University of Surrey

School of Management

Understanding Relationships between eLearning Website Feature Preferences and Learning Styles

by

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Submitted in part fulfilment of the requirements for the degree of Doctor of Business Administration

November 2007
Abstract

The primary purpose of this research was to investigate the relationship between perceived learning styles of the eLearners and their preference of eLearning website features. The secondary purposes of this study was to research various models of learning styles for examining learning styles and eLearning website Systems for studying eLearning website feature preferences of the eLearners. A broad research question was undertaken: What impact (if any) does an eLearner’s learning style have on their preferences for specific features in an eLearning website system? To follow an exploratory line of investigation three research questions were used to examine the broad question: 1) How can an eLearning website system be meaningfully selected to study eLearning website features preference? 2) How can an eLearner’s learning style be meaningfully categorised? 3) How do learning styles impact the eLearner’s preference of eLearning website features? Unlike Research Question 1 and 2 that were examined by mainly literature review, Research Question 3 was studied using a full-fledged empirical cycle involving setting up hypotheses, conducting a survey and analysing data using statistical methods.

Mostly working undergraduate and graduate adult students, from a US university, were the participants in the survey study. The participants completed three parts of the survey: background information, eLearning website feature preference and learning styles. Data analysis was carried out in four parts: descriptive statistics, relevant hypothesis testing, Cluster Analysis, and Kruskal-Wallis ANOVA.

The descriptive statistical analysis was carried out to provide statistical information about the study participants, eLearning Website Feature Preferences and Learning Styles. Correlation studies and hypotheses testing have been performed to study the direction and magnitude of
relationship between learning styles and combinations of learning styles. Cluster analysis executed to investigate how learning styles can be clustered, and if there is a possibility of correlation between clusters and website features. Kruskal-Wallis ANOVA of clusters and eLearning website features was done to examine the difference between clusters and eLearning website feature preference.

The results pertaining to correlation studies between learning styles and combinations of learning styles of the participants and eLearning website features preference indicated that largely there were non-significant correlations between the learning styles, combinations of learning styles and website feature preferences. There were few significant, but weak positive and negative correlations between the leaning styles and combinations of learning styles suggesting that a caution should be exercised by the eLearning website system designers and instructional designer in formulating eLearning website features using eLearning students' learning styles as a consideration.

The association of learning style clusters and eLearning website feature preferences were examined and it revealed that Knowledge Seekers were the dominant group among all four clusters. The results indicated that at least two clusters (Knowledge Cultivator and Knowledge Seeker) have similar characteristics with small difference in the Pragmatist score. Kruskal-Wallis Test was conducted to compare the ranked mean scores on Clusters and eLearning website feature preferences. The results also showed that there is no difference in eLearning website feature preferences - among respondents in four Clusters – Knowledge Seeker, Thinker, Knowledge cultivator and Campaigner. This research is one of the few studies conducted to provide suggestions for eLearning website system designers and online instructions designers about eLearning website feature preference based on learning styles. The results of this study suggest that there is no association between learning styles,
combination of learning styles or clusters of learning styles and eLearning website features. Thus, future research should concentrate on exploring other factors that can be investigated in understanding relationships between learning styles and eLearning website features.

Declaration of Originality

I declare that my thesis entitled Understanding Relationships between Learning Styles and eLearning Website Features Preference for the degree of Doctor of Business Administration (DBA) of the University of Surrey, embodies the results of an original research programme undertaken by me. I have included specific references to any other work, by me or other sources, whether published or not.

Signature:

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Date: 7th November 2007
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Acknowledgement

I would like to take this opportunity to thank persons who have encouraged and supported me during my Doctor of Business Administration studies at the School of Management, University of Surrey.

I especially want to thank my first supervisor, Prof. Hans van der Heijden, for his guidance during my research study at University of Surrey. His perpetual energy and enthusiasm in research have motivated me. In addition, he was always accessible and willing to help me with my research. As a result, research life became smooth and rewarding for me.

I was delighted to interact with Dr. Jane Hemsley-Brown, my second supervisor. Her insights into learning styles were helpful. She provided a good supervision for my research.

Prof. David Gilbert, Director of the DBA Program, deserves thanks for running the program efficiently and teaching a number of modules in the program. His classes helped me develop research ideas and methods for my dissertation.

My deepest gratitude goes to my family for their unflagging support throughout my studies. This dissertation would have been impossible without their support. I am indebted to my father, late Dr. B. N. Srivastava for his influence on my academic abilities and interests, and my mother, Krishna Srivastava for keeping me disciplined during my formative years.

I wish to express my sincere thanks to my lovely wife, Marvin Elizabeth Srivastava, who has helped me on the domestic front by taking on responsibilities and accommodating my household delinquencies during my doctoral studies. Her companionship and encouragement have been invaluable.

Last but not the least, I thank all my DBA student colleagues, who made my visits pleasant and provided an engaging and stimulating classroom environment at Guildford.

Mukesh Srivastava
Chapter 1

Introduction

1.1 Introduction to the Chapter

Designing meaningful and effective learning environments on the Internet is a challenging task (Hill, Wiley, Nelson and Han, 2004). For instructors and instructional technologists, interaction with this new technology should lead to the development of new ways of knowing, teaching and learning (Andrews and Haythornthwaite, 2007; Hiltz, et al., 2007; Song and Hill, 2007). The lack of attention to the understanding of learning could lead to less-effective education (Rogers, 1983, p. 18-19). He provides examination of two aspects of learning: process and outcome. The process aspect of learning relates to theories such as – behaviourist (Hartley, 1998; Merriam and Caffarella, 1991, 1998), cognitive (Bruner, 1960, 1977; Gagné, 1985), humanistic (Kolb, 1984; Maslow, 1968; Rogers and Freiberg, 1993) and social/situational (Tennant, and Pogson, 1995; Wenger, 1999). The outcome aspect relates to acquisition or task related learning, and formalised learning (Rogers, 2003). Learning is perceived as the result of some process, and change is considered inevitable. Saljo (1979) has categorised outcome learning into: 1) Learning is quantitative increase in knowledge; 2) Learning involves storing reproducible information; 3) Learning is acquiring facts, skills, and methods; 4) Learning is abstracting meaning and relating parts of the subject matter to each other and to the real world; 5) Learning as interpreting and understanding the world by reinterpreting knowledge (Ramsden, 1992, p.26). Learning involves engaging and understanding the real world. Thus, learners receive information from external environment and process it internally to develop an understanding.

Every learner can have different preferences as to how one receives, processes, and recalls information during instruction (Akdemir and Koszalka, 2004). Particular attention should be given to preferences of individual learners while designing online instructions where individuals
have limited opportunity to receive instant feedback and assistance. Many researchers, however, have not studied student characteristics like learning preferences in their analysis of students with online courses (Thrumond, Wambach, Conners and Frey, 2002). The preference individuals have for various types of learning are defined as learning styles (NASSAP, 1979). Thus, learning styles may be important selection criteria for designing eLearning websites features in the wider context of online learning.

Learning style refers to the “characteristics cognitive, affective and psychological behaviour that serve as relatively stable indicators of how learners perceive, interact with, and respond to the learning environment” (Keefe, 1979). Numerous learning style dimensions, models and learning style instruments have been identified by the researchers. Honey and Mumford’s learning style model (2006) has been selected from an inventory of learning style models for this research study. This instrument for measuring learning style has been used for the last two decades extensively in the UK and US in many areas of education – colleges and universities, corporations and other learning environments. In chapter 3, a systematic analysis of learning style models is presented. The matrix table (see Table 3.10) reveals that Honey and Mumford’s Model is more suitable given the analysis on the basis of design, reliability and validity of the instrument, pedagogical implications, and overall assessment of the model and instrument.

Educators and instructional designers use different types of design strategies to help learners acquire knowledge in the most efficient and effective ways: Instructional designers describe the general components of a set of instructional material and a set of decisions that result in plan, method or series of activities aimed at obtaining a specific goal (MacLean and Scott, 2007). In online or eLearning environments, understanding of the association between learning styles and design of eLearning website feature is deemed important for eLearning scholars and professionals. The main goal of this exploratory study is to investigate the association
between perceived learning styles of online learners and their eLearning website feature preferences.

This chapter introduces the research topic with the aim of describing the statement of problem, purpose of research, research questions, and limitations of the study, assumption entailed and practical significance of the investigation. Section 1.1 introduces the research carried out in this dissertation. Section 1.2 elaborates on the eLearning context of the research. Section 1.3 highlights the statement of problem. Section 1.4 describes the purpose of the research undertaken. Section 1.5 provides the justification of the research design and methodological approach adopted. Section 1.6 deciphers the limitations of this research. Section 1.7 reviews the limitations of the research. Section 1.8 emphasises the practical significance for the eLearning website designers and technologists, and instructors. Section 1.9 provides an outline of the chapters in the dissertation.

