that students face during the LMS course. In order to perform a field test and validate the research intentions, this researcher developed several interview questions and circulated them amongst some fellow Thai, PhD students in Manchester who were all studying in different fields. After this pilot validation this researcher took the interview to Songkhla Rajabhat University to find the first five undergraduate students who took part in the interview process. After some further validation and some modifications the interview was then conducted with a further 29 undergraduate students. The interviews were arranged by telephone and email. The interviews were scheduled at a time and place convenient to the respondents. Generally, this researcher met students after the laboratory class. Before the beginning of the interview, the consent form was reviewed and signed by both the participant and the researcher. Each interview lasted from 45 minutes up to one hour. Using the interviewees’ advanced permission answers that were not entirely clear as the data was processed were clarified by sending some additional questions to those interviewees by email.

The main data collection came from interviews. The researcher divided interviewees into three groups in the major disciplines, Social Science, Management, and Science. They had all studied the Information Technology course on-line in the laboratory for two hours per week.

3.7.1.3 Participant Observation

The observations were a useful, additional source of data to support the interviews where distinguishing aspects of preferred learning resources could be seen more readily in the group situation. These observations were collected during the on-line laboratory sessions in the same period that the interviews were conducted. Participant observation allows the observer to investigate aspects of the project directly, through their involvement in the process of the project operations. This researcher attempted to observe some parts of the ongoing learning activities in order to investigate learning situations. In addition, observations of the on-line collaborations between the instructor and the students, in the laboratory, via the web discussion board were simply noted because, the researcher could not predict until the future
what would or would not be useful. This researcher also collected some completed on-line assignments arising from activities on the LMS and these formed a further part of the observation data and added richness of all the other first data sources. This researcher also accessed the web discussion board and took notes of the observations of student to student discussions while they were on the LMS.

The following factors, adapted from Creswell (1997: p.125), guided the approach to participatory observation:

a) *Identification of who or what, to observe, when and for how long:* the learning activities of students on on-line courses in the laboratory would be observed, including participations with the teacher and amongst the students themselves. (The observations took place in two distinct periods. The first period of time was during one intensive month in semester 1/2007 while this researcher was personally present observing students who had also been interviewed. The second period of time was much longer, over two years from semester 1/2007 until semester 1/2009 and the observations were made remotely from Manchester via an on-line internet link straight to the laboratory while the students were working. This was the period where more attention was paid to observing assignments and discussion board.)

b) *Role as observer:* The observer is ultimately the participant. In this research the participation was limited to observation without face-to-face interaction.

c) *Observation equipment:* this researcher took note and saved all the necessary information in electronic files.

Data from surveys, interviews and observations covered all of the research questions. However, this researcher referred to some secondary data sources synchronously with the primary data sources.

### 3.7.2 Second Data Sources

In addition to interviews which provided the main data source, this researcher attempted to obtain some complementary data. This second source of data came from institutional materials including curriculum documents, course outlines (Appendix B) and annual reports. Most of the documents referred to as second data sources in this thesis came from the Thai
government and the university, specifically, The Office of Academic Promotion and Registration, Songkhla Rajabhat University. This researcher reviewed a wide range of pedagogical and curricula information published by the university relating to development of key strategies, coordination of various courses and design of on-line systems. These documents were readily made accessible for the template analysis and were interpreted alongside the first data sources (King, 2004).

3.8 Overview of the Research Approach

Figure 3-5 outlines an overview of the entire research approach showing a) the steps of the research process with reference to the data collection process and b) and where this researchers experience and the literature survey specifically informed the study.

This research started with an initial research objective and three research questions. The researcher then carried out a literature review to determine the scope and the rationale of the study which led to the choice of an interpretive case study methodology. An interpretive case study needs various data types to support the findings of the research in order to answer the research questions. The research continued with a pilot study designed to test and refine the questionnaire and interview questions. A full questionnaire survey was carried out in 2007, and the personal interviews and a further questionnaire survey was carried out in 2008. All the data collected was interpreted in order to answer the research questions leading to an implied model and the conclusions of the research.
Figure 3-5 Overview of the Research Approach
3.9 Chapter Summary

This chapter describes the possible qualitative research methods that could be used in this research project and discusses the reasons for the selection of an interpretive case study approach in this Information Systems research and shows that it has been essential to choose an interpretive case study paradigm as the philosophical basis for this research. The chapter then examines how the data collected within this case study approach would be reliable, valid and generalisable and then explains how a Soft System Method (SSM), reported in the literature, can be used to create a rich picture to identify and state the problems and offer a conceptual model of the specific learning process in this context. Moreover this chapter describes the data collection techniques in more detail including the categories of data that would be needed to provide a rich description leading to confidence in the success of the results.

The next chapter goes on to describe the principles of data analysis, the data analysis techniques and the procedures planned for this research. Then, the results and implications of the research outcomes will be discussed.
4 Data Analysis and Results

The previous chapter described the research methodology and research methods that were designed to answer the research questions. This chapter provides the detailed methods of data analysis, the results from questionnaire surveys, the interviews, and the participant observations represented into the final theme. This chapter has two purposes; the first is to describe the terminologies and principles of qualitative data analysis with emphasis on template analysis theory. The introduction to template analysis theory includes details of the techniques of planning data analysis, the applied procedures, and the software used in qualitative data analysis. The second is to provide information about the research interpretations, and explanations, comparisons and justifications of the results that the researcher has collected. The findings of this research are presented as the outcome of the template analysis.

4.1 Introduction

The researcher’s methodological assumptions have been based on an interpretive case study as shown in the previous chapter. The researcher used mostly qualitative data from interviews as the first data source. This was backed up by quantitative data supplied by the pre-interview questionnaires. Statistical analysis of the quantitative data from the respondents was performed by using SPSS. Tables and graphs are presented to compare the important variables. The second data sources were obtained from institutional documents. Results from these different data sources were combined together and analysed by the template.

In this chapter, all the data sources were examined to create an overall picture of how the media and resources are related to learning style. This chapter describes the process of the template analysis and how all the data sources support each other in the interpretation and play equally important roles in obtaining insights.

After completing all the interviews with participants from three major academic disciplines and observing all the laboratory activities, the data showed a relationship between common learning styles which began to emerge through the major disciplines Science, Social Science and Management, and the media they preferred to use in the on-line LMS. Other underlying associations and connections were also seen between the major disciplines and the activities
they preferred to use during the process of learning. The template analysis used ‘NVivo’ software to show evidence of those patterns. Afterwards, the software was used to analyse the data. After all the stages of contextual analysis were complete, the researcher wrote a preliminary summary of the main concepts found.

Template analysis seems to be the best qualitative research approach with multiple data sources in the same template. Previous results published by the researcher were also used in the template analysis. After reaffirming that the research findings were answering the research questions and confirming the reliability, validity and inferences of the data, the analysis was considered to be complete. The most vital part of this research was then mobilising the findings into a discussion of the results and the report writing. Interpretive case studies are useful in that they can chronologically provide rich descriptions and narratives within the theme that may then be applied to any other situation in the same context.

4.2 Choice of Qualitative Data Analysis

According to Cohen et al. (2007), qualitative data analysis is a large and complex multidimensional method which involves seven steps: setting up units of analysis of the data; creating a domain analysis; establishing relationships and relativity between domains; making specific inferences; summarising; finding negative and miscreant cases; and generating theory. The choice of a method of data analysis needs to be guided by the methodological position of a piece of research, and its underlying epistemological assumptions. In this research the main interpretations are based on human behaviour which has to be understood and observed qualitatively rather than just reporting the facts. The qualitative data emerged in a variety of forms from interview transcripts to field observations and data from documents. The researcher concentrated on the interpretation of the data in terms of its meaning. To increase the authenticity of the interpretation, researchers need to make sure that the data in the research comes from first-hand experience and is also derived from a first-hand understanding of the participants world (Golden-Biddle & Locke, 1993). Therefore, the all interview transcripts in the source language (Thai) were organised in NVivo and then analysed and interpreted by the researcher who was also Thai. After the analysis, the interview data was then translated into English by the researcher for the purposes of the research report.
4.2.1 Different Approaches Resulted in Different Data Analyses

Table 4-1, Phelps et al. (2007), shows three different approaches to qualitative research. Each approach uses similar data types such as documents, pictures, video etc. but has a different objective and description and each approach has its own advantages and disadvantages. This research relied on the descriptive/interpretive approach, which provided insights into human behaviour or the student learning situation under study and provided a systematic and illuminating description of the phenomenon (Phelps et al., 2007). The next step for this research was to examine the interview text for topics or themes, break the text into segments that represent instances of those themes and attach to each a keyword or a code, and then bring together segments of text that deal with the same theme, i.e. groups of the same data.

<table>
<thead>
<tr>
<th>Research approach</th>
<th>Objective</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Language-oriented research approach</td>
<td>discourse analysis</td>
<td>• locating individual word and phrases to determine whether and how often, particular words or phrases are used/whether synonyms are used</td>
</tr>
<tr>
<td></td>
<td>ethnoscience</td>
<td>• creating word lists</td>
</tr>
<tr>
<td></td>
<td>structural ethnography</td>
<td>• creating indexing</td>
</tr>
<tr>
<td></td>
<td>symbolic interactionism</td>
<td></td>
</tr>
<tr>
<td>Descriptive/interpretive approach</td>
<td>seek to gain insight into the human phenomenon or situation under study and provide a systematic and illuminating description of the phenomenon</td>
<td>• examining a text for topics or themes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• breaking the text into segments that represent instances of that themes and attaching to each a keyword or code</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• bringing together segments of text that deal with the same theme i.e. retrieving group of 'like' data</td>
</tr>
<tr>
<td>Theory-building research approaches</td>
<td>seek connections within the data and aim to arrive at theories to explain the connections determining whether the data posses discernable structures or whether links exist between/among categories making propositional statements or assertions regarding the underlying principle</td>
<td>• locate or identify patterns, themes or underlying meaning in their data</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• make comments or notes about what is being implied or said</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• mark or extract segments of data which represent meaningful units such as a quote video extract or audio clip</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• attach extracts to categories(Coding and categorizing) while maintaining a connection to the original source (Categories might be developed before interacting with data or if using 'grounded theory' will emerge from the data themselves)</td>
</tr>
</tbody>
</table>

Table 4-1 Approaches to qualitative research and analysis (Phelps et al., 2007)
The template analysis, initially introduced by King (2004), employed NVivo software to organise the data and facilitate the analysis. King’s template analysis framework is a generic method providing a versatile means for qualitative analysis, rather than being a highly specific technique. It provides a procedural structure to which the researcher can apply the data. Therefore, it can be applied to a wide variety of qualitative methods of data collection with differing aims and objectives. It should be remembered that qualitative studies are often concerned with exploring and investigating a particular phenomenon deeply. Thus, the chosen approach should be taken into account when analysing qualitative data.

4.2.2 How NVivo Supports Qualitative Data Analysis

NVivo is a tool that can increase the effectiveness and efficiency of data analysis. Data records can be sorted, matched and linked and then harnessed by a researcher to assist in answering the research questions, without losing access to the source data or the contexts from which the data have originated (Bazeley, 2007).

The research used NVivo to manage and organise all the data which helped to keep track of disordered records such as raw data files from interviews, questionnaires, field observations and other documentary sources which could be used when producing the report. The researcher also took into account the preliminary notes and information about data sources. The researcher used a graphic model to show the cases, ideas and concepts being built up from the data, and the relationships between them, and to present those ideas and conclusions visually. NVivo can also provide themes from the raw data which can be reported and this was the basis of the outline of this chapter.

4.2.3 Template Analysis

Template analysis can be employed to analyse any form of textual data. In this section the researcher presents the results from the cases of an interpretive case study and discusses the key findings from the cases based on the research questions. The researcher used template analysis to examine the thematic relationships between learning style, learning process, media and the materials and activities which may be preferred in particular major disciplines. Template analysis has many techniques for thematically organising and analysing textual data from the interviewees. The essence of template analysis is that the researcher produces a list of codes in a hierarchal form which are added to the body of the text during the initial reading.
and interpretation (King, 2004; Miles & Huberman, 1994). Thematic, or template analysis, provides a structure of categories that can capture the richness of data. It helps to organise the collected data into a structure in which the higher-order codes provide a broad overview of the direction of the interview and the lower-order codes detail distinctions within that structure.

Template analysis allows the researcher to define a number of themes that reflect ideas that are considered to be significant to the aims of the research project before beginning the process of constructing a coding template. The research draws on previous studies to build the initial template. These themes are provisional and open to modification or even deletion as the coding template is developed from its initial form to the final version.

Template analysis was selected for this study for numerous reasons. Firstly, the literature review pointed to the use of a case study to the researcher to examine any themes emerging between major discipline cases. Secondly, template analysis is flexible in terms of being able to consider multiple data sources, i.e. both qualitative and quantitative data sources in the same template. Thirdly, template analysis is useful where the researcher seeks to discover how the participants describe and make sense of particular elements of their learning, rather than attempting to quantify the experience (King, 2004). Using template analysis as opposed to content analysis allows a more in-depth understanding. Rather than simply examining the frequency of codes in the way done by content analysis, template analysis encourages further development by exploring the meaning of the data and adding additional codes. This was more constructive as it allowed for processing the issues that occur in the interviews and refining the interpretations of the final template.

Template analysis works particularly effectively with small data sets and when comparing two or three data sets when the researcher knows precisely what they are looking for (King, 2004). Therefore, this method is ideal for comparing the data sets grouped into the three different major disciplines in the special context of this interpretive case study. As noted before, the exploratory issues across the major disciplines include the differences in learning styles, learning processes, and preferences for media types and activities. This study aims to capture an in-depth insight of the three cases by cross-examining the collected data and discussing the analysis in the themes which gradually emerge from the template analysis and the cross case examination.
Through cross case analysis, the researcher then compared the main themes and patterns that have emerged as a result of the template analysis right through from the initial template, revising the template, and refining the final template. NVivo software allows the researcher to do this and to create possible relationships between different emerging themes.

4.2.3.1 Creating the initial template

All the transcripts were read before the initial stage of coding and the meaning was reinforced by listening to the audio recording of the interviews because intonations of speech can highlight different meanings and emphases that may be missed through reading alone. The researcher created the initial template based on the practice of existing theories found in the literature survey (Appendix A). Table 4-2 shows how the existing theories have been presented into practical categories by various authors. Thematic or template analysis works particularly well with a number of theoretical frameworks at once.

<table>
<thead>
<tr>
<th>Authors, year/Categories</th>
<th>Student characteristics</th>
<th>Satisfaction on web-based courses</th>
<th>Student Motivation /Student need</th>
<th>Achievement</th>
<th>Attitude</th>
<th>Computer skills</th>
<th>Learning Styles</th>
<th>Prior learning experiences</th>
<th>Learning outcomes</th>
<th>Design of Related tasks</th>
<th>Available resources</th>
<th>Individual/group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bach et al. (2007)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dupin-Bryant and DuCharme-Hansen (2005)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shih and Gamon (2001)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beffa-Negrini et al. (2002)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Goold and Rimmer (2000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hu et al. (2007)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4-2 Important categories relating to how students perform with the LMS

Regarding Table 4-2, the initial template was constructed and coded based on the categories listed below.

- Student characteristics
• Satisfaction on web-based courses
• Student Motivation / Student need
• Attitude
• Achievement
• Computer skills
• Learning Styles
• Prior learning experiences
• Learning outcomes
• Design of Related tasks
• Available resources
• Individual/group

The research focused only on the student’s own perspectives and did not include external factors such as staff skills or the design of the on-line environment. These were considered to be the main relevant factors involved in learning with the LMS.

4.2.3.2 Revising the template

The initial template was modified to a second template, after the researcher read through all the transcriptions, descriptive statistics and observation notes again. The researcher needed to clarify any ambiguous phrases, sentences or paragraphs in the interview transcriptions and needed to become clear about how long a coded sentence or phrase had to be in order to represent any real meaning. Sentences and phrases could be used in the template in more than one place. This work of reorganisation resulted in the second template (Appendix G).

4.2.3.3 Refining the final template

The second template was now examined to find coherent coding across the categories that would produce evidence of emerging themes. On this basis categories were either subdivided and renamed or combined and renamed to reflect the processes of or relationships between the emerging themes. Therefore the final template became the clearest representation of the themes that became the final outcome of this research.

4.2.4 Steps of Data Analysis by Template Analysis and NVivo

Table 4-3 demonstrates the interpretive philosophy involved in processing qualitative data to find meaningful and symbolic content. The table shows the seven steps created by the researcher based on the principles of the theory of template analysis (King, 2004) using NVivo software.
<table>
<thead>
<tr>
<th>Stage</th>
<th>Aim</th>
<th>Description</th>
<th>Resources</th>
</tr>
</thead>
</table>
| **Stage One: Description** | To develop thorough and comprehensive descriptions of the phenomena under study | - Thick description encompasses information about the context of an act, the intentions and meanings that organise action, the intentions of the actor, and the process in which the action is embedded  
- Blind personal information by using code to represent personal perspective. | - Transcripts  
- Observation notes  
- Results from survey |
| **Stage Two: Reading and annotating** | To draw the relationship between each code. | - Active reading to comprehend  
- Annotate to begin to open up the data  
- Write the research initial thoughts, ideas and comments on the memo  
- Start to make maps of some of the themes that might emerge | - Transcripts  
- Observation notes  
- Results from survey |
| **Stage three: Finding a focus** | To answer the research question and map between data and existed theory. | - Think about the research questions, or the sensitising concepts that may be important.  
- Create first template from existed theories. | - Literature Review  
- Initial template |
| **Stage four: Categorising the data** | To categorise the data | - Involves differentiating between the included and the excluded: a conceptual and empirical challenge  
- Some resources for generating categories are: inferences from the data; initial or emergent research questions;  
- Substantive theoretical or policy issues;  
- Imagination; intuition and previous knowledge.  
- Create sub categories by suing first template.  
- Step in the coding process | - Initial template  
- Transcripts  
- Observation notes  
- Results from survey |
| **Stage Five: Assigning data to categories** | To assign data to categories. | - Need to be clear about what constitutes a 'bit' of data. Sentence phrase, paragraph  
- Look at notes/ | - Second template  
- Transcripts  
- Observation notes  
- Results from survey |
<table>
<thead>
<tr>
<th>Stage Six: Manipulating categories</th>
<th>To manipulate categories from existed data.</th>
<th>annotations made on the text</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>• Make decision about categorising sequentially or selectively</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Decide about ambiguous categorisation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Decide about multiple categorisation of data bits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Splitting subdividing categories</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Splicing: join categories together</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Key issues are how distinguishable conceptually are the new categories? Is there any overlap? What led to their emergence? Are there any categories overloaded? Do they look right?</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Final template</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Transcripts</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Observation notes</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Results from survey</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stage Seven: the next stages</th>
<th>To seek corroboration of categorisation to produce an interpretation issues.</th>
<th>results from survey</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Making connections between the data once categorised: this depends on the particular method of analysis chosen</td>
<td>Final template</td>
</tr>
<tr>
<td></td>
<td>• Seeking corroboration of categorisation</td>
<td>Transcripts</td>
</tr>
<tr>
<td></td>
<td>• Producing an account (interpretation process)</td>
<td>Observation notes</td>
</tr>
<tr>
<td></td>
<td>• Organising and presenting analysis</td>
<td>Results from survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>New Model</td>
</tr>
</tbody>
</table>

Table 4-3 Seven major stages of template analysis with NVivo

4.2.5 Organising and Presenting Results

This research requires that all the collected data concerning learning styles demonstrates wholeness, coherence and integrity and this is done by interpreting all the data sources in the same template. This chapter presents the comparative results as a final theme of the template analysis.

The research highlights the emergence of common learning styles which could be seen the three major discipline groups. The results of this research were interpreted by the theoretical perspectives, shown by the dashed rectangle in the conceptual model in Chapter 3 (Figure 3-4), which shows how teachers could: (i) know about individual learning styles, (ii) determine
learning styles common to whole groups or academic disciplines, (iii) know about their students’ preferred activities (iv) know about their media and material preferences and (v) know about how students learn on the LMS. Moreover, other factors have emerged in the process of this current research such as previous learning experience, students’ attitudes towards technology, possible obstacles towards learning and the challenges that may arise in using the LMS.

The following sections describe the interpretation of the results showing all the categories that appeared in the final template which provided a clear, organised, and final account of the study (King, 2004).

4.3 Group Learning Styles between Major Disciplines

This section describes how the researcher determined individual learning styles and also determined learning styles that applied to whole groups or academic disciplines of students.

4.3.1 Determine Individual Learning Styles

The main purpose of the questionnaire surveys was to find information about the student’s learning situation in one on-line course in Songkhla Rajabhat University in order to determine individual learning styles. The set of factors that influence the situation when students learn on the LMS include: familiarity with desktop skills, familiarity with internet skills, learning activities that help understanding on the IT course, media that support learning on this course and individual learning styles. Markova’s (1996) Learning Styles Inventory Questions were then used to identify learning styles which may be common to the whole group. Specifically, this study set out with the purpose of investigating possible common learning styles and, by using the questionnaire survey results, ended up discovering that grouping students into major disciplines showed the clearest patterns of common learning styles. Interpretations from both the questionnaire surveys and the interview data showed that, there was a relationship between the background computer skills of students and their learning proficiency with on-line systems and that students had certain personal preferences of media and on-line activities.

412 voluntary on-line questionnaire surveys were posted on the LMS between June 2007 to September 2007 and successfully received back from 396 students who studied basic IT courses (Appendix C and Appendix D). The Table 4-4 shows the amount and percentage of
undergraduate students who undertook the basic IT courses classified by discipline. Table 4-5 shows the amount and percentage of undergraduate students who studied basic IT courses classified by gender.