1.2 eLearning Context

The development of the Internet has started to offer new opportunities for the educational institutions to provide instructions to distance learners. Although distance learning is not a new phenomenon, new technologies have expanded possibilities for distance education at an overwhelming speed (Abbey, 2000; Sloan-C, 2006; Van der Rhee et al., 2007). The last couple of years have witnessed the extended growth of the Internet as a communication medium (Hill et al, 2004). Nowadays the Internet has taken centre stage as a preferred medium for delivery of distance education. Numerous universities, school districts, large corporations and the military have started to offer online courses to meet the growing needs of education in responding to demands for flexible learning environments, continuing education and lifelong learning (Gunawardena and McIssac, 2004). Offering courses on the Internet has brought many challenges for instructors, instructional designers and eLearning website designers. Instructional designers face the challenges of selecting effective ways to
respond learning preferences of online students or eLearners, yet little empirical research exists that can guide these decisions.

1.3 Statement of the Problem

Availability of communication technologies has generated growing interest in the use of distance education methods to reach larger student populations. Online courses provide opportunities for individuals who would otherwise not have opportunities for learning (Deal, 2002) and enrolment in online courses continues to grow (Sloan-C, 2006). Administrators in higher education have asked many faculties to offer their traditional face-to-face courses in online formats in order to respond to the current demand from students. Many faculties have converted their face-to-face courses to accommodate administrators' requests, yet have given little attention to the nature of this new delivery environment. Not surprisingly, delivering course syllabus, reading and PowerPoint developed for traditional face-to-face courses through online course management system or eLearning website system is not adequate to ensure sound online courses. Improvement in current practices of online courses is unlikely to happen before our knowledge about how to design more effective, efficient and appealing eLearning website environment is improved. Implementation of online courses should be achieved through careful analysis of eLearning environment and analysis of online students' characteristics (Singleton, et al., 2004; Young, 2006).

Educators can utilise learning style inventories to understand their students' learning tendencies and can design educational activities and material that responds directly to the students' learning preferences via eLearning Website System features in an eLearning environment. The results of learning style inventories can be used to select specific eLearning website features that match with the eLearners' learning styles. However, the effects of providing instructions that use matching of learning styles of adult students in online courses have not been addressed sufficiently to guide the online course designers. Understanding this relationship is important to guide the online course design practice.
1.4 Purpose of this Research

The primary purpose of this research is to investigate the relationship between perceived learning styles of the eLearners and their preference of eLearning website features. The secondary purposes is to study various models of learning styles for examining learning styles and research various eLearning website systems for studying eLearning website feature preferences of the eLearners.

1.4.1 Research Questions

This study is designed to address a broad research question:
What impact (if any) does an eLearner’s learning style have on their preferences for specific features in an eLearning Website system?
To answer this broad research question three specific research questions were investigated:
Research Question 1:
How can an eLearning Website System be meaningfully selected to study eLearning website features preference?
Research Question 2:
How can an eLearner’s learning style be meaningfully categorised?
Research Question 3:
How do learning styles impact the eLearner’s preference of eLearning website features?
The Research Question 3 is the most extensive one, and is not examined by a literature review alone like Research Question 1 and Question 2, but rather through a full-fledged empirical cycle. This cycle involves setting up research hypotheses and conducting a survey.

1.5 Justification of the Research Design

Researchers in the academic community have given different names to two different research paradigms: positivist versus phenomenological, positivistic versus humanistic, positivist versus interpretive, functionalist versus interpretive, and quantitative versus qualitative (Thietart, R. 2001).
Their emphases are slightly different, but the main characteristics are essentially the same. For this research, two paradigms (1) Positivistic and (2) Interpretive are called as Quantitative and Qualitative since these terms come closest to interpretation sought by the research.

At the philosophical level, the two paradigms reflect different views of reality. They each have:

1. A set of ontological assumptions regarding the nature of the phenomenon to be investigated:

   While the positivist paradigm assumes the world to be an external reality existing objectively and independently (Burrell and Morgan, 1979:4 and Popper, 1972:109), the interpretive paradigm assumes reality to be largely constructed by the experience of different individuals and by the meaning the individuals place upon their experience (Lincoln and Guba, 1985:35)

2. A set of epistemological assumptions regarding the nature of knowledge about the phenomenon:

   The positivist researcher will gather facts and quantifiable measurements, search for patterns, and explain the world using external causes and fundamental laws (Durkheim, 1982). The interpretive researcher will, on the other hand, explain different meanings individuals give to the world by trying to understand their experience (Berger and Luckmann, 1966)

3. A set of methodological assumptions regarding the best approach to obtain the knowledge about the phenomenon:

   The positivist researcher prefers controlled experimentation, surveys and questionnaires (Smircich, 1983), while the interpretive researcher prefers observation, interviews, and diary methods (Lincoln and Guba, 1985).
In addition to the philosophical difference, there is also an important practical implication. The two paradigms may lead to different understandings of the phenomenon under study. The knowledge generated by one research method can only be partial - one can only learn the answers to the questions one asks. By posing questions in different ways, different research methods focus on different aspects of the same phenomenon, and hence may give different answers and insights.

Burrell & Morgan (1979) argue that the paradigms are “mutually exclusive ways of seeing the world” (p.389). This statement seems to suggest that research methods and epistemology are related. Using a particular research method will mean subscribing to a set of assumptions about reality. The choice of research paradigm, and hence methodology should therefore be largely dedicated by the nature of the phenomenon under study (Onwuegbuzie, 2001).

Burrell and Morgan (1979) have pointed out that research methods do not necessarily “bring a trial of epistemological presuppositions in their wake.” Although the dichotomy between the two paradigms is very distinct at the philosophical level, the difference is more blurred at the methodological level (Straub et al, 2005). Interpretive researchers use traditional positivist research methods such as surveys and questionnaires, although these methods are more easily administered in a quantitative way.

1.5.1 Methodological Approach

Many researchers now take a pragmatic view and suggest combining data collection methods drawn from both the positivist and the interpretive paradigms. To a certain extent, this view can be very useful, because different methods can be used to supplement each other to provide more perspectives on the phenomenon being investigated. However, one must still be mindful of the assumptions behind and the limitations of each method, and must choose the methods most appropriate for the purpose of the research, and interpret the data accordingly. This research would
adopt a more practical approach.

The positivist paradigm and its research methods, with their strong emphases on objective measurable quantities and hypotheses testing, will be used for identifying eLearning website feature preferences and learning styles of the eLearners. A set of standardized quantitative measurements will be able to gauge existing association between eLearning website feature preference and learning styles by quantifiable measurements, search for patterns, and explain objectively and independently.

To acquire the information for the proposed research, it is not appropriate to approach a small number of users directly, stimulate discussions with them, and solicit their comments and opinions. This research, therefore, will not follow the interpretive paradigm and adopt a quantitative approach for studying association between eLearning website feature preference and learning styles of the eLearners by conducting a full fledged empirical cycle, which would involve setting up research hypotheses and conducting a survey.

1.6 Limitations

The majority participants were graduate students in a US university's College of Graduate and Professional Studies. Therefore, the sample for this research did not represent all online students at the university. The sample size for this research was small consisting of 105 participants. Use of predominantly graduate participants and small size could affect the results, therefore, it would be inappropriate to generalise the results of the study to all online students. However, results from this sample will be valuable in identifying the effects of association between eLearners' learning styles and eLearning website feature preferences in establishing foundation for future large scale research.
1.7 Assumptions of the Research Study

The participants were adult learners over thirty years of age. All participants had similar technological resources that fulfil the requirements to access online courses and completed course activities. It was assumed that all participants have taken at least one course online using Blackboard as eLearning website system.

The learning style instrument (Honey and Mumford, 2006) required for this study had been validated by others to produce reliable data. The participants in this study understood the questions on the learning style questionnaire as well as eLearning website feature preference survey.

1.8 Practical Significance

Understanding the way students prefer eLearning website features is important for instructors, instructional and eLearning website designers so that effective and efficient instructional activities can be designed and implemented to improve teaching and learning in eLearning environment. Learning styles provide valuable information to understand individual difference about how individuals perceive, think, learn and solve problems (Pheiffer et al., 2003). Being able to identify impact of learning styles of students on their eLearning website preference will provide a basis on which guidelines and models can be designed to provide instructors and instructional or eLearning website designers with verified approaches that respond to the individual student’s learning styles. Therefore, it would be useful to investigate and develop knowledge about the association between learning styles and website feature preferences, and how learning style can be utilised to select and design eLearning website features for eLearners. If these associations are significant, instructional designers can utilise the results of this study to modify existing eLearning courses to meet the needs of eLearners with different learning styles or to design eLearning courses that match learning styles of eLearners.
1.9 Outline of the Chapters

The following outline is organised to present structure of the dissertation:

Chapter 1 - introduces the research topic and eLearning context, describes the statement of the problem, the purpose of this research, research questions, limitations of the study, assumption entailed and practical significance of the investigation.

Chapter 2 - illustrates the features of a number of eLearning website systems along with the definition of an eLearning website and its significance. It presents description of website features of 12 eLearning websites using their website URLs, reviews eLearning website feature matrix, describes the selection of eLearning website for research study and summarizes research papers on eLearning website features in eLearning context.

Chapter 3 - reviews the literature using extensive sources to examine models of learning styles, related instruments and their implications in learning environments. Individual models of learning styles have been examined in detail, a summary of models for comparison to focus on selection of a model has been described along with a review of opportunities for exploring understanding of a framework of relationship between learning styles and eLearning website features.

Chapter 4 - introduces the proposed framework, describes research questions and hypotheses to be tested in this research study, and reviews data collection and instrument design. The chapter also describes data analysis to be undertaken for hypotheses testing and statistical analysis.

Chapter 5 - describes results in terms of descriptive statistics, correlations, cluster analysis, and Kruskal-Wallis ANOVA. The statistical findings are presented and the description of the results is organised into four parts - descriptive statistics; statistics relevant to testing the experimental hypotheses relating to correlations; cluster analysis and description of
relationship between clusters and eLearning website feature preference; and the results of Kruskal-Wallis ANOVA.

Chapter 6 - deciphers discussions of the results in the form of three themes. Theme 1, discusses association between learning styles of individual eLearners and their eLearning website feature preferences; Theme 2, describes future research and limitations; and Theme 3, expounds on managerial applicability for eLearning website system developers.

Chapter 7 – describes conclusions drawn from findings of the study and limitations in terms of research method, sample size and participants.

In the next chapter, an analysis of 12 eLearning website systems is presented with reference to the features of eLearning website systems. It describes summaries of features of eLearning websites using their website URLs. The analytical summary of each eLearning website system features has been illustrated in the form of a matrix along with their relevance to in the selection of the eLearning website system for the purpose of undertaken research study.
Chapter 2

Review of Literature: eLearning Website Features

2.1 Introduction - eLearning

According to Welsh et al. (2003, p.246) eLearning is defined as "the use of computer network technology, primarily over or through the internet, to deliver information and instruction to individuals". As per the Commission on Technology and Adult Learning Report the eLearning is "instructional content or learning experiences delivered or enabled by electronic technology" (2001, p.4). The Conference Board of Canada's (2001, p. 3) workplace eLearning report provides: "eLearning uses information and communications technologies (ICTs) to deliver content (learning, knowledge and skills) on a one-way [asynchronous] or two-way [synchronous] basis". According to Honey (2001, p.200) the only "common thread" linking a wide range of eLearning environment is that all present "the possibility of learning from information delivered to us electronically".

These classifications have been based on differences in collaborative and individual learning practices (Trentin, 2002; Welsh et al, 2003). Russel et al. (2003) have presented a summary based on degrees of structure, interactivity and job-embeddedness. Morrison (2003), Williams (2001) and Zhang & Nunamaker (2003) have categorised eLearning based on synchronous versus asynchronous delivery. In essence, based on how eLearning application functions is used or users require them for interaction, these classifications are deciphered

Types of eLearning

eLearning as a mode of education has appeared since 1999. Even now, web-based modules are the dominant way of delivering eLearning experience. As a learning tool, however eLearning has a broader scope. The Cambridge Programme for Industry Development identified three examples of the eLearning modes (Soloman and Rolph, 2003):
Web-based training: In the corporate environment, eLearning uses web-based technologies to deliver the content to the users. It is a deficient in interaction with trainers, peers or supervisors. This form of eLearning has grown in business opportunities for content authoring, instructional design and learning management.

Online learning: Lecture is the main mode of delivery of course content in the higher education, traditionally. However, in the eLearning environment the course delivery, interaction, access to resources and course content and collaboration is all online.

Informal eLearning: There is a growth of knowledge intensive institutions where eLearning is being used for informal learning. It is outside the traditional approach of 'course-based' eLearning. There are increasing opportunities for technology to provide support informal learning in knowledge demanding institutions.

How big is the eLearning industry?

Nearly 3.2 million students were participating in online learning at institutions of higher education in the United States, according to a report from the Sloan Consortium (Sloan, 2006). The explosive rate of growth of approximately 33 percent a year -- has made eLearning industry a moving target. But according to Sloan, virtually all public higher education institutions, as well as a vast majority of private, for-profit institutions, now offer online classes. By contrast, only about half of private, nonprofit schools offer them. The Sloan report observes that students are equally satisfied with their online classes as they are with the face-to-face 'traditional' classes. It is expected that the Private Institutions due to the decrease of the cost of the systems supporting online learning may take up on this opportunity more vigorously. But, there are challenges that involve using trained staff to work with students online. These staff members must have understanding of the content and high computer and Internet skills (Sloan-C Publication, 2006).
What is an eLearning website system in this research context?

eLearning website system facilitates computerised learning or eLearning. A number of terms have been used to describe website systems - Learning Management System (LMS), Course Management System (CMS), Learning Content Management System (LCMS), Managed Learning Environment (MLE), Learning Support System (LSS) or Learning Platform (LP); it is education via computer-mediated communication (CMC) or Online Education (Paulsen, 2003).

The popular terms used for such systems in the United States are CMS and LMS. However, LMS is the commonly practiced term for describing the software for managing corporate training programs. For the purpose of this research, eLearning website systems term is used since all of the above mentioned systems for providing virtual environment for learning use a website interface and internet.

The eLearning website systems are designed to facilitate management of educational courses, especially by helping teachers and learners in an e-Learning environment. These systems have capability to track students' progress with access to students as well as teachers. In addition to being used in online courses, eLearning website systems can also supplement traditional face-to-face classroom instructions.

The hosting of eLearning systems is done through servers via web pages to present the course to the students using templates. The content is structured in the form of web pages, discussion forums, chat windows, whiteboards, grade sheets etc. Instructors fill the templates with the course contents and give access to the students as per course release requirements. Some new features in these systems consist of blogs, wiki, audio, video, and communication and course administration tools.

In this chapter, features of individual of eLearning websites systems have been reviewed and summarised with the aim of categorising them meaningfully to select a suitable eLearning system for the proposed
research. Section 2.1 describes definition of an eLearning website and its significance. Section 2.2 presents summary description of website features of 12 eLearning websites using their websites URLs. Section 2.3 reviews eLearning website feature matrix and selection of eLearning website for research study. Section 2.4 summarises research papers on eLearning website features in eLearning context and Section 2.5 presents a summary of the chapter.

2.2 Description of eLearning Websites Systems and their features

A thorough search of eLearning websites was done using a variety of terms like Learning Management System, Course Management System, Learning Content Management System, Managed Learning Environment, Learning Support System, Learning Platform and Online Distance platforms. An inventory of various eLearning websites systems (newer versions) was created and features analysed. A list of eLearning websites is presented in this section. The features of eLearning websites have been summarised into feature sets related to Student Learning Features and Instructional Features for the purpose of creating a comparison matrix and consistency, which follows the description of eLearning websites systems section.