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Science</td>
<td>34</td>
<td>8.6</td>
<td>8.6</td>
<td>8.6</td>
</tr>
<tr>
<td>Chemistry</td>
<td>22</td>
<td>5.6</td>
<td>5.6</td>
<td>14.1</td>
</tr>
<tr>
<td>Information Technology</td>
<td>47</td>
<td>11.9</td>
<td>11.9</td>
<td>26.0</td>
</tr>
<tr>
<td>Social Development</td>
<td>103</td>
<td>26.0</td>
<td>26.0</td>
<td>52.0</td>
</tr>
<tr>
<td>Computer Science</td>
<td>40</td>
<td>10.1</td>
<td>10.1</td>
<td>62.1</td>
</tr>
<tr>
<td>Management</td>
<td>45</td>
<td>11.4</td>
<td>11.4</td>
<td>73.5</td>
</tr>
<tr>
<td>Mass Communication</td>
<td>26</td>
<td>6.6</td>
<td>6.6</td>
<td>80.1</td>
</tr>
<tr>
<td>Human Resource</td>
<td>54</td>
<td>13.6</td>
<td>13.6</td>
<td>93.7</td>
</tr>
<tr>
<td>Social Science</td>
<td>25</td>
<td>6.3</td>
<td>6.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>396</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-4 Amount and percentage of undergraduate students studied basic IT course classified by discipline in 2007.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>308</td>
<td>77.8</td>
<td>77.8</td>
<td>77.8</td>
</tr>
<tr>
<td>Male</td>
<td>83</td>
<td>21.0</td>
<td>21.0</td>
<td>98.7</td>
</tr>
<tr>
<td>No Answer</td>
<td>5</td>
<td>1.3</td>
<td>1.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>396</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-5 Amount and percentage of undergraduate students studied basic IT course classified by gender in 2007.

4.3.2 Common Learning Styles

In 2007, the Information Technology course (4000107) was provided for students in nine academic disciplines. With reference to the work of Tongkaw and Wood (2009a), common learning styles appeared when combining those nine academic disciplines into three major disciplines structured and combined as follows: a) Science[SC] (Health Science, Chemistry, Information Technology and Computer Science); b) Social Science[SS] (Social Development and Social Science); and c) Management[MT] (Management, Communication and Human Resource). Table 4-6 shows the numbers and percentage of undergraduate students who studied the IT course classified by the three major disciplines. In Songkhla Rajabhat University, each major discipline contains students who come from similar academic backgrounds taking the same entrance test and following the same core courses in the same curriculum.
<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.00*</td>
<td>143</td>
<td>36.1</td>
<td>36.1</td>
</tr>
<tr>
<td>2.00**</td>
<td>128</td>
<td>32.3</td>
<td>32.3</td>
</tr>
<tr>
<td>3.00***</td>
<td>125</td>
<td>31.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>396</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

*1.00: [SC] Health Science, Chemistry, Information Technology and Computer Science.
**2.00: [SS] Social Development and Social Science
***3.00: [MT] Management, Communication and Human Resource

Table 4-6 Amount and percentage of undergraduate students studied basic IT courses classified by subject area in 2007

The survey results in 2007 showed that common learning styles appeared in the three major disciplines. For the purposes of this research the common learning styles identified in each of the three major disciplines are simply defined as Group Characteristics. The results from the published 2007 survey are shown in the following table and graph.

<table>
<thead>
<tr>
<th>Student’s field</th>
<th>Visual Learning Styles</th>
<th>Auditory Learning Styles</th>
<th>Kinaesthetic Learning Styles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science[SC]</td>
<td>42.10</td>
<td>32.27</td>
<td>25.63</td>
</tr>
<tr>
<td>Social Science[SS]</td>
<td>40.97</td>
<td>28.11</td>
<td>30.92</td>
</tr>
<tr>
<td>Management[MT]</td>
<td>43.00</td>
<td>29.67</td>
<td>27.34</td>
</tr>
</tbody>
</table>

Table 4-7 Percent of each learning styles (VAK) separated by major discipline in 2007.

Figure 4-1 Percent of particular learning style separated by major disciplines published in 2007.

According to Figure 4-1, students who were in the Science [SC] discipline predominantly preferred visual, auditory and kinaesthetic learning styles (VAK), respectively, students who
were in the Social Science [SS] discipline preferred visual, kinaesthetic, and auditory learning styles (VKA), respectively and students who were in the Management [MT] discipline preferred visual, auditory and kinaesthetic learning styles (VAK), respectively.

The Learning Styles Inventory questions were repeated in 2008 to confirm the data published by the same researcher in 2007. The number of participants who participated in the survey in 2008 are shown in the following table.

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Science[SC]</td>
<td>114</td>
<td>63.3</td>
<td>63.3</td>
<td>63.3</td>
</tr>
<tr>
<td>Social Science[SS]</td>
<td>26</td>
<td>14.4</td>
<td>14.4</td>
<td>77.7</td>
</tr>
<tr>
<td>Management[MT]</td>
<td>40</td>
<td>22.2</td>
<td>22.2</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-8 Number and percentage of undergraduate students studied basic IT course classified by major discipline in 2008.

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid Percent</th>
<th>Cumulative Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Valid Female</td>
<td>57</td>
<td>31.6</td>
<td>31.6</td>
<td>31.6</td>
</tr>
<tr>
<td>Male</td>
<td>118</td>
<td>65.5</td>
<td>65.5</td>
<td>97.1</td>
</tr>
<tr>
<td>No Answer</td>
<td>5</td>
<td>2.7</td>
<td>2.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>180</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

Table 4-9 Number of undergraduate students studied basic IT course classified by gender.

<table>
<thead>
<tr>
<th>Student's Field</th>
<th>Visual Learning Styles</th>
<th>Auditory Learning Styles</th>
<th>Kinaesthetic Learning Styles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science[SC]</td>
<td>50.50</td>
<td>25.20</td>
<td>24.30</td>
</tr>
<tr>
<td>Social Science[SS]</td>
<td>50.00</td>
<td>15.00</td>
<td>35.00</td>
</tr>
<tr>
<td>Management[MT]</td>
<td>46.80</td>
<td>31.90</td>
<td>21.30</td>
</tr>
</tbody>
</table>

Table 4-10 Percent of each learning styles (VAK) separated by major discipline in 2008.
Table 4-10 shows the results found in 2008 and the plotted bar graph is shown in Figure 4-2. The results found in 2008 confirmed the results previously published in 2007. There were similar orders of preferences in the same major disciplines in both sets of results (2007-2008); for example, students who were in the major discipline of Science and Management prefer mostly visual, then auditory and then kinaesthetic learning styles (VAK), respectively whereas, in contrast, students in the major discipline of Social Science prefer mostly visual, then kinaesthetic and then auditory (VKA) learning styles. Thus the media or resources in the course could be arranged according to these learning style preferences.

With regard to the results, this research found that learning style of the Management and Science students is predominantly VAK which is the “show and tell” style described in Markova’s stacking (Markova, 1996). The characteristics of this group of learners are that they write logically; they show and illustrate ideas; they connect best by eye contact; they organize in lists; they learn easily by reading and teaching others; they love visual detail; they read everything; they are persuasive speakers; they like to teach, explain, and tell stories; they like to talk out loud to sort their ideas and make decisions; they may only have sketchy sense of their own body, move awkwardly and find physical activities frustrating; they are shy about touching and are private about their feelings.
The predominant learning style characteristics of the Social Science group show up as VKA or the “great collaborators” described in Markova’s stacking (Markova, 1996). The characteristics of this group of learners are that they write logically; they may like to draw and design; they connect best by eye contact; they are visually meticulous; they organize in lists; they learn easily by reading or watching then followed by doing; they learn sports easily; they like competitive sports; they may get others’ feelings confused with their own; they are talkative one-on-one; they are uncomfortable speaking in groups; they ask a lot of questions; they may have trouble with prolonged listening, they speak quickly and abstractly; they are sensitive to voice tone.

This researcher selected a group of interviewees (from undergraduate students who took the IT course in 2007-2008) from each of the three major disciplines. The interviewees included Science students [SC], Social Science students [SS]; and Management students [MT].

Thirty-four students participated in the in-depth interview part of this research. They were all first year undergraduate students at Songkhla Rajabhat University. Most of them had studied at least one Information Technology course beforehand. During the on-line activities using the LMS, the researcher observed two ways learning between teacher-students and students-students. Table 4-11 shows the number of interviewees in each academic field separated by gender.

<table>
<thead>
<tr>
<th>Student’s Field</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science[SC]</td>
<td>2</td>
<td>5</td>
<td>7</td>
</tr>
<tr>
<td>Social Science[SS]</td>
<td>8</td>
<td>11</td>
<td>19</td>
</tr>
<tr>
<td>Management[MT]</td>
<td>2</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>12</td>
<td>22</td>
<td>34</td>
</tr>
</tbody>
</table>

Table 4-11 Number of interviewees in each academic field separate by gender.

Thirty-four participants were willing to volunteer to have a face-to-face interview. Before conducting the interview, the interviewee had the opportunity to read the objectives of the research and sign a consent form. The interviewer conducted the in-depth interviews after the course had finished and the semester had ended.

When the student responses were translated from Thai to English for the purposes of this report all names were left out to ensure anonymity. The information from the interviews was then kept in a coded reference format which showed the major discipline group (denoted by SC=Science, SS=Social Science, MT=Management) followed by the participant number and a
4.4 Categories of Factors that Affect Group Learning

This section moves on to present the main interpretations of the results and look at all the categories of factors that affect student learning in that emerged this special context. The results in the final template were presented in the following categories of factors: attitude towards technology, previous experience with computer technology, learning process, media preferences, learning activities, obstacles to learning, and challenges to learning. The purpose was to explore patterns that emerged according to the major discipline groups.

4.4.1 Attitudes toward Technology

The students who participated in this research all came from many different academic discipline but they all studied in the same compulsory IT course. The researcher asked some general questions in the interviews about the IT course. However, during the course of analysis the researcher was then able to develop a much fuller picture regarding their attitudes towards this technology. The attitudes which emerged are described more specifically in the following sub-sections.

4.4.1.1 Convenience

Learning on web-based systems is convenient and fast in terms of interaction and response. The LMS supports asynchronous and real-time learning and can be accessed via the Internet and, therefore, hence a learner can gain access to learning without any spatial and/or temporal constraints. In most of the responses, learners preferred the LMS because it provided them with a learning delivery course that is more convenient, fast and interactive [MT07_1; SC03_1; SS01_3; SS02_1; SS04_1; SS06_1; SS07_2; SS08_1; SS11_2; SS14_1; SS14_3; SS12_1; SS18_1].

“I like learning on the LMS because it's convenient. I've opportunities to access the resources and consult my teachers on-line, when I have any problems I can ask them. They will give clear instructions, how to do it, in which chapter, and I will know the deadline of assignment, I can manage it.” [SS08_1]

Moreover, some students agree that the LMS makes learning easier and better than face-to-face teaching [SS12_1].
“…when I upload, it’s very fast, we have lots of time to think before doing the homework. We can do assignment at home.” [SS04_1]

Students were also able to submit prepared work for teachers to give feedback by uploading files. This also gave them the opportunity to view work they had previously done and read the feedback given by their teachers. However, the use of the LMS has also helped them to move away from purely individual learning which limits resources to the individual and does not support development of shared mental models. The LMS has offered them a collaborative working environment where students may discuss ideas with each other which results in improved outcomes for all involved students. Moreover, the LMS particularly supports the development of shared knowledge and gradual involvement with new contributions to a knowledge repository.

“I have got new knowledge about IT that I have never learnt before. I have never learnt this from any other virtual classroom classes, for example sending homework by uploading file.” [MT06_1]

4.4.1.2 New technologies

The research found that learning on this web-based course has positively changed student attitudes towards new technologies. Students who learned the IT course with the LMS preferred learning through this new technology more than traditional face-to-face teaching [MT05_1; MT01_1; MT06_1; SS07_1; SS17_1].

“We learn about working on computers through LMS that we have never seen before.” [MT05_1]

“We know new technologies, which is why we like it.” [MT01_1]

“I’ve learned about sending assignments by upload file to LMS, I’ve never learnt this before. That was the first time I did.” [SS17_1]

4.4.1.3 Supporting self-study materials

Practically the LMS supports the delivery of on-line self-study materials. Those materials are reusable and facilitate personal or individual learning. By using the correct learning strategies, this on-line course can motivate learners, facilitate deep processing; cater for individual differences; promote meaningful learning; encourage interaction; provide fast feedback; facilitate contextual learning and provide support during the learning process. Students from
certain disciplines described that the course supported their self-study [SC04_2; SS01_2; SS02_2].

“Teacher will give an assignment related with the subject contents. This is useful for self-studying.” [SC04_2]

Most teachers provided the learner with the course contents using files from PowerPoint, some of which have been used in face-to-face classroom teaching. Students realised that those files were very useful because they could be reused and retrieved the lecture after the class. Moreover, the course contains a number of links to external resources and provides a number of collaborative tools.

4.4.1.4 Increase practical skills

Students need opportunities to gain and practice skills. The LMS has provided the opportunity to further practice those skills. The instruction begins with an introduction to the course and continues to give them opportunities for practice and also gives them feedback. Teachers can use the same instructions in other modules which is very convenient and reduces preparation workload. Student skills gained include both desktop skills and internet skills.²

In Thailand Higher Education follows an ICT strategy plan to cover most of the universities. Songkhla Rajabhat University established a computer centre that allows users to access technology resources. The computer centre has built a solid foundation of personal computer and internet skills while reinforcing and improving student learning ability.

First year undergraduate students, generally, have a high level of IT skills before entering Songkhla Rajabhat University. Most of them are more confident in using new technology than their teachers. Half of the new students have taken basic IT courses before entering the university and some students have taught themselves. Songkhla Rajabhat University made the IT subject a prerequisite for all students. Moreover, in order to evaluate student IT skills, the university conducts a pre-education when they arrive and a post-graduation test after students have finished their degree. The pre-education test was for guiding academic staff in preparing...

² The Desktop skills and Internet skills questionnaires were prepared by Masspro, the Medicare Quality Improvement Organization for Massachusetts, under contract with the Centers for Medicare & Medicaid Services (CMS), an agency of the U.S. Department of Health and Human Services. The contents presented do not necessarily represent CMS policy.
suitable course material for the mandatory IT course and the post-graduation test is to clarify competency in basic IT skills to fulfil career requirements.

The LMS contains drill and practice testing and feedback can be immediate [SS01_2; SS11_1]. The LMS is used to deliver the various resources already created by the teachers for lecture classes and which can be shared and reused by other teachers. The students frequently used resources such as quizzes, tutorials, PowerPoint presentations and assignments [SS06_3].

“We can prepare our studies by reading on PowerPoint files that the teacher put a summary of key points from the textbook. The teacher will add the PowerPoint files before the class begins. After the class, we can go back to read it. The course has these files every chapter and they are very reliable. That’s very convenient.” [SS06_3]

4.4.1.5 Developing knowledge to life-long learning

The interactive e-learning environment can increase the autonomy of students and enhance students’ interest in learning. Students accepted that the LMS is very important in learning how to actively participate in contemporary society. Students felt that this course can provide a variety of ways to learn and a variety of assignments and assessments [SS03_3].

“…convenience, I have opportunities to practice; if I do more practice I will know more.” [SS03_3]

“It’s a medium that helps to increase our knowledge. It’s more understandable than reading a book.” [SS10_1]

The LMS has boosted student learning skills through tailor made instructions and activities. Students may use the LMS both in and out of the classroom. Management students suggested that the LMS has supported the development of their knowledge, which can then be applied in the life-long learning process.[MT05_1]. Competence with technology can ease everyday activities [MT06_2].

“I like this course because I can develop my own knowledge that is related with computers. The course contains many practical modules that can improve my skills for using in everyday activities.” [MT05_2; MT06_2]

4.4.2 Previous Experience

It is extremely important that students should be skilful and knowledgeable about computers and related areas of technology. Computer skills are now essential for students in all disciplines and students must become proficient with them in order to complete their study tasks.
Moreover, internet searching is another skill that everybody should definitely have mastered. Today, computers and the Internet are seen almost as one and the same thing and usually one is not mentioned without the other. Computer skills or computer experiences affect learning on the LMS especially during the assignments and activities (Piccoli et al., 2001). From the researcher’s observations, students who have studied at least one computer course before carrying out the assignments get on very well on the LMS course. Almost all the students said that having prior experience helps a lot when taking this course. If students have no prior computer experience, they may feel that the homework is too difficult. A student from Management said “I don’t agree that the teacher should give similar assignments to all disciplines because some students may not have enough prior experience” [MT03_1]. Consequently, they thought that the homework would be too hard and may not be understood and, therefore, they think that the teacher should select homework which is suitable for all levels of experience.

“… because I have no computer experience, I feel that the homework is difficult, I can’t do it. I think my teacher should give an assignment that is suitable for my subject.” [MT03_1]

Computer skills refer to one’s ability to utilize the software and sometimes the hardware of a computer. This research focused on desktops skills and internet skills. Previously published survey results by this researcher found that there is no relationship between desktop skills and the chosen academic field of study. However, there are some relationships between internet skills and those academic fields (Tongkaw & Wood, 2009a). The in-depth results from this ongoing research demonstrated that most students who use computers now do not isolate desktop skills in their minds because these are now very integrated with internet skills. Moreover, contemporary on-line courses are provided in a web-based form which requires students to be skilled with the Internet rather than just having only basic desktop skills. Therefore, the choice of on-line activities and assignments in should be chosen in order to improve their background internet skills.

“I don't agree (that the teacher gives similar assignments to all academic fields) because some students may not have any computer experiences then they feel very difficult to do homework.” [MT03_1]

Another student suggested that reading and practicing with the exercises in the end of each on-line session helped them to improve their computer skills [MT07_1].
The previously published survey showed that 93.24% of participants on the IT course were already familiar with computers (Tongkaw & Wood, 2009a). For the remaining students the university would encourage them to enrol on a basic computer course which covers basic computer skills and using programs like word processors, presentations, spreadsheets and basic internet skills. However, for the majority of students with previous experience the university aims to improve their proficiency in using computer by learning the required IT course on the LMS. The course includes a number of assignments with homework. If a student seriously lacks of computer experience, he or she may also require a specific assignment that is easier than general assignments. However, the Science students have said that the assignments and homework should be equally balanced to all students irrespective of what academic discipline they are studying [SC04_1; SC04_2] implying that Science students already feel they enough previous experience to cope with the course. Moreover, Science students felt that, in addition, they could benefit from more advanced skills such as a module covering, for example, search engines [SC04_2].

“I think the homework and assignment are suitable for every academic fields because it gives basic of IT that everybody should know how to use.” [SC04_1] but some assignments should include the using of search engine.” [SC04_2]

In contrast, Social Science students are comfortable just using their previous skills rather than trying to advance those skills. They feel they need to learn gradually to improve their knowledge. They suggested that the teachers should concentrate on teaching basic skills and explaining the details [SS18_1; SS19_1].

“I'm a Social Science student, if you ask me how to improve the assignment, I think we should decrease amount of homework. I think the teacher should teach IT from the beginning and more details. Some students have never learned IT before. Then they are faced with difficult tasks. We should start at a very basic level. Some buttons on Windows, they had never known. I recommend teaching from basics. It may help and the students will learn more. I have some experiences from a Worker Development Skill Institute, so I have some experience with computers. Teacher shouldn’t assume that we all know, it's too hard for anyone who have never learned” (I'm familiar with computer).” [SS18_1]

Some teachers may give a huge amount of detailed homework to students because they are trying to help them but the Social Science students react by thinking that they cannot do the difficult homework! Therefore, some students amongst them decide to conduct unacceptable
behaviour such as copying answers from someone else or having someone else do the work instead [SS19_3].

Some Social Science students are agreed that if the required course contains both theory and practical on-line work (laboratory), their previous experience is important [SS01_1].

“We should work hard in theory and follow instruction, this subject focuses on theory and laboratory but if you have no IT previous skills you should try harder.” [SS01_1]

The result of the study indicates that computer skills, especially internet skills affect the students’ feeling that the course is difficult. Increased previous computer experience may help reducing their fears and encouraging them to be more confident in the task.

In summary, this research concludes that assigning suitable tasks must be based on the students’ previous computer experience in order to help students increase their confidence on the computers and this is especially true for those who arrive with lower skill levels.

4.4.3 Learning Processes on the LMS

One approach is to simply consider replicating existing face-to-face teaching methods. However, the opportunity created by blended learning is that any homework given in the theory lectures can be done on-line in the supporting laboratory sessions with the added component of using web-based discussion with other students and all of this can be followed up with on-line formative assessment. This is based on Figure 2-3 in the literature review and is an application of the integration of Kolb’s learning styles and the 4MAT learning process.

The research found that the learning processes in each of three major disciplines are different. The details of differences will be discussed in this section.

The structure of each course was divided up into (1) signing up with an email address, (2) signing up and logging in to the LMS, (3) checking homework requirements, (4) reading the course contents, (5) participating in a discussion board, (6) doing the assignments, and (7) doing their own on-line assessment. Students in each major discipline were found to learn differently in each of these structural components and the order in which they follow them depended on their personal learning styles. The following sections show the different approaches that have been taken by Management students, Science students and Social Science students.
4.4.3.1 (1) Signing up email address and (2) signing up and login to the LMS

The LMS allows teachers to launch any course, choose any material, create any assignment, and any quiz by following the required course outline and using shared resources from the other teachers. Before the course starts, some students would need to get an email address from the university because this is required for accepting the confirmation hyperlink from the LMS. Some students may already have an LMS account (from doing previous on-line courses in the university) but for the majority the teacher would need to sign them up with an account and require them to understand a policy document. Students who have very basic experience or who have never done an LMS will need help from the teacher with this process. Once registered, students may also generate their own individual profile if they want share information with others but this is not compulsory [MT05_2]. Management students said that most of the enrolment process, for the required course through the LMS, was not difficult [MT06_1].

“The process is not difficult, only signing up following to the teacher. Most of all works come from teacher. The teacher is willing to assist you. If there are assignments, we should read the book. If there is a test, we can find the answer from the book.” [MT06_1]

“To register and login, I suggested that everybody enter some personal profile to LMS.” [MT05_2]

Most Science students used help from friends in the enrolment process and after receiving confirmation they could then login by themselves [SC04_1].

“My friend told me (how to sign in) so I can sign in by myself.” [SC03_1]

4.4.3.2 (3) Checking homework

Songkhla Rajabhat University follows a similar structure of major academic disciplines in the Rajabhat University Group. Some required courses in Songkhla Rajabhat University follow the blended learning approach, a hybrid of traditional face-to-face teaching and on-line learning, in order that the university can offer students both flexibility and convenience. As a result the on-line component becomes a natural extension of traditional classroom learning. In blended learning, it is important that the teacher can facilitate and give advice in both face-to-face and on-line learning so that students will have opportunities to ask for help during the course [MT05_1]. Some students said they needed an advisor and required confirmation on some
tasks [MT07_3; MT07_2]. However, some students have some anxieties about the misunderstanding of when instruction can be given [MT07_2; MT07_3].