A summary of the features and their degree of relevance in the selection of each eLearning website systems for the undertaken research is presented. A glossary of terms is presented in the Appendix A. Of all e-Learning websites systems studied, only features of the highlighted websites (Table 2.1) have been described in the Appendix B.
Table 2.1  List of eLearning Website Systems  
(Source: Adapted from platform eLearning Websites)

<table>
<thead>
<tr>
<th>Individual eLearning Website System Features</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ANGEL Suite 7</strong></td>
</tr>
<tr>
<td><strong>Summary and Relevance to the eLearning Website Selection</strong></td>
</tr>
<tr>
<td>ANGEL 7, eLearning website student learning features were classified as moderate based on strength of the features. These features included discussion board, file exchange, internal mail, online journal, whiteboard, bookmark, calendar, help, groupwork, self-assessment, community building and student portfolio. The instructional features were also assigned moderate relevance notation based on the comparative strength of the features. ANGEL 7 did not have the capability for Real-time video, video integration. So, the overall status of the website system features is categorised as moderate.</td>
</tr>
</tbody>
</table>

| **Atutor 1.53**                           |
| **Summary and Relevance to the eLearning Website Selection** |
| Atutor is characterised as a weak eLearning website based on the study of features by the researcher relating to the student learning and instructional |

<table>
<thead>
<tr>
<th>ANGEL Suite 7</th>
<th>KEWL 1.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atutor 1.2</td>
<td>Learnwise</td>
</tr>
<tr>
<td>Avilar WebMentor 4.0</td>
<td>LON-CAPA 2.1</td>
</tr>
<tr>
<td>Blackboard Academic Suite</td>
<td>LRN</td>
</tr>
<tr>
<td>eCollege AU+</td>
<td>Unicon Academus</td>
</tr>
<tr>
<td>WebCT (now Blackboard Vista)</td>
<td>Virtual-U 2.5</td>
</tr>
<tr>
<td>Desire2Learn 8.1</td>
<td>Manhattan Virtual Classroom 2.1</td>
</tr>
<tr>
<td>Educator</td>
<td>MimerDesk 2.0.1</td>
</tr>
<tr>
<td>ILIAS</td>
<td>Moodle 1.5.2</td>
</tr>
<tr>
<td>Janison</td>
<td>Sakai</td>
</tr>
<tr>
<td>Jenzabar Internet Campus Solution 1.03</td>
<td>Teknical Virtual Campus</td>
</tr>
</tbody>
</table>
features. The website system does not have real-time chat video, video integration and work offline/synchronise (Table 2.2 and 2.3) features.

**Avilar WebMentor LMS**

**Summary and Relevance to the eLearning Website Selection**

Avilar Web Mentor, eLearning website's student learning features were evaluated as weak based on the strength of the features such as file exchange, internal mail, online journal, help, self-assessment, community building, student portfolio etc. However, discussion board, bookmark and calendar feature were classified as moderate based on strength of the features. The instructional features were also assigned weak relevance notation based on the comparative strength of the features. In Avilar Web Mentor real-time chat, whiteboard, video integration and synchronisation were absent. Thus, overall rating of the features of the website was characterised as weak.

**Blackboard Academic Suite**

**Summary and Relevance to the eLearning Website Selection**

Blackboard's student learning features were analysed based on the strengths and weakness. These features were assessed to be strong, and consisted of discussion board, file exchange, internal mail, real-time chat and video, whiteboard, video integration, bookmark, calendar, searching within the course, help, groupwork, self-assessment, community building and student portfolio. The instructional features were also assigned strong relevance notation based on the comparative strength of the features comprising of course management, helpdesk, grading tool, automated testing/scoring, course templates, customisation, design tools, content sharing and reuse and accessibility compliance. Blackboard features, therefore, were rated as strong.
eCollege

Summary and Relevance to the eLearning Website Selection

This eLearning website system has a number of strong student learning features such as online journal, video integration and orientation/help, along with moderate features like internal mail, real-time chat, bookmark, calendar, groupwork, self-assessment, community building and student portfolio. However, some features were assessed to be weak like file exchange and work offline/synchronise. The relevance notations for instructional feature were in two categories - moderate and strong. Overall, evaluation of the eCollege website system feature was moderate.

WebCT Vista 4 (now Blackboard Vista)

Summary and Relevance to the eLearning Website Selection

The eLearning website features in WebCT Vista 4 were found to be strong student learning, and moderate instructional features. The strong relevance notation student features were discussion board, file exchange, work offline/synchronisation, group work and self-assessment whereas rest of the student learning features were assigned moderate ranking. The instructional features of WebCT Vista 4 were given moderate notation based on the strength of the features such as course management, helpdesk, grading tool, automated testing/scoring, course template, design tools, content sharing/reuse and accessibility compliance. However, customisation feature was assessed to be weak. Thus, overall rating of the website feature was characterised as strong for the student learning feature and moderate for instructional features.

Desire2Learn 8.1

Summary and Relevance to the eLearning Website Selection

As per analysis by the researcher, Desire2Learn 8.1 had many strong student learning features namely discussion board, file exchange, searching within the course, help, group work, self-assessment and community building, and
a number of moderate strength features like internal mail, online journal, 
real-time chat, video integration, bookmark, calendar, work
offline/synchronise and student portfolio. The instructional features mostly
were assessed to be moderate in terms of strength of features, and consisted
of course management, helpdesk, grading online, automated testing and
scoring, course template, content sharing/reuse and accessibility compliance.
The instructional design feature was ranked to be strong based of the
characteristics and functionality of the tool.

LON-CAPA 2.1

Summary and Relevance to the eLearning Website Selection

The majority of LON-COPA student learning features were rated as weak
with the exception of discussion board, internal mail, calendar, help and
searching within course, which were characterised as moderate. The
whiteboard and video integration features were absent. The instructional
features were a mix of moderate and weak features. The moderate features
consisted of instructor helpdesk, course template, design tools and content
sharing/reuse feature. Overall, LON-COPA site features were rated to be in
between weak and moderate.

Moodle 1.5.2

Summary and Relevance to the eLearning Website Selection

Moodle, eLearning website systems possessed student learning feature of
moderate strength, consisting of discussion board, file exchange, internal
mail, online journal, calendar, real-time chat and help, and other features
like video, self-assessment, community building and student portfolio were
weak. Despite not being a strong eLearning website system, it is adopted by
many educational institutions in the United States due to cost considerations.
It is an open source platform.

The instructional features of Moodle are mostly moderate in strength, like
course management, helpdesk, customisation, instructional design, content
sharing/reuse and accessibility compliance. However, grading tool, automates testing and scoring were rated as weak. The overall comparative ranking was assessed to be moderate to weak.

**Sakai**

**Summary and Relevance to the eLearning Website Selection**

The student learning features of Sakai website system were rated moderate based on the strength of the features, and these included discussion board, file exchange, internal mail, online journal, real-time chat, bookmark, calendar, searching within course, help, groupwork, self-assessment and student portfolio. The majority of instructional features were also ranked moderate. These moderate features consisted of course management, helpdesk, customisation and instruction design tool. The automated testing and scoring, content sharing/reuse and accessibility compliance were assessed to be weak.

**Teknical Virtual campus**

**Summary and Relevance to the eLearning Website Selection**

Teknical VC, eLearning website systems possessed student learning feature of moderate and weak strengths. The moderate strength feature included discussion board, online journal, real-time chat and bookmark and the weak strength features consisted of file exchange, internal mail, whiteboard, calendar, searching within the course, help, groupwork, self-assessment, and student community building and portfolio.

The instructional features were ranked as moderate to weak. The features with moderate strength included online grading, content sharing and reuse, and accessibility compliance. Features such as course management, instructor helpdesk, automated testing/scoring, course template, customisation and instructional design feature were assessed to be weak. Overall, Teknical VC website features were evaluated to be moderate.
2.3 eLearning Website Feature Matrix

On the basis of eLearning website features described in the section 2.2, a comparative summary of the features has been synthesized, and it is presented in the Table 2.3. These features have been categorised into two categories:

1. Student Learning Features
2. Instructional Features

Student learning features include features that are predominantly used by students. Drawing on the review of features, these can be further grouped into collaboration, communication, involvement, interaction and productivity. Instructional features can be categorised as course delivery, course design and course management, and administrative features include authentication, course authorization, and integration of 3rd party vendor software to facilitate added features like video streaming, wiki etc.

Amongst learning feature categories, the communication feature includes file exchange and internal mail. Collaboration entails discussion board, groupwork, online journal and community building features like blog or wiki. Student involvement features category is represented by self-assessment and student portfolio. The features related to student productivity include bookmark, help, searching within course, calendar and progress and work offline/synchronise.

Interaction category involves a mix of features like groupwork, internal mail, discussion board, blog or wiki, real-time chat room, video conferencing and whiteboard.
### Table 2.2 Relevance Notation Example: Discussion Board
(Key Source: http://www.edutools.info/course/)

<table>
<thead>
<tr>
<th>Relevance Notation</th>
<th>Feature Description: Discussion Board</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>Discussion Board does not exist.</td>
</tr>
<tr>
<td>√</td>
<td>Discussion boards that can be viewed by date and thread.</td>
</tr>
<tr>
<td>√√</td>
<td>Discussions can be viewed by thread. Posts can include URLs, and can be either plain text or formatted text. Discussion threads are expandable and collapsible to view a list of topics or view an entire conversation on one screen. Threads can be sorted by author, topic, post date, and activity level. Students can enable or disable notification of new posts sent to their email. Threads can be locked by the instructor from reading and/or writing, or attached to the top of a thread list so important threads appear first. Active threads appear near the top of the thread list. An administrator can share discussions across courses, departments, or any institutional unit.</td>
</tr>
<tr>
<td>√√√</td>
<td>The website system includes support for discussion forums. Discussions can be viewed by date, by thread, by title, by author, by group, by the type of post. Students can categorize posts as problems, explanations, scientific explanations, comments, evaluations, or summaries. Instructors can associate a discussion with any course content. Discussions can be shared across courses, departments, or any institutional unit. Instructors may create separate discussion environments for small groups. Groups can be open to all or only a select set of students. Instructors can determine the level of involvement (read, write, or post anonymously) for students. Only the instructor may delete posts. Posts can include attachments, an images or URLs. Posts can be either plain text, formatted text or html. The threaded discussion software includes a formatting text editor. Discussion threads are expandable and collapsible to view an entire conversation on one screen. The entire discussion can be saved or printed for off-line reading. Instructors can set up discussion forums so new posts are sent to the email of each student. Students can enable or disable posts to be sent to their email. Instructors can limit discussions to specific time periods. The discussion forums can include a moderation function (screen all posts).</td>
</tr>
</tbody>
</table>

Features for instructional use can grouped into two categories – course delivery and course design features. The course delivery category includes course management, helpdesk, online grading, automated testing and
scoring while the course design category includes course template, customisation, instructional design tools, content sharing/reuse and accessibility compliance.