“…not only laboratory we need to practice, but also the theory from the book is crucial. We need to follow the instruction from teacher. If it’s unclear, we should ask the teacher immediately.” [MT05_1]

“…if the teacher does not allow us to do. We shouldn’t do it because it may have an error or a mistake. We may get in trouble. I will wait until the teacher confirms to do the work.” [MT07_3]

“…sometime, I have check the homework and found it but I'm not sure the teacher allow us to do it or not. Then, I will go to ask the teacher by face-to-face or call the teacher to confirm that work.” [MT07_2]

Teachers also check the course materials, or other semester-specific content, to update any documents that have become obsolete. To change a document posted in course materials, teachers need to open the file in the original application, make any required changes to it, and re-post back into the course site and the students are then responsible for checking newly updated materials. One student said that they have to sign in to the LMS frequently because they do not want to lose any chance to do the assignment [MT03_1].

“We should frequently login to the LMS because it is updated all the time. The teacher will give assignments and homework through the Internet if we do not login, we lose the chance.” [MT03_1]

“We should check homework very often and read a lot because our teacher is strict about time. If we cannot do it we will lose the mark, especially we should remember the bold word in the book. I think this course is difficult. The test is emphasised much on details in the book.” [SS07_1]

“We know we have an assignment by regularly checking through LMS. If we have homework, we need to download before we do it.” [SC02_2]

Generally, each unit in the course was set up with assignments and quizzes which were usually due at the end of the week and which the students needed to check frequently. Social Science students emphasised the regular checking of homework [SS07_1; SS11_1, SS16_1; SS17_2; SS19_2].
4.4.3.3  (4) Reading course contents, (6) doing assignment,

Quizzes or tests, and other written submissions, are completed on-line and the students are aware of handing in their homework by frequently checking on-line since they only have a limited time to do an assignment [MT03_1; SS07_1].

“...every works have time stamp and limit period to work on it if we cannot send it on time we will lose the points on that work. This include we should download document that teacher give us through LMS and read it because LMS is the self-study.” [MT03_1]

The material on the LMS contains many file types: presentation files .PPT, document files .DOC, and postscript files .PDF as Microsoft Office and Adobe products which are used throughout the University. Teachers routinely use .PPT files to deliver summary concepts from the text book that was used in the classroom.

“After teacher put the slide on LMS we need to read it before class. After the class we need to re-read it and do assignment on LMS, LMS is useful in term of its repetition system so that we will not forget.” [SS06_1]

“I read the book many times, we need to remember the words if we do not repeat them, we cannot remember them.” [SS03_1]

PDF files provide a rich resource and potential gateway to high-quality material to facilitate students’ learning and therefore it is important that students should have fundamental skills in how to work with the postscript file.

“Work hard on lecture and do as the teacher give suggestion. If we don't have enough skills we should try some more [SS01_1] and work hard [SS04_1].”

Lecture documents and assignments are posted by the teacher through the classroom website. Students can interact on-line, both among the students and the students with the teacher. This can be done by using the message boards in the classroom or by asking direct questions within an assignment. The LMS class can be a productive way to develop student knowledge and complete the assignment in their own time scale. Search engines, such as Google, can help students to do key word searches of the subject matter and, in some cases, to do the assignments and write reports in a word processing format such as Microsoft Word [MT03_2]. When they have finished their assignments, they can upload directly on-line.

“After we get the homework we should read instruction carefully. We should find what does the question mean. Then, we need to follow the instruction carefully. In case that there is a homework about finding some points from the Internet, we will search by
using Google. We need to rewrite and type it into Word (Microsoft word) then send it by uploading.” [MT03_2]

Some Science students required more practices and need to send their assignments on time.

“I've read the text books before doing the quizzes. I do homework that teacher gives and send it on time.” [SC02_1]

It has become evident that students who study together may share numerous benefits and some of them thought that a friend could help to solve the problem of misconceptions and also in doing homework. For example, one student said that studying together increases the course score [SS10_1]. Some students used the discussion board to let the teacher know about their attendance but others the use telephone instead [SS17_3].

“Normally, I will study with my friend after the class, sometimes during free time, we will help each other by reading a book and exchanging some ideas, sometimes we do the homework together, at early of the course I can't follow the teacher, I got some help from my friends. If I don't meet them, I can't do it, but later I always go to join with my friends and get the good score, I think because someone don't have enough skills or never, if he has some friends, friends will push to learn.” [SS10_1]

4.4.3.4 (5) Participating on the discussion board

The discussion board is another tool on the LMS used for communicating or participating with both teachers and other students. This tool is used to give all students new information about the course, the latest news and upcoming events. Usually, this is seen on the first page after the students log in to the LMS. A discussion board is an open forum for communication where both teachers and students can post their messages and read each others’ comments. The LMS also allows users to include links and images in their messages and provide spell checker facilities. The researcher observed that students used the discussion board both to communicate class information and for keeping in touch with social events.

“I use it very often, I answer teacher’s question too. I like it because I know some news posting from my friends, sometimes my friend ask for something, we join because it's fun.” [SS06_1]

“For discussion board, I like it because when I can't attend the class I can check from it, I will know what assignments that I missed and for update news from friend.” [SS14_1]

“It is useful at least for connection between students and teachers without telephone, sometimes a teacher does not receive telephone, we can leave message on discussion board.” [SS15_2]
The required courses are taught by many different teachers. The researcher observed that from November 2008 to February 2009, students who studied in the same subject with various different teachers who did not use discussion boards and those same teachers did not encourage them to use them either. However, students who studied with teachers who regularly used the discussion board themselves also participated in discussion board communication. This situation was the same right across Social Science, Science or Management students.

“Teacher encourages us to discuss on discussion board, I like it because I can discuss anything with her.” [SS17_1]

However, some Social Science students had their own security issues. They did not like the discussion boards because they did not want others to see their profile pictures [SS19_2].

“Personally, I don’t have any questions to ask, and when I post comment my profile picture will appear there, I don’t like it.” [SS19_2]

4.4.3.5 (7) Doing assessments

The most challenging aspect of assessment is to know how to help the students to develop their skills and, therefore, the assessments of the course were given in various styles: quizzes, short answers and matching true or false questions. These styles were also repeated throughout the pre-education test and post-graduation tests. In classrooms where assessment for learning is practiced, students know at the outset of a unit of study what they are expected to learn. This appeals to Management students who are, generally, concerned about the assessments and agonised about their answers. The researcher observed that Management students took neater notes than Science and Social Science students and they thought that notebooks are an important source which may be useful when they have on-line assessments and for doing quizzes and assignments. Management students’ perspectives lie broadly in checking up to date information and assessments.

“We learn from reading the book and assignments from the laboratory class, most of learning process need writing but we can’t write everything on time we use the book for help. We need to check our assignment frequently, personally, I like learning on LMS more than lecture in classroom.” [MT01_1]

In contrast, Social Science students relied more on their teacher’s ideas and comments during the course especially when those teachers taught from experience [SS14_1]. This caused them to listen very carefully to all the instructions given by the teacher. As a result, these students
went back to (read the book) until they have been confident with the content. Then, they returned to take the quizzes and do the assignments [SS14_2].

The process of doing assignments concurs with the active experimentation in Kolb’s learning style theory and is the last step of the experience learning style cycle. When learning, Social Science students rely more on active experimentation than reflective observation and, in this case, learning occurs through the active influences on the learners who have a strong focus on practical assignments to build their confidence. Social Science student have shown strong attitudes towards active experimentation. The survey results also confirmed that Social Science students exploited visual and kinaesthetic learning styles in contrast to Management students who were directed by learning from a deep understanding of governing theories, rules, or principles.

The following table maps the various students learning activities on the LMS with Kolbs’ learning styles.

<table>
<thead>
<tr>
<th>Learning activity</th>
<th>Learning styles Kolb’s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Signing up e-mail address/Signing up and login LMS</td>
<td>CE</td>
</tr>
<tr>
<td>Checking homework</td>
<td>CE</td>
</tr>
<tr>
<td>Reading course contents</td>
<td>AC</td>
</tr>
<tr>
<td>Do assignment</td>
<td>RO</td>
</tr>
<tr>
<td>Participating on discussion board</td>
<td>CE</td>
</tr>
<tr>
<td>Do assessment</td>
<td>AE</td>
</tr>
</tbody>
</table>

Table 4-12 Mapping learning activities and learning styles by Kolbs’ styles.

CE: Concrete Experience  
AC: Abstract Conceptualization  
RO: Reflective Observation  
AE: Active Experimentation

4.4.4 Group characteristics and Media Preferences

This following results show emerging group learning preferences for certain kind of media in on-line systems. Moreover, the results also show preferred activities that encourage those
groups of students learning on the LMS. This section shows a relationship between particular major disciplines or groups and the media and activities that they, collectively, prefer.

The most important support that can be given is to assist teachers in effortlessly turning the existing media and activities into accessible information in the LMS (Bach et al., 2007). In this case study, in the context of the required IT courses, the media used for the activities and assignments on the course includes: text, graphic and figures, animations and game, and video. All of these are directly provided by the LMS except for video which has to be directed to other sources via a URL. It is a challenge for teachers to design and organise a mix of media which are appropriate to a whole group of students but understanding whole group learning styles, for any particular major discipline, will help.

This study showed that Management and Science students have a dominance towards VAK learning styles whereas Social Science students have a dominance towards VKA learning styles. These findings are useful for matching the students with their preferred media and assignments. Table 4-13 maps these major disciplines (MT, SC and SS) with the predominant learning style characteristics (VAK, VKA) identified as Markova stacking (Markova, 1996).

<table>
<thead>
<tr>
<th>VAK “show and tell”</th>
<th>VKA “great collaborators”</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Management [MT] and Science [SC]</strong></td>
<td><strong>Social Science [SS]</strong></td>
</tr>
<tr>
<td>they write logically</td>
<td>they write logically</td>
</tr>
<tr>
<td>they show and illustrate ideas</td>
<td>they may like to draw and design</td>
</tr>
<tr>
<td>they connect best by eye contact</td>
<td>they connect best by eye contact</td>
</tr>
<tr>
<td>they organize in lists</td>
<td>they are visually meticulous</td>
</tr>
<tr>
<td>they learn easily by reading then discuss teach</td>
<td>they organize in lists</td>
</tr>
<tr>
<td>they love visual detail</td>
<td>they learn easily by reading or watching followed by doing</td>
</tr>
<tr>
<td>they read everything; they are persuasive speakers</td>
<td>they learn sports easily</td>
</tr>
<tr>
<td>they like to teach, explain, and tell stories</td>
<td>they like competitive sports</td>
</tr>
<tr>
<td>they like to talk out loud to sort their ideas and make decisions</td>
<td>they may get others’ feelings confused with their own</td>
</tr>
<tr>
<td>they may only have sketchy sense of their own body, move awkwardly and find physical activities frustrating</td>
<td>they are talkative one-on-one</td>
</tr>
<tr>
<td>they are shy about touching and private about their feelings</td>
<td>they are uncomfortable speaking in groups</td>
</tr>
<tr>
<td></td>
<td>they ask a lot of questions</td>
</tr>
</tbody>
</table>
they may have trouble with prolonged listening, they speak quickly and abstractly, they are sensitive to voice tone.

Table 4-13 The predominant learning style characteristics of Markova stacking (Markova, 1996).

Students learn in different ways and their learning can be more effectively supported by the use of multiple teaching methods and modes of instruction. Different modes of delivery also reach different types of learners who have different learning characteristics and therefore blended learning, the context of this research, adds a further opportunity for combined learning experiences. Unlike the totally on-line experience, blended learning offers opportunities for two hours of face-to-face contact between students and teachers as well as another two hours per week in laboratory guided on-line learning using the LMS. This laboratory is a face-to-face opportunity to resolve difficulties and clarify any unresolved issues encountered on the LMS. The specific choice of on-line media also plays an important role as a vehicle delivering information from teacher to learner. Furthermore, as one researcher suggests, media selection factors and frameworks for distance media strategies in teaching also need to be examined from a cultural perspective. Choice of media can influence the learning objectives, learning activities and learning outcomes (Yang & Hsing-Kuo, 2006). The following sections now look at media choices in more depth from the perspectives of the three major groups.

4.4.4.1 Text, Animation, Graphics and Figures and Games

Figure 4-3 Summary of media that may support group learning styles in 2007
Figure 4-3 clearly shows that all the major discipline groups prefer text above all the media and this could be explained in terms of all sharing the same visual learning style where, in Markova’s language they write logically and connect best by eye contact (table 4-13). The second main media preference is Animation but in this case Science students, as a major discipline, show the strongest preference for this media. Management students show the strongest preference for Graphics and Figures which is a media combination preference which lags just slightly behind Animation. Games, universally, are least preferred by all the major disciplines with an average of only 3.8 % coming through the results in this research. Moreover, other noticeable results are that none of the students from Management like Animation.

![Graph showing media preference in 2008](image)

**Figure 4-4 Summary of media that may support group learning styles in 2008**

When another cohort of students were surveyed in 2008, figure 4-4, the results show that all the three major discipline groups of students still preferred Text as the main media choice which compares well with the results from 2007. In this case, however, Management students outstandingly, and to a greater extent, preferred Text over all other media types to support their learning whereas the other two major disciplines showed similar levels of dominant preference towards Text. Again, as in 2007, Games are the least preferred media preference for all three major discipline groups. Minor differences showed that Management students preference for Graphics and Figures decreased in 2008 whereas a preference for Animation appeared Furthermore in the 2008 results, none of the Social Science students preferred Games.
In some cases text and images are combined as a part of a more dynamic medium such as video. During the interviews one Management student commented that that images and flash images attracted their attention and aided them in the learning process on the LMS [MT07_01] and they additionally commented that they thought the teachers should add images and moving pictures with descriptions or scanned images to add attraction to the contents [MT07_2].

“I think, image and clip which are in LMS for decoration affects the on-line learning system, if we have only text contents or it isn’t interesting, I am not interested in learning from them.” [MT07_1]

Slide presentations created on the PowerPoint programme provide summaries of course contents in text format. Slide presentations are a highly effective method of enhancing classroom presentation and they can also assist students’ productivity in on-line laboratory settings. Students’ responses have been overwhelmingly positive towards these; they believe that electronic presentations help clarify, visualise, emphasise, organise, and summarise information. In fact, many students believe that the slide shows are one of the most positive aspects of the course. The teachers generally upload the summary slides from the lecture class into the LMS for self-study for the student’s advantage. However one student suggested that, including Graphics and Figures may increase attractiveness to the course content [MT07_2].

“I suggested that teacher should add more pictures or in PPT. She should import images or insert moving pictures with descriptions or if she can scan paper images that are more attractive.” [MT07_2]

“I like moving image, teacher should have image feedback for example when we choose the right answer we got the moving smiley face.” [SS03_1]

4.4.4.2 Further Information about Animation and Games

Social Science students, who, collectively, demonstrateVKALearning styles, reported their preference for Animation and Games because they like interacting with drawing and design. These Social Science students suggested that the teachers should integrate flash-based, animation files into the LMS in order to create interactive responses [SS11_2; SS03_1]. Flash-based files support learning on the LMS in a way that helps students understand the contents better [SS08_1; SS10_1] and makes students more relaxed [SS03_2].

Building flash-based contents which can be integrated with an LMS is not very complicated and there are many ways to combine flash based files into the LMS. However, the teachers
would need to learn about content communication, object metadata and “manifest files”, which are used for importing, tracking, and publishing flash-based contents which are compliant with the LMS standard. In contrast, Management and Science students who, collectively, demonstrate VAK learning styles did not consider that Animations and Games were their preferred choice of media or activity.

4.4.4.3 Video

LMS, Moodle, is not designed to provide streamed media and some of the content becomes inaccessible when the course ends which eliminates its usefulness for future reflection and review and, effectively, terminates any ongoing discussion. Consequently, the creation of rich-media on the LMS applications is no longer being developed and instead use is being made of external video sites, audio sites and image sites which are designed for the specific purpose of on-line viewing, where the contents can be played before the entire file is downloaded. The teacher is then only responsible only for posting the links and recommending suggestions to the students. The researcher observed that students at Songkhla Rajabhat University would ignore suggested links unless the teacher made a strong recommendation but that, generally the teachers rarely made use of video links.

Management and Science students who share a similar learning style priority, VAK, like visual details and can make extensive use of reading material. Management students, in particular, commented that additional video materials make the meaning of the course content richer.

“Using media will give us more understand in contents if we have only text, reread it but we don't understand, if we have pictures video that make sense” [MT03_1]

Moreover, adding related videos to the content makes the content more interesting [MT06_1].

“(It is) important because it relates with content description for more understanding, describe our data clearer, beautiful and attract reader, make contents look interesting.” [MT06_1]

Students who have a VKA learning style priority are visually meticulous and will be extremely careful and precise in everything they do. As an example, Social Science students learn easily by reading and watching followed by doing. Social Science students preferred looking at long video with the course contents, as opposed to short clips [SS01_1] because it gives more detail and they agreed that this increased their memorizing skills [SS01_2; SS12_2]. There is strong
agreement amongst Social Science students that the most attractive media referred to from the LMS is video [SS01_1; SS04_2; SS05_2; SS14_1; SS16_1; SS17_1; SS19_1] and that the attraction came from the colourful moving pictures [SS13_2].

“(video and clip) increase memorising skills more than others media, moreover, they are showing more descriptions in some details which we do not understand.” [SS01_2]

Based on observations, the researcher found that students, generally, understood the course content better when they watched interactive video and their understanding of the topic is much more thorough. Students can engage in a more exciting learning activity using video referred to by the LMS [SS02_1; SS16_2] and this also increased the content description [SS01_2; SS14_2] and made the contents more comprehensible [SS14_2; SS10_2; SS12_1]. By contrast other content such as Text and Photos do not guarantee the same level of learning effectiveness. Moreover Video can decrease the degree of anxiety and learners can be more relaxed and, consequently, gain a higher level of description [SS03_2].

“It's interesting that change from basic one that we have seen, it attracts us to learn and read.” [SS06_1]

Some students said that most media and resources in the LMS could support their learning [SC02_1; SC03_1; SC04_1; SS11_1]. The students by themselves believe that the resources and media of access can be selected to suit particular groups of students and that the teacher could provide contents according to the situations in which they will be used rather than relying on a blanket use of content.

4.4.5 Group Characteristics and Learning Activities

All the learning activities on the IT course in Songkhla Rajabhat University are organised and managed by, and within, the LMS in a blended learning combination that includes face-to-face teaching and on-line laboratory sessions. The laboratory sessions with the LMS re-use some of the learning materials from the class teaching sessions and, in this way, much time and effort in lesson preparation can be saved and the cost of on-line content development is reduced. However, some of the activities are uniquely only done on-line. Figure 4-5 shows the spectrum of all activities in the blended-learning situation and the responses to those activities by the different major discipline groups surveyed in 2007.
According to figure 4-5, the three most useful learning activities, or situations, overall, are learning from documents (such as supporting textbooks kept physically in the laboratory and PDF files kept on-line), course assignments and teacher-to-student support with some minor variations from each of the major disciplines. The remaining four activities are, more or less, equivalent in being viewed as much less useful (representing only a 5% response on average) in helping understanding of the course. In its detail the results show that Science students and Social Science students almost equally prefer to make use of learning documents. Science students came out top in their own opinion that course assignments help understanding. Social science students clearly value teacher-to-student support as a means for helping them comprehend the course.

Figure 4-6 show the results from the survey in 2008 in which a refined spectrum of preferred activities, confined mainly to the on-line laboratory, were considered.
According to the figure 4-6, the three most useful learning activities, or situations, overall are, listening to the teacher, doing quiz modules, and reading static content (PDF material that cannot be changed by the students). The remaining three activities, discussion on web boards, reading lab instructions and teaching friends, are comparably less useful in the views of the students. In its detail the results show that Social Science students clearly regard listening to the teacher as a means to understanding whereas they clearly do not value quizzes so much as the other disciplines. Science students also value listening to teachers but to a lesser extent. Management students clearly find that reading static content is very helpful. Social Science students showed that they value the quiz modules, lab instructions and reading static content. Though all the major disciplines viewed the on-line discussion board as low in their estimate that it helps them to understand course content, the results show that Management students clearly to had nothing to say about the advantages of discussion boards, lab instructions or gaining help from a friend's teaching. Only the Science students reported that they used friends’ teaching as a means to increase understanding.

Figure 4-7 shows the views, in 2008, of students in the major discipline groups towards the usefulness of various homework activities.
According to figure 4-7, short answer assignments and quiz modules are the two most favoured homework activities. The remaining three, desktop publishing, presentation design, and reports, are generally, less favoured. Management students, amongst the other major discipline groups, show the greatest preference for short answer assignments and quizzes whereas Social Science students show correspondingly the least preference for these activities. Again, as with on-line activities, Social Science students show a very equal balance in preferring a range of homework activities which in this case is the quiz modules, presentation design and reports.

Some of the activities summarised in the above figures are now described and compared in the following sections.

4.4.5.1 Report

Generally, the LMS enables robust and accurate reporting of all the training activities. Historically, reports have been printed on paper, which consumes time and resources and so, in order to support more flexible learning, electronic assignments are chosen to replace paper
assignments on the LMS. The LMS facilitates the acquisition and updating of skills in a practical way, whilst theoretical skills can be acquired and accessed via other e-learning packages. The researcher observed that there are a number of teachers using these services. The electronic reports include the use of the following skills: a) using search engines; b) typing; and c) word processing and uploading. Management, Science and Social Science students responded, in the interviews, that they all like reports [MT05_1; SC04_1; SS08_1; SS19_1]. This is because all these students, whether they are VAK or VKA, share the specific characteristic that they write logically.

Science students like reports because they are given a longer deadline period to think about the work [SC04_1; SC06_1; SC07_1] and because the marks help them increase their grades [SC02_1; SC04_1]. Moreover, some students said that if they have a longer time to work, they will have more inspiration [SC06_1].

Social Science students who share VKA learning characteristics, said they learn easily by reading or watching and then followed by doing. In this respect, Social Science students also prefer assignments that require more time because they value the opportunity to increase the assignment quality. One student said “I like reports that we can take home. We can go back home and do it at home.” [SS15_1] and another student said “For me, I like to send homework by uploading.” [SS16_1]. From the researcher observations, the researcher found that the students who helped each other in doing the reports have an increased sense of teamwork.

The reason why they prefer reports is that it can help improve their skills and knowledge and it is different from other on-line activities.

“I like doing report because I could find the good and complete contents. I got them from various resources, for example the report about IT law, I did 2 reports, and I did very well on both.” [SS19_2]

4.4.5.2 Short Answer and Quiz Module

The LMS contains multiple-choice, true and false, quiz modules, for testing their knowledge. Students can be automatically assessed interactively from their responses to questions. Even though they prefer reports for assessment Management, Social Science and Science students all
found the time limited testing modules or quizzes very helpful. This kind of activity is therefore attractive to students who characterise both VAK and VKA learning styles.