Features in each of the two categories have been assigned relevance notation as per strength of feature functionality. For example, discussion board (see table 2.2).

Based on the matrix Blackboard was selected as the eLearning website system for this research because it ranked the highest as per relevance of the eLearning features. There were strong contenders amongst eLearning websites reviewed with extensive functionality, such as eCollege, WebCT vista, Desire2Learn and ANGEL.

2.4 Summary of Research Papers on in eLearning Context

The reviewed articles related to four themes that emerged from the research, which are presented and discussed with respect to the findings of the broader online learning literature for three modes of online learning: (a) technology-enhanced on-campus learning, where eLearning website systems -enhances online learning activities and has a supplementary role of facilitating face-to-face classroom instructions, (b) blended-mode learning, where occasional face-to-face instruction is complemented by eLearning website systems - via online learning, and (c) 100 percent online learning, that relies exclusively on eLearning website systems.

eLearning Website Systems and eLearning Processes

The analyses under this topic focus on the impact, if any, of the eLearning website systems in the learning process from students' point of view. There are few research studies in this category that report on investigations relating to the eLearning website systems usage and institutional experience, primarily, in terms of faculty and student attitudes toward learning and teaching via eLearning website systems. How effective students perceive eLearning to be in their studies, how satisfied are students with eLearning
website environment and what are their preferred features or function? These points are briefly presented in the following sections.

A number of studies indicate that eLearning website systems are perceived as user-friendly and effective in eLearning process (McCourt and Widmayer, 2000; McClelland, 2002; Dean, 2003). Generally, students have reported a high degree of satisfaction with their eLearning experience and a positive attitude toward eLearning website system (McKenzie, et al., 2001, Magoun, et al., 2003, Bohley, 2002, Newland, 2003 and Sloan-C, 2006). According to Marghitu et al. (2003), eLearning website systems were reported by the students to be useful and enhanced their learning as reflected by the content knowledge and information technology skills. McKenzie et al., (2001) and McClelland (2002) claimed that the flexibility of time and space was, particularly, useful to the working adult students: They found eLearning website systems to be convenient as those provided flexibility to access the course material and discussion opportunity anytime/anyplace. There are a few studies that have reported student dissatisfaction (Lazenby, 1999; Belvin, 2003) with regard to the difficulties experienced by the student in the use of eLearning website system and limitation in terms of interaction with the faculty and classmates during an online course. However, there are some studies that claim student satisfaction with regard to use of eLearning website systems, flexibility and interaction with the faculty and classmates (Morss, 1999; Harasim, 2000; Heeler and Hardy, 2002; and Linge, 2003)
<table>
<thead>
<tr>
<th>Features</th>
<th>e-Learning Website Features</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Angel 7</td>
</tr>
<tr>
<td>Student Learning Features</td>
<td></td>
</tr>
<tr>
<td>Discussion Board</td>
<td>✓</td>
</tr>
<tr>
<td>File Exchange</td>
<td>✓</td>
</tr>
<tr>
<td>Internal mail</td>
<td>✓</td>
</tr>
<tr>
<td>Online Journal</td>
<td>✓</td>
</tr>
<tr>
<td>Real-time Chat</td>
<td>✓</td>
</tr>
<tr>
<td>Whiteboard</td>
<td>✓</td>
</tr>
<tr>
<td>Video/Integration</td>
<td>-</td>
</tr>
<tr>
<td>Bookmark</td>
<td>✓</td>
</tr>
<tr>
<td>Calendar</td>
<td>✓</td>
</tr>
<tr>
<td>Searching within course</td>
<td>✓</td>
</tr>
<tr>
<td>Orientation/Help</td>
<td>✓</td>
</tr>
<tr>
<td>Work Offline/Synchronize</td>
<td>✓</td>
</tr>
<tr>
<td>Groupwork</td>
<td>✓</td>
</tr>
<tr>
<td>Self-assessment</td>
<td>✓</td>
</tr>
<tr>
<td>Community Building</td>
<td>✓</td>
</tr>
<tr>
<td>Student Portfolio</td>
<td>✓</td>
</tr>
<tr>
<td>Features</td>
<td>e-Learning Website Features</td>
</tr>
<tr>
<td>----------</td>
<td>-----------------------------</td>
</tr>
<tr>
<td></td>
<td>Course Management Helpdesk</td>
</tr>
<tr>
<td></td>
<td>Instructor Grading tools</td>
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<tr>
<td></td>
<td>Online Grading tools</td>
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<tr>
<td></td>
<td>Course Templates</td>
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<tr>
<td>Technical VC</td>
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<tr>
<td>Sakai</td>
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<tr>
<td>Moodle</td>
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<tr>
<td>LON-COPA</td>
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<tr>
<td>Delphi</td>
<td></td>
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<tr>
<td>Vista</td>
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</tr>
<tr>
<td>WebCT</td>
<td></td>
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<tr>
<td>eCollege</td>
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</tr>
<tr>
<td>Blackboard</td>
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</tr>
<tr>
<td>AthaworM</td>
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<tr>
<td>Aulcom</td>
<td></td>
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<tr>
<td>AngelL</td>
<td></td>
</tr>
</tbody>
</table>

Legend: - Not Available
To sum up, overall a positive attitude has been reported in the literature reviewed so far toward the eLearning website systems and eLearning by the students and faculty. As stated above, some findings report that the opportunity for interaction is limited, therefore, eLearning systems should provide increased interaction and participation. The designers of eLearning website system should take this into account, so that these systems promote true student-centred learning. The following section summarises findings about collaborative learning activities in eLearning environment.

**eLearning Website System and Collaborative Learning Activities**

The eLearning collaborative activities are reviewed in this section with the focus on collaborative engagement, knowledge-building and problem-solving. The discussion board is the main feature of these studies. It is the primary feature used for interaction in eLearning website system in various ways: online seminars, class discussions, help from instructor, mentors and peers and communication amongst group of students.

There are number of research studies indicating importance of collaboration in eLearning environment in regards to structured and purposeful online dialogue that helps students in their learning, articulate ideas, negotiate meaning and collaboratively construct shared knowledge, reflective discourse and critical thinking. Thus, providing an enhanced learning experience (Carey, 2000; Loving, 2000; Leh and Winograd, 2002; Vellom and Mascazine, 2002; Garvin, 2003).

Furthermore, students appreciate the flexibility of studying anyplace/anytime (Maeers, 2000; Sloan-C, 2006), they consider that they learn as much as they do in face-to-face instructional situations, and some believe they learn more effectively and in greater depth online (Korhonen, 2001). It also seems that there is a direct relationship between, on the one hand, the students' level of interaction and the sense of community developed, and, on the other hand, the students' perceived cognitive learning and satisfaction with the online course (Worrall, 2000; Topper, 2003). However, while the discussion boards of eLearning website system do
support student collaboration; they still lack the flexibility to make this collaboration practical and straightforward so that students easily share their ideas and digital products (Haack et al., 2003).

According to Loving (2000), Korhonen (2001), Lucking, et al., (2001) and Aschermann, et al., (2003) social constructivist approaches adopted by the instructor to eLearning are critical in facilitating, monitoring and assessing interaction. These studies also report that eLearning website systems do not yet support the faculty in terms of structured interactions (Maeers, 2000; Young, 2001), monitoring student interactions (Topper, 2003) and assessing student learning using qualitative and quantitative data based on interactions (Garvin, 2003; Topper, 2003). Thus, it makes instructional task difficult and time consuming for organising and following the student interactions (Verkler, 2001; Haack et al., 2003). Garvin (2003) and Giza (2003) recommend need for additional assessment tools.

The studies summarised in this section show that eLearning website systems support collaborative learning activities. Currently, the main feature for such activities is discussion boards. The effects of these activities on students are enhanced learning experiences and development of reflective skills. Due to the lack of adequate functionality in eLearning website systems to structure and manage students' interactions, eLearning website systems present difficulties for the faculty. Thus, more sophisticated and functional facilities for student collaboration need to be investigated for incorporating into the design of eLearning website system.

eLearning Website system and Assessment Activities

The eLearning website systems are claimed to be lacking or difficult, in the alternate assessment methods, such as methods using social constructivist approach like peer assessment (Korpi, 2000; McMahon and Luca, 2000). However, traditional methods of assessments like multiple-choice and portfolio assessment are also quite useful and prevalent in the eLearning website system (Musgrove, et al., 2001). The alternative methods are difficult and time-consuming for the faculty. The eLearning website system
supports traditional assessment methods and provides quantitative measures of student performance.

**eLearning Website System Features and Learning style**

The literature on association of learning styles with eLearning website systems has not been reported yet. However, there are few studies about the extent to which eLearning website systems can facilitate a student-centred eLearning environment (McCartney, 1999; Pearson and Koppi, 2001; Tselios, et al., 2001; Zaharias, 2002). The user-interface has been recommended to be an important aspect in the design of eLearning websites to facilitate intuitive, student-centred, collaboration and devoid of usability problem (Bullen, 1999).

**2.5 Summary**

Upon review of features of individual of eLearning websites systems, Blackboard was identified as the eLearning website system for studying the website feature preferences of eLearning. A lot of work has been done on learning styles, but there is only a small body of literature has focused on the influences of prior knowledge on learning style preferences in eLearning environment. In the next chapter, researcher reviews literature and provides analysis of various prominent learning style models and instruments for selecting a Learning Style Instrument that will be used for measuring learning styles of the eLearners, and exploring understanding of relationship between Learning Style and preferred eLearning website features in eLearning environment.
Chapter 3

Review of Literature: Learning Styles

3.1 Introduction

Analyses of the models of learning styles as explained in the literature are presented in this chapter. The claims made for these models are critically reviewed. The effectiveness and validity of these models is scrutinised along with the pedagogical implications these models entail. The literature review explores the range of models that exist in research and practice literature, the theories and applications associated with these models in terms of claims made by authors, analyses pedagogical implications of models of learning styles and identifies research opportunities that exist in terms of developing understanding of a framework of relationships between learning styles and eLearning Website System features or online learning Website features.

A voluminous amount of literature was collected that included abstracts, journal articles, proceeding publication, books, dissertation abstracts etc. The literature varied in the quality of content and extent of context coverage. Various search terms in querying various electronic databases and collections, examining cited references, reviewing materials were provided by supervisors and colleagues, and searching sources on the internet.

In this chapter, the literature has been reviewed from a variety of sources to examine models of learning styles, related instruments, their implications in learning environments and overall assessment. Section 3.1 introduces the chapter. Section 3.2 describes research questions and objectives pertaining to this chapter. Section 3.3 reviews individual models of learning styles. Section 3.4 provides a summary of models for comparison to focus on selection of a model. Section 3.5 reviews opportunities for exploring understanding of a framework of relationship between learning styles described as per the selected model and eLearning Web site features. Section 3.6 presents a summary of the chapter.
3.2 Definition: Learning Style

There are many views on learning styles. According to NASSAP (1979), ‘learning style is characterised as cognitive, affective, and psychological behaviours that indicates how learners perceive, interact with and respond to the learning environment.’ This definition focuses on the ‘tendency to adopt a particular strategy in learning’. Most students have a preferred learning style. Though, they may adapt to a different learning style according to the task. Pask (1976) refers these learners as ‘versatile learners.’

Over the last two decades, a significant amount of contribution to the learning style literature and progress in understanding of human cognitive learning style has been made. Learning style refers to the preference(s) that facilitates learning in some situations does not in other situations. There are a lot of factors that influence learning styles such as gender, ethnicity and age (Shuler, 1999; Gordon, 1996). Social factors have also been studied for their influence on development of learning styles (Stenberg, 1997). However, learners adapt to new learning stimuli in their environment and figure what to do to be successful in learning the information or subject matter.

From a practitioner’s perspective, it is a common knowledge that students learn differently. However, lecture seems to be the prominent way of delivering (Newman and Scurry, 2001). When faculty’s teaching and students’ learning style match, there is better learning outcome in the classroom. Learning as a process involves understanding and skilful performance after learning (Drysdale, Ross, and Schultz, 2001). The process itself can be impacted by some factors. These factors are also seen as dimensions of learning styles. Four general dimensions proposed by Dunn, Beudry and Klavas (1990) are:

- Cognitive – relates perception, thinking, problem solving, remembering and relating to others.
• Affective – refers to attention, emotion, motivation, incentive, curiosity, boredom, anxiety and frustration.

• Physiological – views biological characteristics: auditory, visual, kinaesthetic and tactile.

• Psychological – describes relationship of learning with inner strength and individuality.

In this research, evaluation of 8 prominent models has been done in detail, looking both at studies where researchers have evaluated the underlying theory of a model and empirical studies of reliability, validity and pedagogical impact. To ensure consistency in each of these analyses, the following headings have been used:

• description and scope of the model
• measurement description of instrument
• reliability and validity
• implications for pedagogy

3.3 Models of learning styles

Following models and instruments have been described in details:

Gregorc’s Mind Styles Model and Style Delineator (GSD)

Dunn and Dunn model and instruments of learning styles

Riding’s Cognitive Styles Analysis (CSA)

Myers-Briggs Type Indicator (MBTI)

Jackson’s Learning Styles Profiler (LSP)

Kolb’s Learning Style Inventory (LSI)

Honey and Mumford’s Learning Styles Questionnaire (LSQ)

Herrmann’s Brain Dominance Instrument (HBDI)

3.3.1 Gregorc’s Mind Styles Model and Style Delineator

Gregorc (1982b) identifies two dimensions of learning styles – perception
and ordering. Perception is defined by Gregorc as ‘grasp of information’ on a continuum between ‘abstract and concrete’, and ‘ordering’ as the way information is ‘arranged’, ‘systematised’ or ‘referenced’ on a continuum from ‘random to sequential’. Kolb (2000) has used similar dimensions – ‘prehension’ and ‘transformation’. Gregorc’s ‘sequential processing’ and ‘random processing’ also resembles Guildford’s (1980) ‘convergent thinking’ and ‘divergent thinking’.

Description

According to Gregorc (1979) learning style is defined as ‘distinctive behaviours’ by which a person learns and adapts to his/her environment. He has proposed Mind Styles Model, which states that mind interacts with their environments through ‘channels’, and those have been proposed to be measured by the Gregorc Style Delineator (1982). These can be described into four styles (1982a):

- The concrete sequential (CS) learner – have distinctive behaviours of being ordered, perfection-oriented, practical and thorough.
- The abstract sequential (AS) learner – have behaviours that tend to be logical, analytical, rational and evaluative.
- The abstract random (AR) learner – have characteristics behaviours of being sensitive, colourful, emotional and spontaneous.
- The concrete random (CR) learner – have distinctive behaviours of being intuitive, independent, impulsive and original.

Although, these distinctive behaviours are present in everyone to a varied extent, some are ‘prominent’ in individuals, and inborn or God-given (Gregroc, 2002). These distinctive behaviours are not expected to change over the life-time of an individual; therefore, acting against stylistic inclinations would have negative consequences. Gregroc (2002) calls for promoting self-knowledge, self-awareness, harmonious relationships and mitigating harm.
Measurement

Gregorc (1982a) designed an instrument consisting of ten items. Each of these items consists of words, and participants rank words as least descriptive to most descriptive. The words being used in questionnaire may not be clear to the respondents, therefore, are likely to produce erroneous results. The GSD booklet provides description of characteristics when a particular style is dominant. This publication did not report on any normative data or statistical trends based on studies using GSD.

Reliability and validity

Gregorc (1982b) has described results from his study using a small sample size (n=110) and reported a high degree of reliability and moderate correlation. The assumption in this study was that the ranking of words in each item characterises learning style in GSD.

Implications for pedagogy

Unlike, Kolb's (1999) learning style instrument, which is embedded in theory, Gregorc's model relies on mind abilities being diagnosed via rating of words. He considers learning style information about students can help teachers in facilitating teaching strategies (Gregroc, 1984).