One Management student commented that they preferred taking quizzes in the textbook before taking the quiz on-line [MT07_1] and another Management student suggested that learners should study the textbook before taking the quiz. [MT07_2].

“I like exercises at the end of each chapter, quiz, or the on-line quiz that have time stamp like competition. It’s fun.” [MT07_1]

“If we pre-read, we can do it. If don't we can't. It measures us, challenges us, like game. If we don't understand we will get the low score.” [MT07_2]

One Science student commented on the quiz module that it helped with practise before the final exam and the scores of the quiz were useful in additions to their final grade [SC02_1].

“Because working on the testing module is practicing, it will test us how much we know the topic before we learn and after learn. Regarding the homework or assignment, I like it because the teacher will collect the marks to help us, if we fail in other parts.” [SC02_1]

Some students from both Science and Social Science disciplines commented that the quizzes were very exciting [SC03_1; SS06_1; SS13_1], fun [SS01_1; SS04_1] and helped improve their skills [SC07_1; SS11_1].

Several Social Science students agreed that the testing modules helped to increase knowledge and it is was as suitable for assessment as short quizzes in the classroom [SS01_1; SS06_1; SS10_1]. The previously published survey in 2007 showed that Social Science students preferred activities containing interactive tasks. Social Science students have characteristically VKA learning styles, which indicates that they like competition and they learn easily by reading or watching followed by doing. Therefore, most Social Science students agreed that quiz or testing module was the most preferred activity [SS01_1; SS02_1; SS03_1; SS04_1; SS06_1; SS07_1; SS08_1; SS10_1; SS11_1; SS14_1; SS18_1; SS17_2; SS19_1].

“I like quizzes. If we do not read enough, or are not prepared for the quiz, we can't finish on time. We can answer all questions if we have full knowledge before we take the quiz. It's so excited and challenging. We have the inspiration to read the book before we do the quiz. We do not need to waste the time to think, if we are prepared, we can do it.” [SS14_1]
However, in contrast, one student from Social Science said that they were not satisfied with the quizzes because the limited time available makes them stressed [SS02_1] or it was too difficult to do [SS04_1].

“Actually, I don’t like testing modules. I got anxious and stressed. However, I did well sometimes because my friends helped to answer the questions.” [SS02_1]

4.4.5.3 Discussion board

Learning is enhanced when it is a collective effort rather than an individual process. Good learning is often collaborative and social, rather than competitive and isolated. The opportunity for working with other students is increased in on-line learning. From this researcher’s observations, students showed some preference for sharing their own ideas and responding to others’ reactions in a discussion forum even though the number of students participating in each course was still low.

In the interviews it needs to be noted that two Social Science students who belong to the general group of VKA learning styles commented that they preferred discussion board activities and this may be because they are, generally (according to Markova, table 4-13), great collaborators and talkative one-on-one and this is assumed to apply, not only face-to-face contact but also on a discussion board. Discussion is an important part of many on-line classes. It is not usually “live” discussion such as with Instant Messenger, but more like a bulletin board where there is a record of all postings. The students are expected not only to make their own comments but also respond to other students’ ideas and opinions. The students may send an e-mail to teacher any time when they have a question or comment. One Social Science student used the discussion board very frequently and he was very impressed with this system [SS17_1].

“The teacher advised me to use discussion board. I'm really impressed because I can discuss with her in every topic.” [SS17_1]

The LMS is a more meaningful system than just a simple self-study on-line course because it supports higher collaborations and interactions amongst the students. Based on the researchers observations of the LMS in use, there was a sense of informality and most of the discussion topics were greetings and short notices about attendance and absence with very little discussion about course contents or questions.
“The discussion board used for exchanging idea with teachers and friends, but sometimes only used for fun.” [SS05_2]

However, from observations, some classes regularly achieve collaborative and constructive discussions on the board and a few students posted questions that required answers and collective seeking of solutions.

4.4.5.4 Presentation design

Computer-based information plays a crucial role in our society. As a result, an important responsibility of a user interface is to intelligently appeal to visual abilities and use output media to present information. The objective of the IT course is to design the presentation and to present the information in an appropriate way.

Microsoft PowerPoint is an example of software that teachers use to teach presentation design. PowerPoint has a rich source of material for presentation design and allows students to present graphs, figures, scanned photos, and other supporting visual materials.

Students with VAK learning characteristics, such as Management and Science students, like these kind of activities because they are able to show and illustrate their ideas, they tend to talk out loud to sort out their ideas and make decisions, and they like to teach, to explain and to tell stories. Social Science students who have VKA learning characteristics tend to like this kind of activity because they like to draw and design. Management, Science and Social Science students agreed that presentation is one of their most preferred activities but each group based this on different reasons [MT07_1; MT06_1; SC05_1; SS01_1; SS10_1; SS11_1; SS12_1; SS13_1; SS17_1; SS18_1]. Management students like this activity because they focus on skills [MT07_1], previous experience [MT06_2] and attractiveness [MT06_1]. They also like presentation because they have opportunities to design the work and present their own ideas [MT05_1]. Another reason was because they could integrate all of their skills into the activity [MT06_1].

“I like the presenting using the PowerPoint because we can show our art skills and the uploading technique.” [MT05_1]

“I liked designing PowerPoint presentations the most, and I also like presenting with this program too. I think it allowed us to apply overall knowledge that we have learned in the class and also integrate all skills to design PowerPoint and upload it.” [MT06_1]
From the researcher’s observations Management students tended to use huge graphics items such as Clipart to decorate their PowerPoint work. Clipart and cartoons enhance the visual interest and humour to the presentation and Clipart is useful as supportive and appropriate graphics to illustrate the keywords in a student’s presentation. Visual students would be attracted by these additional decorations of presentation designs.

Students with VKA learning styles are often uncomfortable speaking in groups. They may have trouble with prolonged listening and they speak quickly and abstractly but the Social Science, with these characteristics thought that Power Point could improve their presentation skills [SS11_1; SS16_1], increase presentation experience [SS12_1], improve their self confidence [SS01_1; SS10_1; SS13_1; SS17_1], and it is useful for other things [SS18_1].

“I like PowerPoint because of the assignment that the teacher gave us, she would like to see student’s hometown, I mean province. I have some experiences with PowerPoint before, and this assignment help to improve my skills.” [SS16_1]

“I can practice and improve my skills to use in other subjects. I feel like I am working on a project. It’s creative, graphic, full of vision and challenge. I personally like them.” [SS10_1]

Some students preferred the process of creating PowerPoint presentations because they can use search engines to find information for the presentation and also others like the experience of standing in front of a group of people [SC02_1; SS02_1; SS03_1; SS04_1; SS05_1; SS06_1; SS07_1]. Some students suggested that using Power Point did not only improve their skills, but also increased their self confidence. It was a very practical skill to acquire and the experience and activity made them enjoy the class [SS04_1].

However the researcher also observed that that some Social Science students did not focus on presentation much because they were not impressed with teacher’s use of them in the lesson and also some had never used PowerPoint before. The lessons were often slow and only a few of the students in the class could follow the teacher. After the lesson was finished, none of the students in the class were able finish the activity in their own time and therefore the teacher had to allow the students to do it at home.
4.4.5.5 Calculation Practice

Excel is used in this course as a program designed specifically for processing data from a formula based tabular spreadsheet into a graphic display. Management students report their satisfaction with the spreadsheet assignment because they like to do calculations. They generally belong to Markov’s VAK learning styles who like to show and illustrate ideas and love visual details [MT03_4]. One Management student commented on the immediacy of seeing results and, again, the VAK tendency shows up in the desire to sort their ideas and make the correct decision as fast as possible.

“I like Excel because it uses formula and calculation, personally. I like any kind of works that use formula or calculation, if the answer that we have is wrong I will know suddenly, that formula is incorrect, and we will find new answer.” [MT03_4]

In a similar way to presentation design only Management students have referred to the advantages of Excel and said that they like this activities because of fun and usefulness [MT03_1].

“Excel activities is my favourite, by using formula. It is fun, we can apply it to other works and it's very useful.” [MT03_1]

One Social Science student felt that they do not like calculation assignments because they were not skilled enough. [SS19_1]. Nevertheless, in contrast, other Social Science students have improved their calculation skills because of the spreadsheet assignments [SS14_1].

“I like calculation. I’ve learned Excel before. I used to deny to study Excel because I didn't understand and I couldn't do it but after I have learned this course I think calculation is very easy. I can do it and I like it. I think it’s very convenience for calculation. It helps me more understandable in calculation. I have changed from refuse it to love it because I can do the assignments.”[SS14_1]

4.4.5.6 Static course content module

Students with VKA learning styles are likely to be visually meticulous and extremely careful and precise in their tasks. Hyperlinks to the content resources are a vital means of helping students to get an effective overall picture and make summaries about the whole course. The students are able to scan on-line text for the key points or words to clarify a short description of the contents. Social Science students, generally, preferred this activity because it offers a logical and conclusive picture of the contents.
A PDF file must be used to increase the advantages for students because it represents such a rich resource and potential gateway to high-quality material.

“I like resources for example slides or links that the teacher provided, good to read like conclusion, can use for final test and we use it together with the book” [SS07_1]

Bulleted points can also assist by emphasising the main points while students fill in additional details. Traditionally, the teacher would provide students with books containing lecture slide outlines which allowed them to focus on the examples and fill in details, during the lecture, as they wish. Otherwise, students complained that it was excessively difficult to take notes. However, they also tended to spend most of their time staring down at their papers rather than at the slides. Uploading summary slides to the LMS is an efficient way of solving this problem because the students can work in their own time. Some Social Science students preferred using summary slides on the LMS because it is a helpful way to summarise all the details from a hardcopy textbook into their notebooks [SS14_2; SS19_1].

“Summary slides which the teacher added into LMS are very useful, because the contents in the books are too much, when we have exam we can use them for summary of all contents.” [SS14_2]

“Another thing is I like summary slide, PPT that the teacher gave us, that summary I use a lot and more than anything.” [SS19_1]

4.4.5.7 Desktop publishing

When teachers were informally asked how they employ technology, they typically discussed basic applications, such as word processing and internet research. Vocational technology applications and multimedia applications such as PowerPoint were more commonly found in high technology schools. Desktop publishing (also known as DTP) combines a personal computer and WYSIWYG page layout software to create publication documents on a computer for either large scale publishing or small scale local multifunction peripheral output or distribution. While desktop publishing software still provides necessary extensive features for print publishing, modern word processors now have publishing capabilities beyond those of many older DTP applications. It has blurred the line between word processing and desktop publishing. For the IT course, word processing using, for example, Microsoft Word is an example of desktop publishing. Both VAK and VKA learners are expected to prefer this kind of activity because they tend to write logically and organise the writing in list form.
The most basic desktop publishing technology application is word processing. It is the compulsory module that included in required course. Word processing is appropriate for every group of students who begin using technology in the classroom.

Students proposed reasons as to why they prefer desktop publishing design assignments. Comments from students include improving skills based on previous experiences [MT06_2; SS19_1] and increasing their self confidence [SS15_1]. One student confirmed that desktop publishing design assignment increased their skills and given new knowledge when used it with search engines [SS19_2].

4.4.6 Obstacles to Learning on the LMS

Handling of learning material is a challenge and the very complex context, the limited time available for preparation, the large diversity of learners, the requirement to adapt the learning materials all demand a greater level of the teacher’s skills if their students are to have any chance of success.

“Main obstruction of the LMS development is inadequate course contents.” [SS19_1]

This means inadequate core knowledge because the team of teachers, instructors, and media designers do not have enough time or the skill to create and operate sophisticated course contents such as videos or quizzes and most only make use of the limited knowledge they have. However, once teachers have completed one course well it would be easier to adapt the resources to other courses. Every learning object stored in the repository can be shared and reused in other courses or variations of one course adapted for different types of user. The adapted course for each major academic discipline can then share text, pictures, animations or other resources contained within the original course.

Furthermore, one Management student commented that previous computer skills increased their own possibility of success with the tasks [MT07_1]. Inadequate learning skill decreases a student’s self confidence. However, students who are easily able to access computers on and off campus after finishing class are more adaptable [SS03_1].

4.4.7 Challenges

On-line education developments need to be flexible and adapted to serve specific academic disciplines and many variables such as attitudes towards technology, prior knowledge, the
process of learning, learning styles, learning skills and task confidence influence adaptations to on-line learning. This research showed the significant impact that adaptations could make on learner success.

From a student perspective, there are several ways that the LMS can be improved. Firstly in relation to assignments, some students suggested that teachers should add more analysis questions [MT03_1] and extend the time for submission [MT03_1; SS17_1]. Secondly, teachers should include web-page design assignments [MT06_3]. Thirdly, the teachers should focus on assignments that relate to searching for information and subsequent presentation [SC02_1; SC04_1]. A single assignment useful for all academic disciplines should not be too difficult for the students to complete [SC03_1].

The LMS is a tool to enable the development, delivery and management of courses, and improve learning outcomes. However, one student commented that the LMS used for the IT course had insufficient content and lacked other resources to support the main contents [SS19_1]. One way to increase the content in the on-line [IT] course is to recommend that teachers integrate the main contents with other useful links to articles, images, audio, and video [SC05_1; SS19_1]. The university should encourage teachers to increase the content in every subject and also add other information that the teacher considers will be useful for the class.

The students have commented that, as far as the on-line course is a concerned, the designers should concentrate creating the overall template or lay out of the LMS [SS04_1]. Furthermore, as far as curriculum design is concerned, the designer should focus on methods appropriate for on-line learning rather than using the same methods that are traditionally used for face-to-face teaching [SC06_1].

Moreover, since undergraduate education at Songkhla Rajabhat University is moving towards blended learning solutions, it is important to use the LMS to combine high quality methods such as, on-line meetings, digital content, and material uploaded on the Internet with a blend of traditional lecture material according to student choices and needs. Furthermore, this research has demonstrated evidence to suggest that learning objectives should be delivered in different forms appropriate to the learning styles common to each particular major discipline of students.
There are no rigid rules about how to design an interface of instructions on the LMS except to say that consistency is essential. For example if several teachers in one individual module are posting inconsistent information on the LMS in different areas at different times, it causes confusion for the students. Furthermore, large higher education institutions need to ensure consistent training for instructional design when using the LMS across different disciplines. Appropriate outlines of instructions would be helpful in order to remove confusion amongst students and teachers. Suggestions were given by one student [SS16_3] to help teachers understand what is realistic when trying to accommodate different groups of students. This is because the needs, requirements and abilities of Science students are, generally, different to Social Science students.

“For our field, Social Science, I think teacher should give easier activities, the home work should not very difficult, some home works have very strictly timed, I read it and notice that it's very difficult to finish on time. For Social Science students if the tasks are difficult, teacher should expand time to do it, Excel is the final tasks that the course is nearly finished, my friend can't do this because it is very short time.” [SS16_3]

One student from Social Science suggested that, as far as basic skills, the teacher should provide an average task level for all the disciplines. However, for advanced skills, the teacher should select the appropriate task levels to suit each particular academic discipline [SS18_1].

4.5 Final Template

The template analysis helped the researcher to produce a clear, organised, and final presentation of the results for this study. The results from the final template, which have been presented in this chapter could be summarised under three important themes as follows:

Learners
- Determine individual learning styles
- Common learning styles
- Attitudes toward technology
  - Convenience
  - New technologies
  - Supporting self-study materials
  - Increase practical skills
  - Developing knowledge to life-long learning
- Previous experience
Learning processes on the LMS

(1) Signing up email address and (2) Signing up and login to the LMS
(3) Checking homework
(4) Reading course contents, (6) Doing assignment
(5) Participating on the discussion board
(7) Doing assessments

Context

Blended learning (face to face teaching and supervised on-line study)
Obstacles to learning on the LMS
Challenges

Content

Group characteristics and media preferences
   - Text, Animation, Graphics and Figures and Games
   - Video
Group characteristics and learning activities
   - Report
   - Short answer and quiz module
   - Discussion board
   - Presentation design
   - Calculation practice
   - Static course content module
   - Desktop publishing

These themes began to appear during the process of analysing the second template and before the final template was attempted. The themes emerging from the final template are fully discussed in the next chapter.

4.6 Chapter Summary

This chapter shows how results taken from surveys, observations and interviews were analysed with a template. It describes the principles and terminologies behind qualitative data analysis, and describes the template analysis theory followed by details of the planning behind the data analysis techniques, the applied procedures, and the qualitative data analysis software used. It reviews and clarifies the goals and processes behind the innovation of blended learning and
applies a systematic theoretical framework for the design on-line courses to suit the three particular major academic disciplines (Science, Social Science and Management). The next chapter discusses the research questions in order to provide a model for learning in groups.
5 Discussion and Implication

In Chapter 1, the researcher identified the problem that numerous web-based technologies are currently available and yet there is no systematic structure for stating which should be used, who should use them and how they should be applied. This chapter aims to provide a model for learning which obtains, in three themes, the best possible match between the characteristic learning styles of students (Learners), the major disciplines in which they learn (Context) and the contents on the LMS (Content).

This chapter merges all the results taken from the case of one compulsory IT course into one coherent whole in order to answer the main research questions and to provide a possible systematic structure for a learning framework which can be applied in a blended learning environment (face to face teaching and practical on-line sessions in a laboratory). The LMS can be efficiently designed, not only to meet the needs of individual learning styles but also for the common learning styles that characterize whole groups. Moreover, this model can be applied for group learning on any compulsory, on-line course.

5.1 The Relationship between Results and the Implications

The template analysis described in Chapter 4 produced the three clear themes (Learners, Context and Content) shown in section 4.5 which were further sub-divided into nine main categories and at least three of those categories were further subdivided into minor categories. The main categories of the themes produced in the final template require the ultimate users of this model to: determine individual learning styles, determine the learning styles common to whole groups (major disciplines), understand the students’ attitudes towards technology, be familiar with their previous (computer) experience, understand their learning processes on the LMS, be familiar with their media preferences and their learning activity preferences, and have considered some of the obstacles to learning on the LMS, and any other challenges they may face.

All these categories, which overlap to some extent, emerged from interpretations of the results based on the initial research objectives and follow the conceptual framework described in Chapter 3. This research has showed understanding individual learning styles alone will not
automatically lead to the design of on-line learning systems that are tailored for whole group learning styles in the context of blended learning situation.

5.2 The Findings in terms of the Research Questions

The most important aim of this research was to improve the design of the LMS for whole group learning in the blended learning situation. The research emphasized the need to explore group characteristics and their learning styles, and the media and activity preferences that are common to whole groups when studying on a compulsory IT course. Finally, the research findings should provide a universal framework strategy that can be used, in a blended learning context, for undergraduate students who study on any compulsory course in any university worldwide.

There has been some research done which has tried to understand how students learn in particular environments such wholly on-line, wholly in traditional class settings or some combination of both which has been given the term ‘blended learning’. It has been widely noted that learning and perception is partly due to the learning environment and partly and independently due to the learner (Lee & Lodewijks, 1995). Songkhla Rajabhat University runs a basic Information Technology course in a blended learning environment which has been constructed by the teachers to provide a supportive, scaffold learning environment for students which includes both face-to-face teaching together with on-line learning in a laboratory using the LMS. Many previous research papers have also suggested that it is important to adapt on-line learning according to students’ learning styles (McNutt & Brennan, 2005; Solvie & Kloek, 2007; Tóth, 2004).

This chapter considers the significance and implications of learning in groups and draws out recommendations and suggestions for future web-based course designers. The researcher proposes a model based on observed the relationship between the learners, the content and the context which leads to the design of quality courses for group learners.

5.2.1 The Important Themes

Learners learn in different ways and adopt different strategies, which differ in terms of efficiency and effectiveness. Matching and mismatching learning styles to the media and activities used for learning can have significant effects on learning outcomes (Entwistle, 1981;
Familiarity with personal learning styles can assist learners to understand the way in which they learn and it will also certainly enable the tutor to design effective learning experiences based on their awareness of the range and variety of learning styles to be accommodated. This section focuses on the following research question:

**What are the different learning styles in particular groups of students that enable them to learn effectively on a required LMS course?**

To distinguish a student by their learning styles, there must first be a review of the student's abilities and the factors affecting their learning and clues or signals can be picked up from their habitual interactions in on-line learning. These can be used by a teacher to work out when a student is learning best as an individual. Although, students learn differently from each other when only considered as individuals they can present some common learning characteristics when grouped according to major academic disciplines because those disciplines, in themselves, give them something in common. The research found that group learning styles are similar in type to individual learning styles and the type can be identified by Markova’s theory (1996).

### 5.2.1.1 Categories within the Learner theme

The main categories that emerged from the research within the whole theme of ‘learners’ are determining individual learning styles, understanding students’ attitudes toward technology and becoming familiar with their previous experience and understanding the learning process.

The progress of knowledge in this research has its intellectual origins in the work of two key theorists; Markova (1996) and Kolb (1984). Markova (1996) discovered that people learn and interact in radically different ways depending on how they process visual, auditory, and kinaesthetic information. Kolb (1984) experimented with learning styles and modes of learning. The work of Markova (1996) and Kolb (1984) is the basis, in this research, of the development of a theoretical framework for the observation of learning styles common to particular academic groups. The research found that the learner is the most important consideration in the design of the course.

The research found that common learning styles appear in the major academic disciplines at Songkhla Rajabhat University which draw students from similar backgrounds to do the same core courses. The research showed that learning style patterns manifest differently according to
particular groups of students. Management and Social Science students tend to be patterned in the order VAK which correspond to Markova’s show and tell, learning styles. However, Science students tend to be patterned in the order VKA which correspond to Markova’s great collaborators. Therefore, there is need for different on-line learning styles to be available to suit the learning needs of those groups and this must be recognised as the primary factor for effective learning on the LMS courses.

In the details, the VAK, or the “show and tell” learners write logically; show and illustrate ideas; connect best by eye contact; organise in lists; learn easily by reading, discussing and teaching others; love visual detail; read anything and everything; are persuasive speakers; like to teach, explain, and tell stories; like to talk out loud to sort their ideas and, finally, make decisions. Many of these characteristics can be seen in Science and Management students when considered as a cohort.

VKA or the learners who are Markova’s “great collaborators”: write logically; may like to draw and design; connect best by eye contact; are visually meticulous; organise in lists; learn easily by reading or watching followed by doing; learn sports easily and like competitive sports; are talkative one-on-one; are uncomfortable speaking in groups; speak quickly and abstractly; and are sensitive to voice tone to increase their confidence. Again, many of these characteristics can be seen in Social Science students when considered as a cohort.

As well as Markova’s theory (1996), Kolb (1984) also explains the learning process in this blended learning context. The processes of the participants’ learning on the LMS were observed and interpreted through Kolb’s experiential learning cycle which conceptually includes both learning styles and the learning process. According to Kolb (1984), the learner ‘touches all the bases’ – concrete experience, reflective observation, abstract conceptualisation and active experimentation – “in a recursive process that is responsive to the learning situation and what is being learned” (A. Y. Kolb & Kolb, 2009: p.17). Furthermore, Kolb (1984) suggests that learners predominately process their learning in an accommodative learning style, in which they apply two modes of learning: active experimentation and concrete experience. However, in the research, the results indicated that the students did not entirely follow Kolb’s framework. The last step of Kolb’s process was active experimentation and it was observed
that Social Science students have shown stronger attitudes towards active experimentation in this process than either of the other two fields.

Another category for teachers to consider when designing on-line courses is the learner’s attitudes toward technology. Attitudes are not related to learning styles but they still affect learning competency. The students’ learning ability increases if they feel the course (i) is convenience, fast and attractive; (ii) provides new technology; (iii) increases their practical skills; (iv) is full of materials; (v) and develops skill needed for to life-long learning.

Piccoli et al. (2001) highlighted the previous experiences of the students is also an important consideration because practical skills and learning experiences affect the learning on the LMS course. When designing the compulsory course, the teachers are also advised to consider the student’s background and previous experiences and the contents of the course including the media and activities should be balanced in difficulty in order to suit the learners.

5.2.1.2 Categories within the Context theme

Since Kolb (1984), there have been a few more studies that have highlighted the characteristics of groups with regard to learning. One study recommended that ignoring disciplinary differentiation may seriously undermine the main learning objectives and the intrinsic requirements for effective educational programmes in particular knowledge areas (Neumann & Becher, 2002). This current research has found that it is useful to understand the learning styles and media and activity preferences common to major discipline groups of students when they are learning together in the context of the blended learning situation.

The context of this research is thirty on-line compulsory courses in Songkhla Rajabhat University which are provided for undergraduate students every semester. Most of the required courses are taught in the context of blended learning. The concept that the courses may be planned according the learning style needs of the major discipline groups is very useful for the teachers who need to plan other required courses in the future. The university uses the LMS as the on-line vehicle chosen in order to reduce the workload of the teachers and increase course quality and learning opportunities. This research found that the group learning context is very important because most students study the required courses and then help each other with understanding, doing assignments, chatting, and managing and exchanging information.
5.2.1.3 Categories within the Content theme

Content refers to the media and activity preferences. Although numerous conference papers, books and reports have been published describing initiatives for learning and measuring learning styles for on-line course design, only a few have been published giving research information about how learning styles affect media and activity preferences (Dupin-Bryant & DuCharme-Hansen, 2005; Hu et al., 2007; McNutt & Brennan, 2005). More details are now discussed in the following section.

5.2.2 Media Preferences

This section answers this research question:

What are the appropriate media and materials that match group learning styles and why do learners prefer those materials?

According to the literature, there is some relationship between learning style and media preference (Smith & Whiteley, 2002). Table 5-1 shows that courses designed for student discipline groups that share VKA learning styles in common should make use of animation and games as media and activities that support the kinaesthetic needs of those students. In this way using media that is preferred for a particular group of students may increase participation and make the course more attractive to the learners. It is important to note that both VKA and VAK learners can benefit from courses which contain text, graphics, figures and video.

<table>
<thead>
<tr>
<th>VAK Learning Styles (Management &amp; Science student)</th>
<th>VKA Learning Styles (Social Science students)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text, Graphic and Figures (They write logically, they organise in list)</td>
<td>Text, Graphic and Figures (They write logically, they organise in list)</td>
</tr>
<tr>
<td>Animation and Game (They like interaction, competition and design)</td>
<td>Animation and Game (They like interaction, competition and design)</td>
</tr>
<tr>
<td>Video (They love visual details)</td>
<td>Video (They are visually meticulous, They learn easily by reading or watching followed by doing)</td>
</tr>
</tbody>
</table>

Table 5-1 Appropriate media for VAK and VKA learning styles

5.2.3 Activity and Assignment Preferences

This research found that it is very important to select activities and assignments based on the students’ preferences according to their learning styles because the students all come from
different major discipline groups. The following two sections summarise possible activities and assignments on the LMS that may be suitable for each particular group.

5.2.3.1 Suitable activities

This section answers this research question:

What are the appropriate activities that are suitable for a particular group of students and why do the students preferred those activities?

Students should have the opportunity to engage in activities according to their own learning style preferences and should also be encouraged to diversify those preferences. The research found that there are different preferred activities in each of the three major disciplines. The following table summarises some possible activities that have been shown, in this research, to be commonly preferred in each particular major disciplines.

<table>
<thead>
<tr>
<th>Learning Styles</th>
<th>VAK</th>
<th>VAK</th>
<th>VKA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activities</td>
<td>MT</td>
<td>SC</td>
<td>SS</td>
</tr>
<tr>
<td>Assignment practice after study</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>discussion board</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>quiz</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Presentation design</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>calculation practice, spreadsheet</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>static course contents</td>
<td></td>
<td>✓</td>
<td></td>
</tr>
</tbody>
</table>

Table 5-2 Summary of activity preferences
MT: Management students
SC: Science students
SS: Social Science Students

Management students generally prefer assignments for practice after the laboratory class, discussion boards, quizzes, presentation designs, spreadsheet exercises and to refer to static course contents, while Science students prefer assignments for practice after the laboratory class, quizzes, and presentation designs. Social Science students prefer assignments for practice after the laboratory class, discussion boards, quizzes, and to refer to static course contents. It is noticeable that only Management students prefer calculation practice activities and spreadsheets and only Social Science students prefer to refer to static course contents.

<table>
<thead>
<tr>
<th>Learning Styles</th>
<th>VAK</th>
<th>VAK</th>
<th>VKA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reasons for preferred activities</td>
<td>MT</td>
<td>SC</td>
<td>SS</td>
</tr>
<tr>
<td>Present own ideas</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 5-3 Summary of reasons for preferred activities

<table>
<thead>
<tr>
<th>Reason for Preferred Activities</th>
<th>MT</th>
<th>SC</th>
<th>SS</th>
</tr>
</thead>
<tbody>
<tr>
<td>To Increase knowledge</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>To Increase grades</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Exciting</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Encourages learning</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>To Improve skills</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>Fun</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Practice summary</td>
<td>✓</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

MT: Management students
SC: Science students
SS: Social Science Students

Because Management students generally manifest ‘show and tell’ learning styles, this may be a reason why they prefer activities in which they can present their own ideas.

However, though Science students also manifest ‘show and tell’ learning styles, their activity preferences are different from Management students. It has been shown that Science students preferred activities where they could: increase their knowledge; increase their grade; be excited; encourage learning on the course; and improve their computer skills. In contrast, have show and tell learning styles Social Science students who manifest ‘great collaborator’ learning styles prefer activities where they could increase their knowledge, be excited, improve their skills, have fun and do practice assignments to summarise the course.

5.2.3.2 Suitable assignments

Table 5-4, below, shows specific assignments which are preferred by particular major disciplines of students. Management students mostly prefer to do PowerPoint (PPT) only as a presentation exercise. They also prefer publishing design work, and spreadsheets and their interest in search engines comes out mainly when they have to do reports. This pattern of preferences may also be due the fact that they manifest ‘show and tell’ learning styles which is typical of Markova’s VAK description. Meanwhile, in the context of blended learning, Science students do not prefer to do spreadsheets or publishing design work and also, it is noticeable that, they do not distinguish between doing assignments that require the use of Power Point presentations with or without the additional use of search engines. Social Science students make no distinctions at all in their preferences for assignments. This may be because as ‘great collaborators’ they like to take on all kinds of challenges.
Learning Styles | VAK | VAK | VKA
--- | --- | --- | ---
Assignment | MT | SC | SS
--- | --- | --- | ---
PowerPoint (PPT) | ✓ | ✓ | ✓
PowerPoint+Search Engine+Presentations | ✓ | ✓ | 
Publishing design | ✓ | ✔ | 
Report+Search Engine | ✓ | ✓ | ✓
Spreadsheet | ✓ | ✓ | ✓

Table 5-4 Summary of preferable assignments
MT: Management students
SC: Science students
SS: Social Science Students

The research results indicated in Table 5-5 show some of the reasons why assignments are possibly preferred across different the academic disciplines. Management students tend prefer activities or assignments that enhance their skills, make use of their self confidence and previous experience and which are attractive and build up new knowledge. Science students mostly prefer activities or assignments that enhance their skills, bring them into new levels of difficulty, have reasonable submission times and to do assignments that are all very different from each other. Social Science students seem to like all kinds of assignments and they do not like to rigidly compartmentalize activities and this, again, may be due to the ‘great collaborator’ style that they share.

Learning Styles | VAK | VAK | VKA
--- | --- | --- | ---
Reasons of preferred assignments | MT | SC | SS
--- | --- | --- | ---
To improve skills | ✓ | ✓ | ✓
Try to engage with difficulty | ✓ | ✓ | 
Don’t like deadlines | ✓ | ✓ | 
like distinct activities | ✓ | 
Self confident | ✓ | 
Have previous experience | ✓ | ✓ | 
Relevant to other work | ✔ | 
Fun | ✔ | 
Brings new knowledge | ✓ | ✓ | 
Attractive | ✓ | ✓ | 

Table 5-5 Summary reasons of preferable assignments
MT: Management students
SC: Science students
SS: Social Science Students
5.2.3.3 Summary of activities and assignment in the IT course

Mixing activities and assignments in any course may not be useful unless it meets either the requirements or preferences of a particular group of students. Students who show preferences for particular learning styles need different learning activities and assignments. Table 5-6 shows a summary of activities and assignments that could possibly match the common learning styles of each major academic discipline.

<table>
<thead>
<tr>
<th>Learning Styles</th>
<th>Preferred activities &amp; assignment</th>
<th>Ac/As</th>
<th>VAK</th>
<th>VAK</th>
<th>VKA</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT</td>
<td>Management students</td>
<td>Ac</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>SC</td>
<td>Science students</td>
<td>Ac</td>
<td>✓</td>
<td>✓</td>
<td></td>
</tr>
<tr>
<td>SS</td>
<td>Social Science Students</td>
<td>Ac, As</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Ac</td>
<td>Activities</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>As</td>
<td>Assignments</td>
<td>✓</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5-6 Summary activities and assignments preferences

MT: Management students  Ac: Activities
SC: Science students    As: Assignments
SS: Social Science Students

Table 5-6 shows that although Markova’s learning style description for Management and Science students are same (VAK) there are still differences in their preferred activities and assignments on the IT course. Again table 5-6 shows that Social Science students (VKA) prefer all activities and assignments. The activities and assignments that Management and Science students prefer in common include: Reports, Quizzes and Presentation design and in this respect Science students only prefer a very limited range of activities whereas Management students prefer a fuller diversity of activities and assignments including: Discussion board, Calculation practice and Desktop publishing.

Indeed, a teacher who can choose suitable activities and assignments is potentially able to accomplish more than a teacher whose repertoire is relatively limited. Another important curricular solution might be to devise alternative instructional situations to accommodate the variations in learning styles as well as to manage the complexities of group learning styles.
The following section describes a suggested model of group learning which brings together the relationship between the learners, the content and the context.

### 5.3 Implication: The Model for Group Learning

The learning model based on compulsory on-line courses in a blended learning context and created as the outcome of the interpretive case study in this research is shown in figure 5-1 which identifies the main components: the learners, the content and the context. Each component is made up from further key elements. One of the basic principles of this particular model is that each component is unable to stand alone and needs strong support from the others if teaching and learning is to occur. The three corners of the triangle are reminders to academics to find the balance and to situate the learning process within the context, consider the needs of the learners and design relevant contents. In this research it was found that each major component is constantly dependent on the other components and is directly susceptible to, and strongly influenced by, all the detailed elements that appear in figure 5-1.

![Figure 5-1 Complementary triangle for adapting web-based learning for group learners](image)

**LEARNERS**
- Individual Learning Styles
- Group Learning Styles (Common Learning Styles in group) VAK, VKA
- Attitude toward technology
- Previous experience
- Learning Process

**CONTENT**
- Media Preferences
- Activities & Materials Preferences

**CONTEXT**
- Blended learning
- Obstacles/Challenges

**Who is studying?**

**What do we have available?**

**Which environment?**
The learners’ component includes the following elements: individual learning styles, group learning or common learning styles, attitudes toward technology, previous experience, and the learning process. The content component includes: media preferences and activities preferences. The context component includes: blended learning and the obstacles and challenges.

Bach and colleagues (Bach et al., 2007) proposed a model called the “golden triangle” which also contained the three components of on-line learning: the learner, the context and the task. The three corners of the triangle remind the course designers or teachers to focus on learning within context, to consider the needs of learners and to design related tasks. The model in figure 5-1 is similar to Bach’s et al. (2007) model but is different in the details and, furthermore, Bach’s et al. (2007) model is not based on the concept of group learning.

The model in figure 5-1 helps to explain the dynamic variety of interactions that are often considered essential in fostering a socially constructed learning environment. What follows is a rationale for this model that could guide the design and development effort towards meaningful and memorable learning environments. The learners are the group of first year undergraduate students taking a compulsory IT course. All the students in each group come from the same major academic discipline. The content includes the complete assortment of instructional media such as text, graphic and figures, etc. and materials such as report, quiz, etc. and these serve as resources, that the learners make use of. The context is a compulsory IT course using a blended learning strategy. The details of each component are now described.

5.3.1 Insights into the three Components

The Learners, Who is studying?

Learner characteristics are often multi-faceted and include personal, environmental and situational characteristics that may impact one’s ability to succeed in a learning environment. The teacher needs to fully consider each element of the ‘Learners’ component. The students’ already positive attitude towards technology, in the blended learning situation, may further increase if they feel the course is (i) convenient, fast and attractive; (ii) is provided with new technology; (iii) able to increase their practical skills; (iv) full of preferred media and activities; (v) able to develop skill to life-long learning.
Considering individual learning styles (Markova, 1996), the researcher extended Markova’s theory to look at how whole groups may have common learning styles. This research found that each of the major academic disciplines contains students who have certain learning styles in common which has an effect on the design of the LMS. It is important, when using the LMS, that the teaching strategies consider the common learning styles of groups because understanding the differences between any particular group of students plays a vital role in improving the learning process amongst the undergraduate learners.

The Content, *What do we have available?*, In addition to the formal efforts of the teachers to design and develop the core activities in various courses, the teachers need to consider further available resources that may become available by sharing resources with other teachers within the university. If a course has more media and activities available, the teacher will simply have more choice from which to select. Even if there was a limited choice of media and activities it is still useful to select only the most suitable media or activities that suit the preferences to the students.

The Context, *Which environment?*

Along with learner characteristics, context is one of the first major variables to be considered in learning design (Ramsden, 2005).

Obstacles and challenges may occur when studying in this blended learning context and these include the policies, infrastructure and systems, such as class sizes, of the teaching institution which impose powerful contextual influences on learning and which impact directly on the students. The fact that Songkhla Rajabhat University has radically redesigned its curriculum for all compulsory courses is a step forward. This redesign into a 50-50 balance between face to face teaching and supervised on-line study, which is called blended learning, sets the context, in their view, for an efficient application of on-line learning. The alternative context of 100% on-line study is not acceptable to them because the students would receive insufficient academic support.

This researcher recommends two possible ways of designing the course content in the blended learning situation: One way is for the teacher to write the course material within the LMS, which will then be ready to deliver for the students to use on-line, and then to transfer all the
content into conventional lecture notes for delivery face-to-face in the lecture class. The other way is the reverse where the teacher writes the course for the lecture class and then transfers all the material content into the online system. From an educational point of view it is probably better to write the material content for online courses directly onto the online system because it, more naturally, allows the teacher to make use of all the media and activity choices available and furthermore makes it much easier to choose media and activities that truly suit the preferences of the various groups who will be using it. However, from a practical point of view teachers who have been used to working with face-to-face delivery will already have a wealth of material available and they will simply want to transfer this into a digital format. The majority of the work currently happening in the university is taking previously delivered lecture notes and transposing these into an online environment while still attempting to retain the unique and positive communications and interactions of a classroom-based activity. In reality this more practical approach can only be achieved by blended learning (50:50 mix of teaching and online study) which is the system and context that has been introduced by the University as a matter of policy.

5.3.2 Interaction between the Components

Blended learning is a hybrid teaching method which is supposed to combine the efficiency, flexibility and controllability of online learning with the interaction and personal attention of traditional face-to-face teaching. The key to efficient blended learning seems to be in selecting the right combination of online contents and delivery media to the right group of students. In the context of Songkhla Rajabhat University, the teachers who teach the IT course will need to deliver both face-to-face lectures and supervised online laboratories. This researcher further recommends that these learning strategies should also incorporate a variety of activities, classroom instructions and online contents that are preferred by the common learning styles of the groups of students defined by the major disciplines. The researcher suggests that concentrating only on individual learning styles may be not enough when designing content for online learning.

Learners-Content Interaction

The students interact with the material contents provided by the teachers on the LMS using a variety of media and activities. However, this ‘learners-content interaction’ in a blended
learning context is different from the interaction in the distance learning context because the interaction in blended learning is not just confined to the interaction between the learners and the content but has the additional interaction of learners to learners and learners to the teacher. The teachers help the learners to more fully and actively engage with the course content and, as demonstrated by the findings of this research, the learner to learner interaction has helped students to feel more confident about their achievement.

Learner-Context Interaction

Prideaux (2003) said that the curriculum must be in a form that can be communicated to those associated with the institution, [and] should be able to be readily transformed into practice. The specific learner-context interaction at Songkhla Rajabhat University is that students who study on the required courses have to remain always within their major discipline while they study any required courses and therefore any course designed for those learning preferences will be useful in the long term because these decisions are made by the faculty development committee at the upper curriculum level which means the learning context will remain steady for at least five years. This means that teachers, who operate at the lower level of year by year course development, can have confidence that any changes made will be useful in the long term.

Context-Content Interaction

Once a course has been designed, using the preferred media and activities suited for a particular major discipline group of students in a blended learning situation, it can, theoretically, be taught for any subject. This is because the major part of the context remains the same that is it is the same group of learners with common learning styles and the same process of delivery (i.e. blended learning) but only one minor aspect of the context, i.e. the subject taught, has been changed.

5.3.3 Factors which affect the Design of Compulsory Courses

This research found three key themes or components, emerging from all the data analysis, which have a major effect on the design of compulsory courses. These key themes; the learners, the content and the context, represented in figure 5-1, can be compared in outline
with the theoretical model shown in figure 2-1 but in the detail, figure 5-1 has a much fuller
description with a greater number of elements.

The components in figure 5-1 are coherent in that they all have to be considered together for
success in designing compulsory on-line courses. The only factors outlined in figure 2-1 were
the [individual] learning styles and the learning process. However, some more elements or
factors have emerged from this research and some of the more important ones include
consideration of common learning styles, the factor that media and activity choice should be
guided by the preferences of whole groups and the effectiveness of blended learning.

The main difference between the proposed model in figure 5-1 and the initially proposed,
theoretical model in figure 2-1 is that this researcher has been able to describe, by the
interpretations of the template analysis, interactions between the main themes; learners,
content and context.

5.3.4 Implications for other Compulsory Courses in the University

As mentioned before, Songkhla Rajabhat University is a member of the Rajabhat University
group which include forty other Rajabhat Universities which have the same curriculum and a
similar university structure. The model could be recommended to the academic staff so that
they can design similar courses with an equal level of competence since the context (i.e. the
policy for blended learning) is the same.

At a practical level certain minimum requirements need to be considered.

(i) the learners; what attitudes do they have towards technology?; how much
computer experience do they have?; and how well do they perform in the process
of learning on-line?

(ii) the context; does this differ from the context of this research case study?

(iii) the contents; what media resources are available and are they compatible with the
findings of this research case study?

This model should also inform those committees who have the responsibility for planning
such things as the information literacy curriculum and other compulsory courses and the
setting of guidelines for performance measures and learning outcomes. This committee would be responsible for the evaluation of the effectiveness of blended learning using instruments such as the post-education test and therefore it is very important for them to have some understanding of how this model works.

The use of this model requires collaboration between teachers so that there is a good level of agreement about the basic design of how the on-line courses need to be structured for maximum effectiveness because, historically, the staff have been very individual in the way that courses have been designed. Furthermore course design is a dynamic process and requires interaction between teachers who have different skills which can be used collectively together to achieve a successful delivery of the course contents.

5.3.5 Cultural aspects of Learning Styles

The notion is that people from different cultural backgrounds have different styles in their approach to life. This could also be true and recognized in their learning styles. Psychologists have had difficulty in showing any clear evidence that one method of teaching works better for learners of one cultural group while a different method of teaching works better for learners in a different cultural group.

Field Dependence and Field Independence are theories which have been identified as a cognitive model by Witkin et al. (1977), who have provided a way to determine how people, from different cultural aspects, disseminate information. The study showed that a field independent student can identify the parts [of a concept or a new idea] and manipulate and construct them into a whole picture, while a field dependent student has difficulty identifying the various parts and needs additional external help in how to manipulate and construct them. Field dependence is often a product of culture and socialization practices and can be explained by the degree of social tension, ecological adaptation, and, even, biological effects. A strictly group-controlled environment tends to produce and support individuals who are more field dependent whilst a more free-thinking society, that encourages individuality and tends to generate more field independence.

Previous research (Rodrigues, 2005) has confirmed that if a group of learners are all from the same cultural background, a single customized teaching technique may be effective. When
members of a group are from diverse cultures, it serves as a useful reminder to the teachers that they may have to provide structures both to reach those students and trainees from cultures who learn best through directive techniques and those who learn best through less directive technique.

Some of the results in Chapter 4 indicated that feedback from the teachers inspired in the students’ a more positive attitude toward technology and helped them improve their own practical skills. In the experience and observations of the researcher, it has often been clear that new students need frequent feedback on their performance. This is a small amount of evidence but nevertheless an important indication that the students, in the context of this study, are displaying field dependency in their approach to learning.