Gregorc (1982) contends that respondents with Concrete Sequential (CS) style selected learning methods such as workbooks, tutorials and help tools, while individuals with Abstract Random (AR) dominant style selected assistance from TV, movies and group discussions, and Abstract Sequential (AS) learning individuals chose audio and reading material/assignments. Individuals with Concrete and Random (CR) styles preferred independent projects/assignment and simulation exercises.
Table 3.1: Gregorc’s Mind Styles Model and Style Delineator (GSD)
Key Source: Gregorc 1985

<table>
<thead>
<tr>
<th></th>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>The GSD is based on two dimensions – perception and ordering.</td>
<td>Styles being inborn abilities cannot be changed overtime.</td>
</tr>
<tr>
<td>Design of the model</td>
<td>These dimensions include a continuum of concrete-abstract and sequential-random. Predominance of these dimensions may be in one or two areas of the continuum.</td>
<td>Words in the questionnaire be not clear or familiar to the participant. Normative data is reported, and detailed descriptions of the style characteristics are unvalidated.</td>
</tr>
<tr>
<td>Reliability</td>
<td>The author reports high levels of internal consistency and test-retest reliability.</td>
<td>Reliability of GDS is questionable in terms of psychometric properties based on independent studies.</td>
</tr>
<tr>
<td>Validity</td>
<td>Correlations are reported to be moderate.</td>
<td>The empirical evidence is absent for construct validity.</td>
</tr>
<tr>
<td>Implications</td>
<td>Gregorc’s bases usefulness of GSD in pedagogical implications as individual learners prefer a variety of instructional strategy mix.</td>
<td>Gregorc claims that individuals not following natural styles would incur negative harm.</td>
</tr>
<tr>
<td>Overall assessment</td>
<td>It is not an instrument based in a learning theory that can be used for assessment of individual learning styles.</td>
<td></td>
</tr>
</tbody>
</table>

The study by Gregorc (1982) indicated that participants decided on a variety of forms of materials and approaches despite predominant disposition about one or two learning styles or preferences. According to the study, this was done by the participants to avoid boredom. If there is no alignment between student styles and teaching methods, students experience discomfort in their studies. Thus, developing a repertoire of skills can be useful for effective in learning and teaching (Gregorc, 2002), and the notion of changing natural styles is not recommended by Gregorc, as it will cause more harm than good.
Conclusion

Because of the lack of support in terms of reliability and validity of GSD, and basis of identifying learning styles not being embedded in theory, it is not considered a strong candidate for studying learning style of eLearners for the undertaken investigation. However, literature does provide some support to the group difference as it relates to the ‘sequential’ and ‘random’ constructs.

3.3.2 Dunn and Dunn Model and Instruments of Learning Styles

Dunn and Dunn model has become popular amongst elementary schools in the US since 1960s. It is being used in teacher training courses, and by individual practitioners (Dunn 2003a). Reese (2002) states that Dunn and Dunn model has attracted financial support from the US government for implementing the use of the model in the school districts. Klein et al. (2003a and 2003b) have given a call for further research investigations into the usefulness of the model before allocating resources for use of this model by the school districts to enhance the retention and achievement of students.

Description and definition of the model

Dunn (2003b) describes five threads of stimuli that influence individual's learning, namely environmental, emotional, sociological, emotional and physiological. The environmental threads of stimuli are preferences related to the external environment of the learner such as light, furniture and seating arrangement in the class, and temperature. The emotional stimuli are associated with the motivation, responsibility and structure. The sociological stimuli have a limited connotation about social dynamics of the student preference of learning for by oneself, in peer groups or teams in the presence of an instructor using assertive or mutually respectful approaches. The physiological threads of stimuli assess senses like visual, auditory, kinaesthetic or tactile and the need for eating food or drinking water while learning. The psychological stimuli are associated with the information-processing such as global and local or impulsive and reflective. Dunn and
Dunn (1992) emphasise on biologically developed characteristics, and define style to be a manner in which people process, reflect and retain information.

Evaluation

A large number of research studies are being conducted using Dunn and Dunn model, in the higher education institutions (Lovelace, 2003). At least in one instance, several awards have been received by the Saint John's University for research in learning style using Dunn and Dunn model. This model has been used in various groups with different academic levels like gifted, at risk, drop-outs, special needs' and vocational disciplines, in higher education.

Reliability

This model has been cited in the literature extensively in various studies involving a variety of research contexts (Dunn et al. 1995; Dunn and Griggs 2003) using a set of demographic variable such as age, gender, socio-economic status, academic achievement, race, religion, culture and nationality (Ewing and Yong 1992; Dunn et al. 1995). The findings demonstrate that these variables are important in influencing learning preferences of students. The difference between and within group means cannot be simply explained by the differences in the learning styles.

Dunn and Dunn make a case about reliability of the model by describing studies done under various conditions like tight administration of the model, authorised centres, certified learning style trainers who in turn randomly select students to constitute a random sample size. However, the selection criterion is not explained by the authors.

Validity

De Bello (1990) based on his studies of two years at Ohio State University of Dunn and Dunn’s learning style instrument reports a high degree of reliability and validity. Other authors have also cited De Bello to support
their claim (Hlawaty and Honigsfeld, 2002; Curry, 1987; and Geiser and Pinto, 1991) about Dunn and Dunn's learning style instrument in comparison to nine other instrument.

Implications for pedagogy

Dunn and Dunn model claimed to provide an alternative to the informal observation approach by the teachers in matching preferences of the learners and the type of materials. The informal observations are mostly inaccurate. Dunn (2003c) indicated that reliability and validity of the model was high when informal insight and experience of the teacher were used along the preferences indicated by the model. This combination of model and informal insight use is claimed to be more useful in case of student trying to learn complex material.

Statistical inferences as per the model (Dunn 2003) reported that up to 75% higher standard deviation higher for the students being accommodated for their learning styles than those who were not being accommodated.

At St. John's University, NY a long-term study has been carried since 1980 and similar results have been found. The reports of matching of learning instructions and preferences with instructions indicated 0.87 weighted effect for achievement and 0.85 for attitude.

Conclusions

The literature review of the Dunn and Dunn suggests that if there is a match between learning styles and the instructional environment, any student's learning can be positively influenced. Thus, how to teach students whose learning styles are not known to the teacher is a critical question to investigate. This model provides some pointers toward that view.
### Table 3.2: Dunn and Dunn’s model and instruments of learning styles

**Key Source:** Dunn and Griggs 2003

<table>
<thead>
<tr>
<th></th>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td>Model is responsive in terms of various groups of factors such as motivational, social interaction, physiological and environmental.</td>
<td>It presents a simplistic view of the physiological and psychological preferences.</td>
</tr>
<tr>
<td><strong>Design of the model</strong></td>
<td>Twenty two factions are rated for high and low preferences by the learners. Teachers adopt specific techniques or make environmental changes based on strong preferences.</td>
<td>It is criticised for not being a model for learning. There is no theoretical basis for the design of the model.</td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td>Strong claims are made by the authors using the LSI.</td>
<td>There is criticism of design and reliability of the LSI.</td>
</tr>
<tr>
<td><strong>Validity</strong></td>
<td>Strong claims by the supporting studies.</td>
<td>There are questions about the validity.</td>
</tr>
<tr>
<td><strong>Implications for pedagogy</strong></td>
<td>As per the LSI claims, learning preference can be described, and intervention with regards to environment and pedagogy to match learning styles will impact achievement.</td>
<td>The implications are described in a biased and forceful manner. There is a lack interest in exploring options. Generalisation of pedagogy is weak to be adopted.</td>
</tr>
<tr>
<td><strong>Evidence of pedagogical impact</strong></td>
<td>The model has created a large international research interest.</td>
<td>Independent evaluation of the instrument is lacking.</td>
</tr>
<tr>
<td></td>
<td>The empirical studies have reported isolation of individual elements fostered effect evaluation.</td>
<td></td>
</tr>
<tr>
<td><strong>Overall assessment</strong></td>
<td>There is a sizable amount of supporting literature about the use and benefits of the model that has been generated over the years, despite the limitations in many studies. An independent examination of the model is still lacking.</td>
<td></td>
</tr>
</tbody>
</table>

#### 3.3.3 Riding’s Model and Cognitive Styles Analysis (CSA)

Cognitive style is defined as the manner of an individual’s thinking and preferred way of organising and structuring information (Riding and Rayner, 1998). They introduce another term learning strategy, which is defined by them as processes used by the learners to engage in learning activities. The distinction between the two is made by Riding (2000) in that the learning
strategy is dynamic and can be changed and developed, whereas learning styles remain static and integral part of an individual.

The grouping of models by Riding and Rayner (1998) is based on a number of themes like learning through experience, preference of modes of instructions and the development of cognitive skills and processes used by learners in learning activities. Thus, their model does not provide a diagnosis of different learning styles, but focuses on development of cognitive styles, learning through experience and social behaviour.