Asian cultures vary across the whole continent of Asia but, it is generally true that majority of Asian cultures place great importance on the good of the group and put little emphasis on individuality. As a result, students raised in Thailand tend to be more field dependent (Kaewprapan & Suksakulchai, 2008). Most Thais have group patterns in their thinking which differ from Western thought patterns which tend to be focused on the individual. Thai communication, in terms of speech and body language does not totally provide as full a meaning as it does in Western communication (Sriussadaporn-Charoenngam & Jablin, 1999). In Thailand, in order to determine the conversation, the listener needs understand the context and to be able to integrate the speakers and their emotions.

This researcher has found that there are not many research studies that clearly describe the effect that particular cultures have on learning. Even though this interpretive research case was conducted in a situation where there was no cultural diversity, the evidence from this research is that Thai students are behaving in a field dependent style of learning and therefore display many of the characteristics expected of those kind of learners including the tendency they have to want to work in groups rather than independently.

There are many approaches that could be employed in designing learning environments that allow new students to respond more effectively. We have noticed, for example, that new Thai students, in the context of this research, prefer concrete learning experiences on which they can build on the way to a more abstract understanding. Assignments need to be structured to exploit experience first followed by, theory later. In general new students appear to need a
great deal more structure so that they know precisely what is required of them and this enables 
them to gain confidence in the challenge of learning. They prefer sequential learning tasks –
and building a linear concepts rather than having global concepts presented all at once. They 
seem to find open-ended assignments, independent projects and self-designed learning 
situations extremely challenging and, therefore, too much diversity in ideas in the classroom 
environment, or the assignments can cause anxiety for new students.

Furthermore, new students, perhaps compared to their more traditional predecessors, seem to 
prefer a high degree of personal support. Because they are often unsure of themselves, they 
want a great deal of feedback from their teachers. However, they adapt well to group activities 
and collaborative learning.

It is not only individual learning styles but group learning styles which have to be considered 
for field dependent students and this is an important part of the blended learning strategy. 
Field dependency, where students need constant support, also justifies why the on-line 
laboratory sessions, in the blended learning context, are supervised.

It is, therefore, important for the academic staff, at Songkhla Rajabhat University, to review 
classroom methods, testing methods and assignments in accordance to how well they match 
up with the way field dependent students learn. Thus course contents on the LMS should be 
arranged by adding media that are preferred by whole groups of students rather than focusing 
only on individual learning styles. Songkhla Rajabhat University offers a wide range of 
opportunities to staff to increase their flexibility and allow them to improve their teaching 
skills. Understanding the reasons for writing courses for the blended learning context will help 
the university in providing relevant training. Previously IT related training courses were 
provided but this only increased staff stress when it was perceived that this added to their 
workload. However, today most of the staff are now aware of the benefits and tend to accept 
the new training courses more easily. This may now be the ideal opportunity to help academic 
staff to be informed about the importance of group learning and the potential success of 
blended learning as a strategy for dealing with field dependent students.
5.4 Chapter Summary

This chapter has discussed the findings of this research study by explaining the implications of the research with reference to the research questions stated in Chapter 1 and derived in Chapter 2. First, the researcher has discussed the different learning styles which have emerged in particular major discipline groups. Second, this chapter has compared and discussed appropriate media and activities that are preferred by each particular group of learning styles. Third, the researcher has then suggested a model for application in the specific situation of blended learning which the teachers need to consider when preparing on-line courses for use on the LMS. The three important components suggested in the model for designing on-line courses for groups of students in a blended learning context are: the learners, the content and the context. The interactions between these components are then discussed i.e. learners-content, learners-context, and content-context. Finally, this chapter discussed some cultural aspects that affect learning.
6 Conclusions and Further Work

The previous chapter has summarised all the findings of this research which have culminated in a three component model useful for designing on-line courses. The model could be used to inform the academic staff about the important components or themes, the learners, the content and the context which needs to be considered when preparing courses in a blended learning situation. This study has shown that a variety of on-line media and activities should be used for instruction in order to suit the preferred learning styles for particular major discipline groups of students in the Rajabhat University Group and beyond. The key to success is to choose the right combination for each group of students. There is good potential for online learning to provide an environment for educators to deliver a wide range of different types of media and activity thus allowing the students engage with their course of study in the preferred learning styles of the majority of students in their academic discipline (group) and thereby raising student satisfaction with the course.

6.1 Contributions of the Research

6.1.1 Theoretical Contributions

This research has built a body of knowledge and a theoretical contribution supported by important work in the field of designing on-line course content in a blended learning situation and is demonstrated, for example, by the findings of Moallem (2003) who showed that the structure of the course activities should present the didactic content of the course in an organised, ‘building-block’ fashion which takes account of the students’ previous knowledge, experiences and concepts and finds ways to help them to assimilate and accommodate new concepts. This is expanded by Masie (2002, p. 59) who commented that “blended learning adds a significantly greater opportunity for the learner to master the [course] material and move towards [knowledge] transfer and performance.” Therefore, the development of media and activities used in blended learning should, ideally, be based on ascertaining learning style preferences, and understanding the learning process, students’ previous experience and their attitude towards technology. In the literature, over the last two decades, this has usually been considered in the situation where students learn independently. In blended learning, however, the situation is different because students prefer to stick together in groups when they study within the same course.
In the literature review, many studies were referred to which argued that matching the learning preferences of students within the same learning environment is absolutely essential for the success of any new initiatives (Chapman & Calhoun, 2006; Felder & Spurlin, 2005; Holsapple & Lee-Post, 2006; Kuo et al., 2009). The work of this current thesis highlighted the need to explore learning styles from the student's perspective. McPherson & Nunes (2004) indicated that educators and designers must interact, and invest more time and effort on understanding the students and the content of the course, the learning context, the software applications, the curriculum and the learning technologies used to design an effective on-line program. It is important to acknowledge that the quality of the learning process is not determined only by something that is delivered to a learner by the course provider but rather constitutes a process of co-operation between the learner and the learning-environment.

This research extended the range of the theories identified by Markova (1996), who explored individual learning styles using a learning styles questionnaire and Kolb (1984) who proposed an individual learning process. The extension took both of these theories into a group learning context. Other researchers, such Al-Balhan (2010) and Thomas (2000) used Markova's theory of stacking the perceptual order of learning styles but again only in the context of individual learning.

The students surveyed at Songkhla Rajabhat University, when analysed as major discipline groups, all fell into either VKA or VAK perceptual orders which is only a very narrow range of the complete possibilities of Markova learning styles. This is attributed to the limited range of degree courses offered by the Rajabhat University Group. If other disciplines existed at Songkhla Rajabhat University a wider range of styles may be expected in line with the findings of Santhamma James et al. (2011) who reported that nursing or midwifery students manifest KVA learning styles when identified as a major discipline group.

Blended learning, in which on-line studies are carried out in a supervised laboratory setting for the benefit of field dependent learners who are more comfortable learning with the support of the teacher and the group body, requires that the on-line courses are designed to match the preferred learning styles of the whole group rather than the styles that are usually identified for individuals. For this reason it would be a fundamentally flawed approach to use existing
theories which only consider individual learning styles and therefore the theoretical basis of this research had to be extended.

6.1.2 Methodological Contributions

This thesis was written for all academic staff in educational training settings who are seeking proven methods to create efficient learning environments for web-based classroom training as a part of blended learning instruction. This thesis is also applicable to designers and developers of classroom and multimedia instructional materials. The recommendations may also be useful for appropriate sponsors and academic administrators who are interested in realising the potential of on-line learning. These findings are expected to be useful for drawing up strategies which implement efficient blended learning.

Soft System Methodology (SSM) is normally done in a process of change but this research used it as a part of methodology by using a rich picture to analyse the areas of concern, identify the problem statement, and highlight the value of the research. This research was based on a qualitative approach using an interpretive case study methodology which does not aim to produce ‘truth’ or social laws but to distil generalisable findings and this can be used, as an example, for other similar research which requires an iterative approach where initial theories are expanded, revised or abandoned towards a final product. It is of particular value to those who need to understand a larger reality by examining it in a holistic way or by examining the components of that reality within a contextual setting. An important key for success was the use of the template analysis originally developed by King (King, 2004). This research shows the efficiency of using NVivo software to carry out the template analysis in that the researcher achieved a full qualitative data analysis within seven stages. Although it would have been possible to conduct this research using Action Research instead of an interpretive case study, the researcher would have needed to make sure the framework was valid before comparing it with the real situation and therefore, that could only be considered for any further work.

6.1.3 Practical Contributions

This researcher proposed a three component (or three theme) model that can be applied when designing a particular on-line instructional course. The model helps the designer to ask the following questions: in relation to the learners, *Who is studying?*, in relation to the content, *What do we have available?*, and in relation to the context, *Which environment is being considered?*. The
environment in this research case was blended learning. The nine elements found within the three themes as a result of this research are pertinent to developing course content in a blended learning context or environment.

This model can be used in blended learning to get guidance on how to choose and mix appropriate media and activities (Kerres & Witt, 2003). This is done by using the model to analyse the pedagogy to produce improved learning experiences for the students (T. Boyle, Bradley et al., 2003).

Although the model guides the teachers to the effective design of the course in this blended learning situation, teachers need to understand a subject enough to convey its essence to students. While traditionally this has involved lectures, new instructional strategies such as team-based learning put the teacher more into the role of course designer, discussion facilitator and coach and the student more into the role of an active learner who is discovering the subject of the course. In either case, the goal is to establish a sound knowledge base and skill set on which students will be able to build as they are exposed to different life experiences. Blended learning is consistent with the values of traditional higher education institutions and has the proven potential to enhance both the effectiveness and efficiency of meaningful learning experiences (Garrison & Kanuka, 2004).

In practice educational designers need to follow the course outline step by step and, using the model, look for the most appropriate mix of media and activity that will most effectively communicate the topic being considered. Clear educational purpose and careful decision-making and design are key factors for developing good on-line educational programs that are increasingly being required.

In retrospect, it appears that previous initiatives to produce on-line courses using the LMS have delivered material which has been all too inconsistent, isolated and fragmented. The resulting pedagogical efforts have therefore lacked coherence, and the goal of developing the interactive on-line classroom has remained unfulfilled. By coordinating the future efforts of the individual faculties, faculty developers, academic administrators, and educational researchers, it may be that a successful change can be made into blended learning.
The following practical guidance is based on the findings and literature review of this research. First, this research confirmed that the appropriate media and material for on-line blended learning situations can be selected to suit the preferences of the different major disciplines of the students. Second, it is also important to design the on-line course in a manner which is appropriate and suited to the learning environment.

It is not only the teachers who should be concerned to use this model to improve their teaching practice but the senior university developers who are responsible for training the teachers in achieving their best teaching practice.

Academic administrators can help by recognising and rewarding excellent teaching in general and the adoption of instructional innovations in particular. The university should address institutional employment policies and practices, the allocation of adequate resources for instructional development and the development of strategic administrative action plans.

6.2 Evaluation of the Current Work

6.2.1 Research Limitations

This research surveyed most of the major academic disciplines within Songkhla Rajabhat University which is one out of forty-one in the Rajabhat University group. The context in all the Rajabhat universities is very similar in terms of university structure, curriculum offered and course structure and, therefore, this research can be generalised for the whole group. It may not be so easily generalised to other universities outside the group which have different structures and curricula. As a qualitative exercise these research outcomes provide insights, rather than proofs but the findings in one context are likely to be relevant to those in similar contexts. If further research were conducted with students from similar backgrounds in a related educational context, it would be expected that the outcomes would be similar. However, further specific research covering both similar and different contexts is needed to substantiate the findings of this research.

This study used interview data and the findings of the study are based on the perceptions of students and the assumption that the students have responded honestly and that the interpretations are a valid instrument of the students intentions. The investigation covered the undergraduate student population only. In retrospect, an investigation of other students would
have added more insight to the research because there are a number adult learners studying vocational undergraduate degree within a similar context.

6.2.2 Further Work

Currently, most published articles on learning styles and course based instructional design have been empirical investigations rather than descriptive accounts and many are out of date, either chronologically or methodologically, and a large number of important conceptual issues have never been explored. Further qualitative Information System research should be done to examine strategies that enhance students’ learning.

This study has explored the learning styles preferences common to three major discipline groups of undergraduate students. There are other directions in which this research could be extended and these are now outlined.

On-line course design in the blended learning situation depends on many factors or components. Some of these have been proposed by the three component model illustrated in figure 5-1. This model needs further work for full practical confirmation. Further research projects could attempt to replicate this work and to assess the accuracy of the study by surveying and observing students on other compulsory courses in the university. Additionally, further research could be extended to identify other possible components that may affect course design for blended learning situations.

Similar studies could be initiated to investigate other educational levels such as, high school students or adult learners to explore the possibility of group learning styles at all levels of Thai education and furthermore whether the findings can be repeated or refuted in other regions of Thailand. In the case of high school students the learner groups could be explored in other ways such as by subject choice and for adult learners, group learning styles could be explored on career choice.

Another area that would be benefit from further research is a longitudinal study over the full four academic years to increase the richness of the data and in order to investigate the learning characteristics of undergraduate students in their preferred academic disciplines over an extended period of time throughout their entire bachelor degree. This would be a valuable addition to the growing body of research and knowledge about student learning and may have
the benefit of studying the impact that intellectual development has on the ability of the students to succeed in on-line learning.

Another group of researchers could be commissioned to repeat this research using an Action Research methodology in order to explore some of the processes involved and the effect of the researcher actions on the outcome within the context of blended learning (Heinze & Procter, 2004). It is important to note that the researcher would need to have sufficient authority to make the required changes over the long period of time that Action Research requires in order for the actor to take action in the context (Shah et al., 2007). The Soft System Method (SSM) that the researcher has already used to draw the conceptual framework may very useful as the starting point to understand and identify the problem and could provide an analysis of the situation (Urquhart et al., 2008). In addition, by using the model suggested in this research, those researchers could easily start the first round of the Action Research cycle.

For any other further work the faculty plays an important role in the adopted pedagogy on LMS. Firstly, the faculty should begin by being self-reflective about its pedagogical goals and the strengths in integrated group learning styles. Any attempt to modify teaching style, in the context of any specific course, needs to be framed within the three components: the learners, the content and the context. Secondly, it is important to remember that neither learning styles nor teaching styles are immutable and they can be modified over time and for different purposes in different classroom contexts. Therefore, while it may be advantageous to just modify course contents to fit a broader range of students in a discipline or a major, it may also benefit those same students to gradually introduce class activities that substantially expand their learning style preferences.
References


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presented at the EDU-COM 2008 International Conference Edith Cowan University, Perth Western Australia.


Roper, A. R. (2007). How Students Develop Online Learning Skills Successful online students share their secrets for getting the most from online classes, focusing on time management, active participation, and practice. EDUCAUSE Quarterly Magazine, 30(1).


Stodel, E. J. (2006). Learners’ perspectives on what is missing from online learning: Interpretations through the community of inquiry framework. *International review of research in open and distance learning, 7*(3).


Appendices
## Appendix A Table of Important Studies

### Learning styles theories

<table>
<thead>
<tr>
<th>Authors/Years</th>
<th>Aim/Contribution of the paper</th>
<th>Concepts</th>
<th>Methodology</th>
<th>Main Result</th>
<th>Critiques/Analysis</th>
</tr>
</thead>
</table>
| Alice Y. Kolb and David A. Kolb, 2005 hardcopy | Learning Styles and Learning Spaces : Enhancing Experiential Learning in Higher Education  
- to draw the foundational theories of John Dewey and Kurt Levin  
- to examine developments in theory and research on experiential learning and explore how this work can experiential learning in higher education. | Comparing learning styles of case management and Art students             | Quantitative Qualitative | Negative emotions such as fear and anxiety can block learning, while positive feelings of attraction and interest may be essential for learning.  
By developing their effectiveness as learners(Kecton, Sheckley, & Griggs, 2002), students can be empowered to take responsibility for their own learning by understanding how they learn best and the skills necessary to learning in regions that are uncomfortable for them | Cognitive Learning Styles |
| Steven John Simon, 2000     | The relationship of learning style and Training Method to End-User Computer Satisfaction and Computer Use: A structural Equation Model  
To determine the optimum method of | Related correlation between learning styles and computer use | Structural equation modelling Field experiment | The finding indicate a correlation between learning style, training technique, user satisfaction and computer use  
- learning style impacts the results of training based on the agreement of training treatment, use style and information type  
- instruction and exploration training produced positive results based on the match between the technique and |
To assess learning style's role in computing system training, only the use of a technique like behaviour modelling should produce optimum result in most training/learning situations with a variety of learning styles. Tools such as Kolb learning styles inventory can be utilized to help predict trainee success.

<table>
<thead>
<tr>
<th>Author(s)</th>
<th>Title</th>
<th>Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paul Jen-Hwa Hu, Wendy Hui, Theodore H. K., and Kar Yan Tam, 2007</td>
<td>Technology-Assisted Learning and Learning Style: A Longitudinal Field Experiment</td>
<td>To conduct a longitudinal field experiment to compare technology-assisted with face-to-face learning for students' learning of English. The comparative investigation focuses on learning effectiveness, perceived course learning ability, learning-community support, and learning satisfaction. They postulated favourable learning effectiveness and outcomes through the use of technology-assisted learning. They developed several hypothesis comparing technology-assisted and face-to-face learning in the context of the learning system that they studied. They tested two hypotheses in accordance with Kolb et al.'s learning style model within their evaluation context.</td>
<td>Quantitative-The use of technology-assisted learning can result in significant improvements in learning effectiveness that is measured objectively and subjectively. Students that are supported by technology-assisted learning may consider the course to be less learnable and perceive weaker learning community support compared with those who use face-to-face learning exclusively. Learning style influences learning effectiveness and outcomes in a technology-assisted learning setting.</td>
</tr>
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</table>

Richard M. Felder, Linda K. Silverman, 1988 (renew) | Learning and Teaching Styles in Engineering Education | Mismatches exist between common learning styles of Theory/Concept | Learning styles of most engineering students and teaching styles of most engineering professors are mismatches exist between common learning styles of Theory/Concept. | Cognitive Learning Styles (Kolb's) | The field experiment has limited in its controls. The design did not incorporate the manipulative controls that are common to laboratory experiments. |
<table>
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<tr>
<th>Judy Beck, 2007</th>
<th>An Exploration of the Relationship between case study methodology and Learning style preference</th>
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<tr>
<td></td>
<td>Participants completed a Barsch Learning Styles Inventory to determine learning style preference</td>
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<tr>
<td></td>
<td>At the end of semester, students were asked to rate the eight identified teaching methods utilized throughout the semester as to their effectiveness</td>
</tr>
<tr>
<td></td>
<td>This research looked at the use of the case method approach in relation to the preferred learning style of students in an elementary science methods course</td>
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**Table:**

<table>
<thead>
<tr>
<th>Quantitative</th>
<th>Case method pedagogy can be an effective tool for use in pre-service teacher education classrooms.</th>
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<tbody>
<tr>
<td></td>
<td>Pre-service teachers found the use of case studies as potentially useful in helping them learn and process course content no matter what learning style preference the pre-service teacher has.</td>
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</tbody>
</table>

**Learning styles:**

- Engineering students and traditional teaching styles, students become bored and inattentive in class.

- Uncompetitive in several dimensions.

- Many or most engineering students are visual, sensing, inductive and active and some of the most creative students are global

- Most engineering education is auditory, abstract (intuitive), deductive, passive, and sequential

- These mismatches lead to poor student performance, professorial frustration, and a loss to society of many potentially excellent engineers.
elementary science methods course. 97 students enrolled in an elementary and elementary middle level science method course at Midwest university participated in this study. Used Barsh Learning Styles inventory to determine learning style preference.

<table>
<thead>
<tr>
<th>Author</th>
<th>Title</th>
<th>Purpose</th>
<th>Method/Type</th>
<th>Additional Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chang S. Nam</td>
<td>Web-based Learning Environment: A Theory-Based Design Process for Development and Evaluation</td>
<td>The improvement of the design process and usability of the WD2L environment based on a theory-based Integrated Design Process (IDP)</td>
<td>Quantitative (Evaluation)</td>
<td>For an e-learning environment to be successful, various aspects of the learning environment should be considered such as application domain knowledge, conceptual learning theory, instructional design, user interface design and evaluation about the overall quality of learning environment</td>
</tr>
<tr>
<td>Graf, S., S. R. V. a. T. Leo, et al. 2007</td>
<td>In-Depth Analysis of the Felder-Silverman Learning Style Dimensions</td>
<td>The analyses show the most representative characteristics of Theory/Concept</td>
<td>The result provided additional information about the learning style dimensions of FSLSM.</td>
<td>Felder-Silverman learning style model FSLSM</td>
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<thead>
<tr>
<th>Reference</th>
<th>Methodology</th>
<th>Description</th>
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<tbody>
<tr>
<td>Sabry, K. and L. Baldwin (2003)</td>
<td>Web-Based Learning Interaction and Learning Styles.</td>
<td>Reports a study exploring the learning styles and perceptions of undergraduate and postgraduate students at Brunel University (United Kingdom) in relation to using the Web for learning. Explores the sequential/global learning style dimension in relation to three categories of Web-based interaction: learner-tutor, learner-leaner, and learner-information; and suggests implications for designing interactive learning systems.</td>
</tr>
<tr>
<td>Shih, C.-C. and J.</td>
<td>Web-Based Learning</td>
<td>Reports a study to analyse data about learning styles with respect to the Felder-Silverman learning style model (FSLSM) in order to provide a more detailed description of learning style dimension as well as how representative these characteristics are. This information is especially important when learning styles are incorporated in technology-enhanced learning.</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Title</td>
<td>Description</td>
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<tr>
<td>Gamon 2001</td>
<td>Relationships Among Student Motivation, Attitude, Learning Styles and Achievement.</td>
<td>Students completed a learning style test, an on-line questionnaire, and received a grade by the end of the semester. Styles and backgrounds learned equally well in web-based courses. b) The students enjoyed the convenience and self-controlled learning pace and were motivated by competition and high expectations in web-based learning. c) Motivation was the only significant factor that explained more than one-fourth of student achievement measured by class grade.</td>
</tr>
<tr>
<td>David Robotham(1999)</td>
<td>The application of learning style theory in higher education teaching</td>
<td>In considering learning and how to improve student learning one needs to understand the way(s) in which an individual learns. The term of learning style indicates an interest in the totality of the processes undertaken during learning. “A complexus of related characteristics in which the whole is greater than its parts Learning style is a gestalt combining internal an external operations derived from the individual’s neurobiology, personality and development, and</td>
</tr>
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</table>
reflected in learner behaviour" (Keefe & Ferrell 1990, p.16)

Learning style therefore relates to the general tendency towards a particular learning approach displayed by an individual.

<table>
<thead>
<tr>
<th>Pamela A. Dupin-Bryant and Barbara A. DuCharme-Hansen 2005 hard copy</th>
<th>adapting and modifying instructional strategies to match the needs of the group and individuals within the group</th>
<th>Needs assessment is the first step in the design of instruction it's the key to select appropriate technology and instructional strategies for on-line learning</th>
<th>Quantitative method /Qualitative</th>
<th>The research confirmed that to identify a sequence of events for successful needs and interest assessment including define the purpose, choose the assessment methods, develop a timeline for data collection, conduct the student needs assessment analyse the data match student needs with the learning environment.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boatman 2008 hard copy</td>
<td>the impact of faculty and student learning style on student performance in introductory economics</td>
<td>students and instructors completed the VARK questionnaire to identify which of the sensory modalities they prefer to use to learn information</td>
<td>quantitative 211students</td>
<td>a strong visual learning preference positively influences student performance. neither ethnicity or gender influence student performance confirms results of prior research ethnicity and gender-based differences in student performance may be at least partially based by differences in learning style preferences. the fact that students with strong aural and kinaesthetic learning preferences did not outperform their peers suggests that instructors might make greater use of concrete examples and class</td>
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<td></td>
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<td></td>
<td></td>
<td>VARK Reason why we used VARK questionnaire -The VARK systems focuses on one dimension of learning style: sensory preferences for how to absorb and deliver information. It is precisely this dimension that we focus on our study. using the VARK questionnaire the instructors can identified student</td>
</tr>
</tbody>
</table>
discussions in presenting introductory economics material

Hawk and Shan (2007) suggested that VARK model clearly explaining about read/write and kinaesthetic dimensions. Moreover, this only model link relatively with media that contained on on-line courses.

Ahmad A. Kardan et al. classify the tools and implicit or explicit techniques necessary for measurement of the related parameters in the learning environment. This research introduced a new learning style model for e-learning, moreover, this research proposed parameters that can be acquired in an e-learning environment. (CELS)

conceptual/analysis theories

the research constructed a three layers model and exhibit the properties such as e-learning aspects and e-learning environment.

Media preferences is in second layer including text/image/voice/video/animation and the adaptation type should be focus on content level.

The research suggested the method that can be match with the learners regarding to the content based in particular the learning style

This research represents that learning style concept different from learning process. the traditional learning style models are out of date and lack of considerations regarding new technological aspects of learning based on multimedia, fast internet and large amount of information

Alan R. Roper how student develop learning style skills the research try to find out how student develop learning styles skills by showing in 7 categories case study/qualitative

1 develop a time-management strategy
2 make the most of on-line discussion
3 use it or lose it
4 Make question useful to your learning
5 stay motivated direct physical contact with instructor
6 communicate with instructor

learning preference and selecting suitable media that provide in LMS course.
**Judith Kleinfeld**  
**Learning Styles and Culture**  
- People from different cultural backgrounds have different styles of learning.  
  *** Style of learning were formed by environments esp. the cultural environment and the ways life is lived in different communities ***

**Children from different cultural background as a group seem to have distinctive patterns of intellectual abilities.**

- Comparing learning styles and cognitive abilities of children from difference cultural environment, case study between Eskimo and Temne children.

**Qualitative**

- If we have no scientific evidence that we should teach children of different cultural groups in different ways, why is the concept of "cultural differences in reaming styles" still

**Cultural groups develop child-rearing practices adapted to the demands of their environments. In hunting and gathering societies, like the Eskimo, successful hunters must be independent and venturesome, with the courage to travel alone or in small groups over great distances.**

- And to adapt successfully to extraordinarily difficult Arctic environment, Eskimos is skilful of observing such landmarks and remembering their spatial relationships. In agricultural societies, like the Temne, members of the group need to conform to social demands, to follow seasonal styles which require everyone to plant and harvest at particular times

**The test of Berry about spatial and visual skill among Canadian Eskimo, Temne in Sierra Leone, and Scots (comparison group) gave a result that The Eskimo noticed and drew the tiny gaps more quickly than the Temne and the Scots. Berry found the same basic pattern: Eskimos far exceeded the Temne in spatial and visual skills. On many tests, the Eskimos' performance...**

**This research focusing on the group that have different learning styles because different culture student.**
The concept of cultural reaming styles is also helpful when it reminds teachers to pay attention to the ways of life in the communities in which they teach, especially when these are culturally distinctive communities.

Katica Roy 2006

<table>
<thead>
<tr>
<th>The Impact of Learning Styles on Interactivity in Asynchronous e-Learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>How do instructional theorists and distance learning specialists define interactivity within an e-learning environment?</td>
</tr>
<tr>
<td>2. How does interactivity help distance learners remember the information they are being taught?</td>
</tr>
<tr>
<td>• Does interactivity help learners develop schemas?</td>
</tr>
<tr>
<td>• Does interactivity help learners</td>
</tr>
<tr>
<td>action research</td>
</tr>
<tr>
<td>qualitative/quantitative data collection</td>
</tr>
<tr>
<td>it has not been proven that learning styles make a difference when considering interactions in an asynchronous e-learning environment.</td>
</tr>
<tr>
<td>This was a wonderful way to develop schemas, because we learned from both an instructional designer’s and a student’s perspective.</td>
</tr>
<tr>
<td>Actually, it did not contain any evidence that action research should have for example the action stage and the next cycle.</td>
</tr>
<tr>
<td>the paper claim that the VAK learning style is cognitive style which conflict any other papers.</td>
</tr>
</tbody>
</table>
retrieve these schemas more easily?

4. How can various interactivity devices (for example, discussion boards, visually based activities, quizzes) be made maximally useful for different kinds of learners, particularly for learners with different learning styles?

## Learning style and media

<table>
<thead>
<tr>
<th>Authors/Years</th>
<th>Aim/Contribution of the paper</th>
<th>Concepts</th>
<th>Methodology</th>
<th>Main Result</th>
<th>Critiques/Analysis</th>
</tr>
</thead>
</table>
| Dr. Jack Fei Yang, Hsing-Kuo University, Taiwan 2006 hard copy | Title:The Discussion of Media Selection and Accessible Equity in Distance Education
How to choose the media of distance education
instructional design | Is the role of media in distance education important? Is the medium the message? The impact of media on instructional outcomes continues to be debated. Media influences learning by introducing different levels of learning objectives, learning activities, and learning | conceptual, theory | decision-making and program design are key factors to develop a good distance education program
Media selection factors and frameworks for distance media strategies in teaching need to be examined from a cultural perspective. | usefulness of media that integrate in distance learning
necessary of choosing the right media for right culture. short,sharp |
outcomes. (our research has data supported) factors
-instructional methods,
-learning styles
-teaching strategies

people of developing countries need the concern of the high technology world

| Wolfe, Kara; Bates, Derald; Manikowske, Linda; Amundsen, Rebecca 2005 | Learning Styles: Do They Differ by Discipline? |
|---------------------------------------------------------------------|
| 531 students.                                                       |

Critiques:
Past studies have analyzed learning styles of certain professions and majors.

<table>
<thead>
<tr>
<th>Kolb's Experiential Learning Theory describes how learners see and interpret information.</th>
</tr>
</thead>
</table>

This study evaluated whether student learning styles differ by major.

The Marshall and Merritt Learning Style Inventory was completed by

The assessment of students' learning styles reminds faculty that diverse learning styles exist in the classroom.

Based on results, faculty could choose teaching methods that reflect the different learning styles of students. (Contains 1

<table>
<thead>
<tr>
<th>Media can influence levels of learning objectives, learning activities, and learning outcomes, if faculty will use media appropriately **</th>
</tr>
</thead>
</table>

Differences were found in learning style preferences by students' majors.

Cognitive learning styles Data confirm different learning styles inventory question however, this research supported the conclusion.
Catherine McLoughlin

Title the implications of the research literature on learning styles for the design of instructional material

Conceptual/analysis

Instructional designers turn to research on learning styles to inform the design of adaptive learning material

Kolb's learning styles provide instructional design

(i) each stage of the learning cycle

(ii) individual differences between learners in processing and presenting information.

Factors that affect learning on LMS

<table>
<thead>
<tr>
<th>Authors/Years</th>
<th>Aim/Contribution of the paper</th>
<th>Concepts</th>
<th>Methodology</th>
<th>Main Result</th>
<th>Critiques/Analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patricia A. Beffa-Negrini, hard copy</td>
<td>Factors related to success and satisfaction in on-line learning</td>
<td>Factors related to success and satisfaction in on-line learning</td>
<td>quantitative</td>
<td>Student interaction with instructors and peers has important implications for success and satisfaction in on-line learning. Faculty should aware of the characteristics and course-behaviours of their students Further research require to understand the relationship of successful outcomes</td>
<td></td>
</tr>
<tr>
<td>Annagret Goold</td>
<td>Factors affecting performance in 1st year computing</td>
<td>Learning style and problem solving skills are important in information technology</td>
<td>Quantitative/ regression</td>
<td>The relevance of only one aspect of learning style in only first semester Only IT unit, Unobvious describe about why doesn't learning style also matter in Basic Programming Concepts Suggestion answer is the active-reflective dimension of learning style might play an important role than abstract concrete dimension.</td>
<td>Mix participate</td>
</tr>
<tr>
<td>Russell Rimmer</td>
<td>hard copy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Author(s)</td>
<td>Title</td>
<td>Abstract</td>
<td>Methodology</td>
<td>Analysis</td>
<td></td>
</tr>
<tr>
<td>-----------</td>
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<td>----------</td>
<td>-------------</td>
<td>----------</td>
<td></td>
</tr>
<tr>
<td>Nansi Shi</td>
<td>Critical Success Factors for IS Executive Careers - Evidence from Case Studies</td>
<td>This article qualitatively analyzes the Critical Success Factors (CSFs) for Information Systems (IS)</td>
<td>Qualitative Case study descriptive framework</td>
<td>Good example of case studies analysis and descriptive framework</td>
<td></td>
</tr>
<tr>
<td>David Kember, Amber Ho And Celina Hong</td>
<td>The importance of establishing relevance in motivating student learning</td>
<td>qualitative</td>
<td>Analysis of the transcripts for main factors which motivated student learning identified eight principal facets of a teaching and learning environment. They were: establishing relevance, establishing interest, allowing choice of courses so that interest can be followed, learning activities, teaching for understanding, assessment of learning activities, close teacher– student relationships and sense of belonging between classmates.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kyung-Sun Kim and Joi L. Moore</td>
<td>Web-base learning: Factors affecting students’ satisfaction and learning experience</td>
<td>Student’s interaction with classmates and their instructor may have an impact on their satisfaction with Web-based courses</td>
<td>Quantitative</td>
<td>82 students taking a Web-based course from a Midwest university participated in the study. Web-based questionnaire were used to collect data on students’ interaction with classmates and their instructor.</td>
<td></td>
</tr>
</tbody>
</table>
Annette Valenta, David Therriault, Michael Dieter, Robert Mrtek

The research efforts examined the cluster of opinions held by students with respect to technology and its application to education. Identifying student attitudes and learning style in distance education positive aspect and negative aspects propose in the research. Q-methodology applying a hybrid of qualitative and quantitative statistical techniques. Q used to uncover commonly shared opinions regarding a specific topic qualitative in Q allow participants to express their subjective opinion quantitative in Q use factor analytic data-reduction and induction to provide insights into opinion formation as well as to generate testable hypotheses.

Di Challis I, Dale Holt and Mary Rice 2005

A cross-disciplinary comparative study that examines the interplay between information and communication technologies (ICT) and experiential learning, in the context of seven fields of professional practice in undergraduate education. The potential for reusable learning objects constituting different simulation scenarios as virtual practicum complementing actual workplace practicum seems high. This requires a programmatic focus in curriculum design and learning resources development.

Qualitative case study in Australian University

Comparative case study

-Many obstruct of experiential learning - ICT supported experiential learning can be enhanced through its grounding in holistic approaches to designing teaching and learning environments they suggested that restrict the design of virtual simulation

Staff perceptions of ICT and experience learning in Australian University (Deakin)

only 8 staff members from each discipline
environments We need to think beyond the media components of such simulations to the nature of the engagement with the learning environment.

Collaborative Learning

<table>
<thead>
<tr>
<th>Authors/Years</th>
<th>Aim/Contribution of the paper</th>
<th>Concepts (learning style/collaborative/tools)</th>
<th>Methodology</th>
<th>Main Result</th>
<th>Critiques(Analysis)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bosung Kim, Chia-chi Yang, I-Chun Tsai 2005 import to endnote</td>
<td>Review of Computer-Mediated Collaborative Concept Mapping: Implication for Future Research</td>
<td>review and analyze previous research on collaborative concept mapping in both face-to-face and networked environments</td>
<td>Review Theory</td>
<td>a) learning effectiveness depended not only on the result but also on the learning process taking place via social interaction. b) Individual internalization should be also assessed as well as group outcomes. Although group maps show c) group members’ consensus on the meanings of concepts and propositions</td>
<td></td>
</tr>
<tr>
<td>Authors</td>
<td>Title</td>
<td>Methodology</td>
<td>Findings</td>
<td>Notes</td>
<td></td>
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<tr>
<td>---------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>----------------------</td>
<td>-------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Richard H, Hall/1999</td>
<td>Web-based Conference as a component of a collaborative -learning Based Educational Psychology Class</td>
<td>Comparison face-to-face and web-based collaborative discussion</td>
<td>Quantitative by questionnaire and open-end</td>
<td>a) response from both group did not differ</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>b) face-to-face more social positive learning more about others in their group</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>c) web-based discussion of opinion question as less effective than application question</td>
<td></td>
</tr>
<tr>
<td>Patrizia Ghislandi &amp; Remo Job/2005</td>
<td>remove because it was not clear evidence</td>
<td>CSCL- Computer supported collaborative learning</td>
<td>Qualitative/ Case study</td>
<td>a) group learning practices stimulates the students’ intrinsic motivation related to the chance of addressing the teacher personally</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>b) the possibility of a constant interaction with the professor has been one of the main positive aspects of the course</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>c) testing would have led students to collaborate and to create a positive interaction an a positive interdependence</td>
<td></td>
</tr>
<tr>
<td>Karen Swan, Jia Shen, Starr Roxanne Hiltz 2006</td>
<td>Topic: Assessment and Collaboration in on-line learning To discusses three sorts of on-line collaborative activity</td>
<td>Collaborative need assessment to encourage participate in on-line learning</td>
<td>Experiment Quantitative and Qualitative</td>
<td>a) assessing collaborative learning is difficult because it requires radically rethinking traditional evaluation techniques</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>b) rethinking is also critical because collaboration among students has been</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>This paper supported that the assessment is critical for collaborative learning</td>
<td></td>
</tr>
</tbody>
</table>
Yanessa Paz Dennen  
Trena M. Paulus  
2005

Endnote

** the author talked about a research which neither addressed the effects that such feedback had on the learners nor did it look at the quality of the feedback**
Jong-Baeg Kim, Sharon J. Derry, Constance A. Steinkuehler, John P. Street and Jeffery Watson

<table>
<thead>
<tr>
<th>Topic: Web-based Online Collaborative Learning</th>
<th>web-based collaborative learning</th>
<th>Quantitative (t-test) Qualitative participates</th>
</tr>
</thead>
<tbody>
<tr>
<td>- to comparison face-to-face and on-line collaborative learning</td>
<td>Theoretical Framework TAPPED IN technology is a Multi User Virtual Environment (MUVE)</td>
<td>a) student perceived face to face condition more effective than on-line communication</td>
</tr>
<tr>
<td>- to explain how group activities affect overall perceived performance of students</td>
<td></td>
<td>b) students were trying to make sure everybody participate in discussion</td>
</tr>
<tr>
<td>58 undergraduate student secondary education major students at mid western university</td>
<td></td>
<td>c) students spent a long time to follow instructions however, they did not follow instructions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>d) group discussions were unidirectional in many times which is inappropriate for discussion</td>
</tr>
<tr>
<td></td>
<td></td>
<td>e) discussion in this group was seriously interrupted by other non group members</td>
</tr>
</tbody>
</table>

A.Hron & H.F. Friedrich

<table>
<thead>
<tr>
<th>A review of web-based collaborative learning: factors beyond technology</th>
<th>They point to net-based collaborative learning have specific characteristics and suitable instruction leading to participating in net-based.</th>
<th>Conceptual analysis, review, experiment and observation</th>
<th>no conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>- to consider about collaborative learning methods on-line moderation appropriate learning tasks or computer-based visualisation tools</td>
<td></td>
<td></td>
<td>The outlook of the paper is usually happened.</td>
</tr>
</tbody>
</table>
Focusing on social communication situation, message exchange, cognitive load and participation of the learners.

**Hanna Salovaara 2005**

**Topic:** An exploration of students' strategy use in inquiry-based computer-supported collaborative learning (CSCL)

**Aim**
- To investigate students' use of cognitive learning strategies in inquiry-based CSCL

The author emphasised about self-regulated learning and related theories of self-regulated learning that try to explain how individual learners manage their learning behaviour.

He also emphasised that reading strategies, writing strategies, and problem-solving are different task-specific strategies.

"Self-regulation is an active, constructive process whereby learners set goals for their learning and then attempt to monitor, regulate, and control their cognition, motivation and behaviour, guided and constrained by their goals and the contextual features in the environment."

**Methodology**
- Mix method but emphasis on Qualitative (Triangulation)

- The students participating in inquiry-based CSCL used a variety of cognitive learning strategies. The strategies reported by the students were not related to a single cognitive operation such as writing or reading. Three deeper-level strategies were reported significantly more by the intervention group than the comparison group. Two cognitive learning strategies, memorizing and evaluation, were reported significantly more by the comparison group.

- The inquiry-based learning situation might lead students to engage in cognitive self-regulation and apply at least partly different types of strategies than in the conventional classroom situation.

**What is the relation between learning styles and self-regulated learning?**

The critiques of quantitative analysis is the quantitative data in this research is not complete; the student did not report all strategies that could have been expected in the light of theoretical background (only 6 of 15 strategies (less than half)).
Appendix B Course Outline

Songkhla Rajabhat University
Faculty of Science and Technology
Program Computer
Course Outline

Course Name  4000108 Information Technology for Learning
Credit  3(2-2)
Lecturer  Lecturer in computer program

Course Properties
Information Technology for Learning is compulsory course for all students who studying all particular subject. This course is in general study in mathematic, science and technology group followed Rajabhat Institute curriculum 2543.

Course Description
This course is to study the importance of Information Technology (IT) and Information system for searching and retrieving knowledge in Digital society and intellectual society that effected human being and life. Moreover, the course is teaching about how to collect data, store data and how to use database management system. The course has details covers computer and networking for example, LAN, WAN, internet, intranet. Furthermore, the course provides the details about multimedia such as video on demand and virtual reality. Finally, the course contains management information system about knowledge discovery and information retrieval for developing career and information society.

Objective
- Describe the relation between information technology and human society and the effecter and influence of IT to human
- Use and aware of information system, database, manage information for communication, searching and retrieving new knowledge and news, respect of copy right program
- Have adequate skill of using information technology for career
- Problem analysis decision choosing diagnostic and control technology in appropriate way for self access and society

Contents
1 Information Technology, the Internet, and You
2. The System Unit
3. Connectivity, the Wireless Revolution, and Communications
4. Privacy and Security
5. Databases
6. Information System

Activities
1. Lecture
2. Self studying
3. Exercise
4. Computer Laboratory

Resources
1. Paper Worksheet
2. Overhead
3. Computer
4. Internet

Assessment

1. Measurement
1.1. Midterm 70% contain
- Midterm test 20 %
- Affective domain 10 %
- Laboratory test 20 %
- Mini test 10 %
- report 10 %
1.2 Final 30 %

2. Assessment

Use "Criterion-referenced evaluation"

<table>
<thead>
<tr>
<th>Grade</th>
<th>A</th>
<th>80-100 %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>B+</td>
<td>75-79 %</td>
</tr>
<tr>
<td>Grade</td>
<td>B</td>
<td>70-74 %</td>
</tr>
<tr>
<td>Grade</td>
<td>C+</td>
<td>65-69 %</td>
</tr>
<tr>
<td>Grade</td>
<td>C</td>
<td>60-64 %</td>
</tr>
<tr>
<td>Grade</td>
<td>D+</td>
<td>55-59 %</td>
</tr>
<tr>
<td>Grade</td>
<td>D</td>
<td>50-54 %</td>
</tr>
<tr>
<td>Grade</td>
<td>E</td>
<td>0-49 %</td>
</tr>
</tbody>
</table>

Books
2. เอกสารประกอบการฝึกปฏิบัติการ รายวิชาเทคโนโลยีสารสนเทศเพื่อชีวิต และรายวิชาเทคโนโลยีสารสนเทศเพื่อเรียนรู้
3. หนังสือเกี่ยวกับ “การใช้โปรแกรมสำเร็จรูป”
4. หนังสือเกี่ยวกับ “เครื่องจักรคอมพิวเตอร์” ฯลฯ

Course Schedule

**Course ID 4000108**  
**Course Name: Information Technology for Learning**  
Credit 3(2-2)

Time 4 period/week  
Total 64 period/semester

<table>
<thead>
<tr>
<th>Week</th>
<th>Contents</th>
<th>Activities</th>
<th>Period</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Course Introduction</td>
<td>Lecture, Lab, Exercise</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>2-3</td>
<td>Information Technology, the Internet, and You</td>
<td>Lecture, Lab, Exercise</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Information systems</td>
<td>Lecture, Lab, Exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Application software vs. system software</td>
<td>Lecture, Lab, Exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Computer types</td>
<td>Lecture, Lab, Exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Types of files</td>
<td>Lecture, Lab, Exercise</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Connectivity, Wireless Revolution, and the Internet</td>
<td>Lecture, Lab, Exercise</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td><strong>LAB: Internet &amp; Email</strong></td>
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<tr>
<td>4-5</td>
<td>The System Unit</td>
<td>Lecture, Lab, Exercise</td>
<td>8</td>
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<td>System unit types</td>
<td>Lecture, Lab, Exercise</td>
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<td></td>
<td>Coding</td>
<td>Lecture, Lab, Exercise</td>
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<td></td>
<td>Memory and chips</td>
<td>Lecture, Lab, Exercise</td>
<td></td>
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<td></td>
<td>Cards and buses</td>
<td>Lecture, Lab, Exercise</td>
<td></td>
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<tr>
<td></td>
<td>Ports and cables</td>
<td>Lecture, Lab, Exercise</td>
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<td></td>
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<tr>
<td></td>
<td><strong>LAB: MS-Windows</strong></td>
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<td></td>
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</tbody>
</table>
## 6- Connectivity, the Wireless Revolution, and Communications

- Connectivity
- Wireless Revolution
- Communication systems
- Connection devices
- Transmissions and protocols
- Network architecture

**LAB : MS-Word**

<table>
<thead>
<tr>
<th>Weeks</th>
<th>Contents</th>
<th>Activities</th>
<th>Period</th>
<th>Note</th>
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<tbody>
<tr>
<td>8</td>
<td>Midterm Test</td>
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<td>4</td>
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</tr>
<tr>
<td>9-10</td>
<td>Privacy and Security</td>
<td>Lecture Lab Exercise</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Negative effects</td>
<td></td>
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<tr>
<td></td>
<td>Privacy</td>
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<tr>
<td></td>
<td>Security</td>
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<td></td>
<td>Ergonomics</td>
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<td></td>
<td>Environment</td>
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<td></td>
<td><strong>LAB : MS- PowerPoint</strong></td>
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<tr>
<td>11-13</td>
<td>Databases</td>
<td>Lecture Lab Exercise</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How data is organized</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Advantages of databases</td>
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<td>Essential parts of DBMS</td>
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<td>Database Structures</td>
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<tr>
<td></td>
<td>Uses and issues</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td><strong>LAB : MS-Excel</strong></td>
<td></td>
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</tr>
<tr>
<td>14-15</td>
<td>Information System</td>
<td>Lecture Lab Exercise</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Organizational structure</td>
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<td></td>
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<tr>
<td></td>
<td>Information flow</td>
<td></td>
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<tr>
<td></td>
<td>Support systems</td>
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<td></td>
<td>Office automation</td>
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<td>Knowledge work systems</td>
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<tr>
<td></td>
<td><strong>LAB : MS-Excel</strong></td>
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<tr>
<td>16</td>
<td>Summary</td>
<td>Lecture</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>
Appendix C The Survey Questionnaire in 2007

QUESTIONNAIRE 2007
Program Computer Science and Information Technology
Faculty of Science and Technology
Songkhla Rajabhat University (SKRU)

PLEASE COMPLETE ALL QUESTIONS

Computer Skills and Learning Styles Survey

June 2007

Experience in the use of computers.

There will be a series of basic computer course to help you to improve your IT skills. To set these courses up, we need your help. We want to collect data on the IT skills of all students before the start of basic computer course. It is essential that we have 100% feedback so that we have an accurate picture of the range of skills in the year.

Part 1 Computer Skills
General Information about student status:

1. Faculty
   - Faculty of Arts
   - Faculty of Agricultural Technology
   - Faculty of Education
   - Faculty of Humanities and Social Science
   - Faculty of Industrial Technology
   - Faculty of Management Science
   - Faculty of Science and Technology

2. Do you take a previous Computing course? □ YES □ NO

3. Normally, Where you use a computer?

<table>
<thead>
<tr>
<th>School</th>
<th>Home</th>
<th>Net Café</th>
<th>Others</th>
</tr>
</thead>
</table>

4. When did you last use a computer?

<table>
<thead>
<tr>
<th>Within the last week</th>
<th>Within the last month</th>
<th>Within the last six months</th>
</tr>
</thead>
</table>

- 219 -
5. Over the last year, how many hours per week did you use a computer? (in an average week)

6. How would you describe your keyboard skills? (Please tick ONE)
   - □ I am completely unfamiliar with the basics of typing
   - □ I can type with two or three fingers
   - □ I am very competent but cannot touch type
   - □ I can touch type

7. Do you own a computer? □ YES □ NO

8. Do you feel that you understand the basic terminology and concepts of computing (e.g. words such as hardware, software, viruses, operating system, Windows environment, formatting discs)? □ YES □ NO

<table>
<thead>
<tr>
<th>Skills</th>
<th>Least Familiar</th>
<th>Fair Familiar</th>
<th>Most Familiar</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Desktop Skills</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Turn on and safely turn off your computer</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Restart your computer if it becomes locked up</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Open a program using the <strong>Start</strong> menu</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Name the basic computer system parts (mouse, monitor, etc.)</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Explain the terms: icon, menu, window, click, select, drag</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Use scroll bars and move, resize and close windows</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Use help screens in software programs</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Navigate among folders, create and name folders, delete folders</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Copy or move a file from one folder to another</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Cut/copy and paste text?</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td><strong>Internet Skills</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use a web browser like Netscape Navigator or Internet Explorer</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Recognize a URL</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Explain the terms ISP, website, home page, search engine</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Activity</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Type a URL in an open box</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use <strong>Back</strong> and <strong>Forward</strong> buttons to move through web pages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Create a bookmark or save a favourite website</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Locate and click on links in a webpage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Use a search engine to locate information on the Internet</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Print a webpage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Download and install a computer program or plug-in (Flash, Shockwave, Authorware, etc.)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>You have e-mail address</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Logged into the system and read and sent messages</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attached files for mailing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Read or save attachments</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Created and used a signature</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Which of these learning activities were more helpful in understanding the subjects that were covered in this module.

<table>
<thead>
<tr>
<th>Learning Document</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course assignment</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animation library</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Student-to-student support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Discussion board</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Instructor-to-student support</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional resources</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Which of these media were more helpful for your learning

<table>
<thead>
<tr>
<th>Media</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Text only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graphic and figures</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Games</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. What other learning activities or media do you think it would have been helpful to have include?

<table>
<thead>
<tr>
<th>Activity</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video clips</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audio only</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virtual Classroom</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classroom lecture</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nothing was needed</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Part 2 Learning Styles Inventory Question**
Take a few minutes to complete the following questionnaire to assess your preferred learning style. Begin by reading the words in the left-hand column. Of the three responses to the right, check the one that best characterizes you, answering as honestly as possible.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Visual learner</th>
<th>Auditory learner</th>
<th>Kinaesthetic learner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concentrating</td>
<td>Does seeing untidiness or movement distract you? Do you notice things in your visual field that other people don’t?</td>
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</tr>
<tr>
<td>Visualizing</td>
<td>Do you see vivid, detailed pictures in your thoughts?</td>
<td>Do you think in sounds and voices?</td>
<td>Do the images you see in your thoughts involve movement?</td>
</tr>
<tr>
<td>Talking</td>
<td>Do you dislike listening for a long time? Do you often use words such as see, picture, and imagine?</td>
<td>Do you enjoy listening? (Or maybe you’re impatient to talk?) Do you often use words such as say, hear, tune, and think?</td>
<td>Do you like to gesture and use expressive movements? Do you often use words such as feel, touch and hold?</td>
</tr>
<tr>
<td>Contacting people</td>
<td>Do you prefer direct, face-to-face, personal meetings?</td>
<td>Do you prefer the telephone for intense conversations?</td>
<td>Do you prefer to talk while walking or participating in an activity?</td>
</tr>
<tr>
<td>Meeting someone again</td>
<td>Do you forget names but remember faces? Can you usually remember where you met someone?</td>
<td>Do you tend to remember people’s names? Can you usually remember what you talked about?</td>
<td>Do you tend to remember what you did together? Can you almost feel your time together?</td>
</tr>
<tr>
<td>Relaxing</td>
<td>Do you prefer to watch TV, see a play, or go to a movie?</td>
<td>Do you prefer to listen to the radio, play music, read, or talk with a friend?</td>
<td>Do you prefer to play sports, knit, or build something with your hands?</td>
</tr>
<tr>
<td>Reading</td>
<td>Do you like descriptive scenes? Do you pause to imagine the action?</td>
<td>Do you enjoy the dialogue the most? Can you “hear” the characters talk?</td>
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</tr>
<tr>
<td>Spelling</td>
<td>Do you try to see the word in your mind? Do you imagine what it would look like on paper?</td>
<td>Do you use a phonetic approach to sound out the word? Do you hear it in your thoughts or say it aloud?</td>
<td>Do you write down the word to find out if it feels right? Maybe you run your finger over it or type it out?</td>
</tr>
<tr>
<td>Doing something new at work</td>
<td>Putting something together</td>
<td>Interpreting mood</td>
<td>Teaching people</td>
</tr>
<tr>
<td>---------------------------</td>
<td>--------------------------</td>
<td>------------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Do you like to see demonstrations, diagrams, flow charts? Do you seek out pictures or diagrams?</td>
<td>Do you look at the picture and then, maybe, read the instructions?</td>
<td>Do you primarily look at facial expressions?</td>
<td>Do you prefer to show them?</td>
</tr>
<tr>
<td>Do you find verbal or written instructions helpful? Do you like talking it over? Do you ask a colleague?</td>
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<td>Do you listen to the tone of voice?</td>
<td>Do you prefer to tell them? Write it out?</td>
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<td>Do you prefer to jump right in and try it? Do you keep trying? Do you try it different ways?</td>
<td>Do you usually ignore the directions and figure it out as you go?</td>
<td>Do you watch for body language?</td>
<td>Do you demonstrate how it’s done? Ask them to try it?</td>
</tr>
</tbody>
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Appendix D The Survey Questionnaire in 2008

QUESTIONNAIRE 2008
Program Computer Science and Information Technology
Faculty of Science and Technology
Songkhla Rajabhat University (SKRU)

PLEASE COMPLETE ALL QUESTIONS

Student Characteristics and LMS perception

September 2008

Experience in the use of computers.
There will be a series of basic computer course to help you to improve your IT skills. To set these courses up, we need your help. We want to collect data on the IT skills of all students before the start of basic computer course. It is essential that we have 100% feedback so that we have an accurate picture of the range of skills in the year.

Part 1 General Information
1. Faculty
   - Faculty of Arts
   - Faculty of Agricultural Technology
   - Faculty of Education
   - Faculty of Humanities and Social Science
   - Faculty of Industrial Technology
   - Faculty of Management Science
   - Faculty of Science and Technology
2. Do you take a previous Computing course? □ YES □ NO
3. What are the social software types that you have participated in?
   - Hi5
   - Multiply
   - Facebook
   - Flickr
   - MSN live spaces
   - Others_________________
   - None
4. Do you think the social software can use in education field?
   - □ YES □ NO

Part 2 Preferable Learning Styles
5. Which of these learning activities were more helpful in understanding the subjects that were covered in this module? (Rank 1-7)

<table>
<thead>
<tr>
<th>Learning document</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Course assignment</td>
<td></td>
</tr>
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<tr>
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<td></td>
</tr>
<tr>
<td>Other ________________</td>
<td></td>
</tr>
</tbody>
</table>

6. Which of these media were more helpful for your learning in LMS? (Rank 1-6)

| text only |  |
| animation |  |
| graphic and figures |  |
| discussion |  |
| games |  |
| Other ________________ |  |

7. Which activity do you like most in Lecture class? (Rank 1-6)

| Listening to lecture |  |
| Discussion with friend |  |
| Test Sheet |  |
| Presentation |  |
| Reading book |  |
| Other ________________ |  |

8. Which activity do you like most in Laboratory class? (Rank 1-6)

| Listening to lab instruction |  |
| Discussion on board |  |
| Testing module |  |
| Reading contents |  |
| Teach your friend how to do it |  |
| Other ________________ |  |

9. What is the most your preferable homework in LMS? (Rank 1-7)

| Short answer |  |
| Test module |  |
| Design card |  |
| Report |  |
| Design presentation work |  |
| Search Engine |  |
| Other ________________ |  |

10. What is the most effective homework that you have done in LMS? (Rank 1-7)

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Part 3 Arrangement course activities

11. Do you think styles of homework or activity influence to your preferable?
   Agree | | | | | | | | Disagree
   Extremely neither Extremely

12. Do you think styles of homework or activity influence to your ability?
   Agree | | | | | | | | Disagree
   Extremely neither Extremely

13. Do you think some assignments or some activities suitable for particular field of students?
   Agree | | | | | | | | Disagree
   Extremely neither Extremely

14. Do you think the assignments or activities in the LMS course can adjust for students in particular area of study?
   Agree | | | | | | | | Disagree
   Extremely neither Extremely

15. Do you think most of assignments or activities can provide the same knowledge or skill on this IT course?
   Agree | | | | | | | | Disagree
   Extremely neither Extremely
Learning Styles Inventory

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<td>Do you listen to the tone of voice?</td>
<td>Do you watch for body language?</td>
</tr>
<tr>
<td>Teaching people</td>
<td>Do you prefer to show them?</td>
<td>Do you prefer to tell them? Write it out?</td>
<td>Do you demonstrate how it’s done? Ask them to try it?</td>
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</tbody>
</table>
Appendix E Consent Form

CONSENT FORM

Student Learning Styles and Information Technology (IT) Learning Skills on Learning Management System

Title of Project

MRS SASALAK TONGKAW

Name of Chief Investigator

- I confirm that I have been given and have read and understand the information sheet for the above study and have asked and received answers to any questions raised
- I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason and without my rights being affected in any way
- I understand that the researchers will hold all information and data collected securely and in confidence and that all efforts will be made to ensure that I cannot be identified as a participant in the study (except as might be required by law) and I give permission for the researchers to hold relevant personal data
- I agree to take part in the above study

Name of person taking consent ___________________________ Signature ___________________________ Date ___________________________

One copy for the subject; one copy for the researcher.
Appendix F Interview Questions

Interview Questions

1. English: Please explain about overall of the LMS course?
Thai: ให้นักศึกษาอธิบายถึงบทบาทเทคโนโลยีสารสนเทศใน LMS อย่างคร่าวๆ

2. English: What are any reasons that why do you like the LMS course? or dislike?
Thai: เพราะเหตุใดนักศึกษาชอบเรียนวิชาเทคโนโลยีสารสนเทศใน LMS นี้

3. English: What is the most preferable activity in the LMS course? (Resources for example slides or links, discussion board, homework & assignment, testing module, etc.)
Thai: กิจกรรมใดใน LMS ที่นักศึกษาชอบมากที่สุด (เนื้อหาประกอบเช่นไฟล์หรือสิ่งค้า, กระดาษสนทนา, การบันทึกเรียน, แบบทดสอบ)

4. English: Why do you think like that?
Thai: เพราะเหตุใดคิดเช่นนั้น

5. English: What is the important role that you do to successful in the LMS course?
Thai: ให้นักศึกษาบอกวิธีการเรียนให้ประสบความสำเร็จในวิชาเทคโนโลยีสารสนเทศ บน LMS นี้

6. English: Why do you think the media (text, video, image, clip, theme, etc.) is the most important?
Thai: เพราะเหตุใดนักศึกษาคิดว่า ‘สื่อ’ (ข้อความ, วิดีโอ, รูปภาพ, คลิป ภาพเคลื่อนไหว, ต่างๆ) สำคัญสำหรับการเรียนรู้นี้

7. English: How do you make your LMS assignments?
Thai: นักศึกษาทราบได้อย่างไรว่าการบันทึกหรือแบบฝึกหัดบน LMS
เพื่อแล้วส่งการบันทึกหรือแบบฝึกหัดแล้ว นักศึกษาทำอย่างไร

8. English: What is your most preferable work in this course? Why?
Thai: นักศึกษาคิดว่างานที่นักศึกษาชอบมากที่สุดคือแบบไหน เพราะอะไร
9. English: Do you think what is the best homework and activities that you have done in this course? Why do you think like that?
Thai: การบ้านหรือกิจกรรมที่นักศึกษาทำได้ดีที่สุดในวิชาที่น้องอยู่ และทำไมถึงคิดว่าดังกล่าวทำได้ดีที่สุด

10. English: What is important key that you like or dislike the homework?
Thai: นักศึกษาคิดว่าอะไรเป็นเหตุผลให้นักศึกษาชอบหรือไม่ชอบการบ้านขึ้นนี้

11. English: Do you think the proper assignments should provided to the particular field of students? How?
Thai: นักศึกษาคิดว่าการบ้านบางส่วน หรือ กิจกรรมบางอย่างใน LMS นี้ เหมาะสมสำหรับนักศึกษาบางวิชาเอกหรือไม่

12. English: If activities in this LMS course can rearrange, how to develop activity or assignment of the LMS course?
Thai: หากกิจกรรมหรือการบ้าน ในวิชาที่น้องสามารถปรับปรุงตามที่นักศึกษาขอได้ นักศึกษาคิดว่าจะปรับปรุงอย่างไร (ลอง หรือ เพิ่ม อะไร)

13. English: Do you agree or disagree with this statement?
The statement is "The activities and assignment on the LMS course should be selected to the particular field of student."
Thai: นักศึกษาเห็นด้วยหรือไม่กับข้อความต่อไปนี้
"กิจกรรมหรือการบ้านบน LMS ของวิชาที่น้องควรจะถูกเลือกให้เหมาะสมสำหรับนักศึกษาในแต่ละวิชาเอก"

14. English: Do you think that the teacher should give you an activity (or assignment) on LMS as same as any other students in other disciplines or give it differently? Why?
Thai: นักศึกษาคิดว่าอาจารย์ควรให้กิจกรรมบน LMS เหมือนกันกับนักศึกษาวิชาเอกอื่น ๆ หรือควรจะให้แตกต่างกัน เพราะเหตุใด
Appendix G The Three Templates

The First Template:
- Student characteristics
- Satisfaction on web-based courses
- Student Motivation /Student need
- Attitude
- Achievement
- Computer skills
- Learning Styles
- Prior learning experiences
- Learning outcomes
- Design of Related tasks
- Available resources
- Individual/group

The Second Template:

Learners
- Student characteristics
- Satisfaction on web-based courses
- Student Motivation /Student need
- Attitude
- Achievement
- Computer skills
- Learning Styles
- Prior learning experiences

Content
- Design of Related tasks
- Available resources

Context
- Individual/group

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The Final Template:

Learners

- Determine individual learning styles
- Common learning styles

Attitudes toward technology

- Convenience
- New technologies
- Supporting self-study materials
- Increase practical skills
- Developing knowledge to life-long learning

Previous experience

Learning processes on the LMS

- (1) Signing up email address and (2) Signing up and login to the LMS
- (3) Checking homework
- (4) Reading course contents, (6) Doing assignment
- (5) Participating on the discussion board
- (7) Doing assessments

Context

- Blended learning (face to face teaching and supervised online study)

Obstacles to learning on the LMS

Challenges

Content

Group characteristics and media preferences

- Text, Animation, Graphics and Figures and Games
- Video

Group characteristics and learning activities

- Report
- Short answer and quiz module
- Discussion board
- Presentation design
- Calculation practice
- Static course content module
- Desktop publishing
## Definition of Terms

<table>
<thead>
<tr>
<th>Term</th>
<th>Abbreviations</th>
<th>Description</th>
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<tr>
<td><strong>Blended Learning</strong></td>
<td>BL</td>
<td>Blended learning is a kind of online learning which students and tutors(s) proceed with the learning and teaching of the unit of study by an arrangement whereby part of the learning and teaching is undertaken face-to-face and part online.</td>
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<tr>
<td><strong>Cognitive Strategy</strong></td>
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<td>Adopting a plan of action in the process of organising and processing information.</td>
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<tr>
<td><strong>Cognitive style</strong></td>
<td></td>
<td>An innate habitual approach to processing information when engaging in cognitive tasks such as problem solving, thinking, perceiving and remembering. It has a high degree of stability and consistency (Simon Cassidy).</td>
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<td><strong>Internet</strong></td>
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<td>The global connection of computers via interlinked networks across the World Wide Web.</td>
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<td><strong>Learning Management System</strong></td>
<td>LMS</td>
<td>A software systems for managing training/educational records to software for distributing courses over the Internet and offering features for online collaboration.</td>
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<td><strong>Learning Preferences</strong></td>
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<td>An expressed personal preference favouring one type of learning environment, method of teaching or instruction over another. May involve preference for group or independent study. (Simon Cassidy)</td>
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<tr>
<td><strong>Learning Strategy</strong></td>
<td></td>
<td>A chosen plan of action in how to approach a given learning task or adopting a plan action in the acquisition of knowledge, skills or attitudes. They are deployed depending on the nature of a task, prior experience with a learning situation and motivation. Individuals are usually conscious of strategies.</td>
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<tr>
<td><strong>Learning Styles</strong></td>
<td>LS</td>
<td>An innate pattern of thinking, perceiving, problem solving, adopting a habitual and distinct mode of acquiring knowledge, and remembering when approaching a learning task. It is fair stable and consistent over time and across a wide variety of learning situations. Regarded as an application of cognitive style to learning situations.</td>
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<td><strong>Managed Learning Environment</strong></td>
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<td>Like a VLE, this is a single platform and gateway that connects students and academics to a network of ICT that can be used for learning materials and activities. In addition a MLE offers, where appropriate, links to other platforms such as student and university records.</td>
</tr>
<tr>
<td>Term</td>
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<td><strong>Model</strong></td>
<td>A simplified representation of structure or process, which can be the basis for a theoretical or empirical understanding or for calculations and predictions. A model is much more than a metaphor, which is a description of superficial resemblance between one object or action and another. A model of a university learning and teaching system is an accurate representation of some significant aspects of the university's organizational processes, which can be used as a research tool to gain understanding of those processes.</td>
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<tr>
<td><strong>Multimedia</strong></td>
<td>A computer file or similar that communicates a variety of types of information and media including text, audio and still and moving images.</td>
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<td><strong>Online</strong></td>
<td>When a computer, or similar hardware device, is connected to a network, allowing it to communicate with potentially very large numbers of other computers.</td>
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<td><strong>Online Learning</strong></td>
<td>OL Any use of networked computer media for learning, whether on a university intranet, for example from a campus computer laboratory, or on the web-based internet.</td>
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<td><strong>Rich Picture</strong></td>
<td>RP A flexible graphical technique which may be used as part of the Checkland Soft Systems (Checkland, 1981).</td>
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<td><strong>Soft Systems Methodology</strong></td>
<td>SSM The application of aspects of both hard and soft methodologies to the study of human interaction. Later descriptions, in 2006, summarize SSM as a structured process of enquiry using purposeful activity models that are based upon declared worldviews (Checkland &amp; Poulter, 2006a).</td>
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<td><strong>Total Online Delivery</strong></td>
<td>Total online delivery is the unit which will be delivered totally online with little or no face-to-face contact although students and tutor(s) are will advised to meet at least once in the process.</td>
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<tr>
<td><strong>Virtual Learning Environment</strong></td>
<td>VLE A single platform and gateway that connects a student and academic to a hardware of ICT that can be used for learning materials and activities.</td>
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