Riding and Rayner (1998) describe their model to be two dimensional. The first dimension consists of the cognitive organisation, and the second one refers to the mental representation. The mental representation dimension is designed to measure how fast an individual can process verbal and visual information. Both of these dimension measurements are focused on speed rather than accuracy.

Cognitive Styles Analysis (CSA)

Description

The computerised model using Riding's (1998a and 1998b) assessment methodology has been described as Cognitive Styles Analysis (CSA). It provides learners with cognitive tasks and measures two dimensions: holistic-analytical and verbal-imagery. In this model, the comparative speed of matching responses is considered more important than the accuracy of responses. The CSA has been reported suitable for adults as well as young students (Riding, 1998b).

Reliability

There is no known literature that has been published by Riding regarding reliability of CSA. However, Peterson et al. (2003) have published a study about reliability of CSA entailing a small sample size (n = 50). The reliability is reported to be low for the verbal and imagery dimension (r=0.27) as well for the holist-analytic dimension (r=0.53). Redmond et al.
(2002) have found a negative correlation for verbal-imager dimension \( (r = 0.21) \) and a positive correlation for holist-analytical dimension \( (r = 0.56) \). Thus, there are limited numbers of studies providing evidence of reliability even after a decade of research on CSA.

Evaluation

There are conceptual problems with Riding’s model and the instrument. Riding’s view of holistic entails field-dependence, impulsive, unwilling to engage in complex analysis. Analysis and synthesis have been place on opposite extremes as polar characteristics. He reports cognitive styles to be fixed and non-changeable, but preferred and habitual processes. His views are contrary to the views of the researchers that recognise the role of met cognition in changing learning styles (Antonietti, 1999). Riding describes meta cognition as cognitive style that helps in developing learning strategies, and not styles.

Implications for pedagogy

According to Riding (2002) matching of cognitive style and learning resources, and teaching approach are important for less able students. There are many factors that influence style, and thereby performance. A large number of research studies have been reported based on his model about correlations and predictive investigations on learning outcomes. The recommendations, therefore, cannot be adopted without substantial empirical evidence. These studies have not been replicated, thus their reliability is questionable.

Conclusion

There are empirical issues with the Riding’s model and CSA; however, it may have implications for teaching, in that teaching toward any of the poles described in the model would present limitations for the students. Thus, a teacher should teach in dual mode to address generalities and specifics; structure the teaching material in such a way that global and specific
issues are addressed, use deductive and inductive reasoning and emphasise verbal and visual communications.

Table 3.3: Riding’s Cognitive Styles Analysis (CSA)

<table>
<thead>
<tr>
<th></th>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>It emphasises that strategies for learning can be adopted and help improve learning.</td>
<td>This model assumes that learning styles cannot be changed.</td>
</tr>
<tr>
<td>Design of the Model</td>
<td>It presents two dimensions of learning: holistic-analytical and verbal – imagery.</td>
<td>It does not cover aspects of cognitive thinking or learning.</td>
</tr>
<tr>
<td>Reliability</td>
<td></td>
<td>There is a lack of empirical research to support the model and the instrument.</td>
</tr>
<tr>
<td>Validity</td>
<td>The measure may be more useful for groups rather than individual.</td>
<td>Sample size used in the studies is small for reliability and validity of CSA. Replication studies are absent.</td>
</tr>
<tr>
<td>Implication of pedagogy</td>
<td>Cognitive styles have been shown to be linked with preferred instructional approaches.</td>
<td>Recommendations have been made based on this model without adequate empirical evidence.</td>
</tr>
<tr>
<td>Overall Assessment</td>
<td>Riding’s model is simplistic, and its instrument CSA is unreliable.</td>
<td></td>
</tr>
</tbody>
</table>

3.3.4 Myers-Briggs Type Indicator (MBTI)

In the 1940s, Katherine Briggs and Isabel Briggs-Myers started the design of the instrument, now called as Myers-Briggs Type Indicator (MBTI). They were driven by the idea that Jung’s theory of human personality could be made more understandable by making it more useful for our daily lives or everyday lives. As a result, in 1962 the first MBTI manual was published, and revisions have appeared in 1985, 1998. The MBTI has been used frequently as a personality instrument identifying personality factor like agreeableness, conscientiousness, extraversion, neuroticism and openness. Neuroticism is not included in the MBTI. A variant of MBTI popular instrument in the UK and US is called NEO-Personality (McCrae and Costa, 1987).
Description

Over the years few versions of MBTI have emerged: Form M (1998), Form G (1985) and some other variation of the standard version (form M). The Form M consists of 93 items whereas Form G comprises of 126 items. Form M provides introduction of the Item Response Theory (IRT) scoring, structure of the instrument and two option responses. The benchmarking of MBTI has been done using a sample size of n = 3009. The instrument scores items for 16 combinations of preferences based on affective, behavioural, cognitive and perceptual style.

There is criticism of the MBTI in the literature, on the basis of the nature of MBTI as it is more appropriate for measuring personality types rather than learning. Di Tiberio (1996) provides support for MBTI that the instrument includes learning measure and that Briggs and Myers intended to use this as a tool to provide support to the learners.

Reliability and validity

Researchers from the personality theory field have a wider acceptance of MBTI research, and a number of comparative studies have been carried out using MBTI and other scales. In the following section, some of the views of MBTI and other scales are highlighted:

MBTI and NEO-PI: According to McCrae and Costa’s (1989) study there are correlations between the NEO-PI scales and the MBTI, while Furnham (1996) detects ‘clear overlap’, despite promoting the psychometric superiority of the NEO-PI.

MBTI and GSD: Drummond and Stoddard (1992, 103) note connections between the MBTI and the Gregorc Style Delineator, concluding that ‘the Gregorc measures some of the same dimensions as the Myers-Briggs but uses different labels’.

MBTI and Constructive Thinking Indicator: Spirrison and Gordy (1994) have reported predictive of scores between constructive thinking indicator
and MBTI. Higgs (2001) has claimed that MBTI and emotional intelligence are highly correlated. Nordvik (1996) and Di Tiberio (1996) have reported modest correlation between MBTI and other learning styles. The MBTI validity to the field of learning styles is plagued with problems pertaining to the definition of shared terms.

**Table 3.4: Myers-Briggs Type Indicator (MBTI)**

**Key Source:** Myers and McCaulley 1985

<table>
<thead>
<tr>
<th></th>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>It describes analysis of the personality including learning.</td>
<td>MBTI is not designed for diagnosis learning types or styles.</td>
</tr>
<tr>
<td>Design of the model</td>
<td>The model uses Jung's theory to formulate 16 personality types on the basis of four bipolar scales.</td>
<td>The description of personality type based on bipolar scale is complex.</td>
</tr>
<tr>
<td>Reliability</td>
<td>Reliability coefficients are high for individual pairs of scores relating to each of the scales.</td>
<td>The personality types are less stable.</td>
</tr>
<tr>
<td>Validity</td>
<td>MBTI has acceptable face validity.</td>
<td>The Construct validity of opposing pairs is questionable.</td>
</tr>
<tr>
<td>Implications for pedagogy</td>
<td>It has been widely used in student counselling by matching 'type' with appropriate field of study.</td>
<td>There is lack of evidence about 'type' and 'processing of information'.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Does matching teaching style and learning style influence achievement- is questionable.</td>
</tr>
<tr>
<td>Overall assessment</td>
<td>Of 16 elements of personality types what types relate to education is not known as per the MBTI. Thus, it is not a suitable model for studying learning styles.</td>
<td></td>
</tr>
</tbody>
</table>

**Implications for pedagogy**

The evidence supporting MBTI as an instrument for learning measurement is insufficient. The individual differences in intuition are found to be correlated with sensing-intuition (Woolhouse and Bayne, 2000). Thorne and Gough (1999), have analysed 10 year data on MBTI, and have found
moderate correlations between high verbal and vocabulary scores and extrovert males and sensing females. The MBTI type has not been found to be correlated with the achievement (Oswick and Barber, 1998), and Harasym et al. (1995a, 1995b) have reported similar results for the nursing students.

Conclusion

MBTI has attained colossal success; however, it has not acquired support as an instrument for the measurement of style nor as a tool to aid pedagogy in the research community. The analytical and empirical research work carried out to test the instrument has not been sufficiently critical in terms of suitability, strength and weakness, and the research work, probably, is driven commercial pressures. There is a lack of research about the stable types over life time of an individual, unclear knowledge of types' impact on education and not well researched practical applications of MBTI type in pedagogy, the usefulness of MBTI as a learning style instrument is questionable.

3.3.5 Jackson's Learning Styles Profiler (LSP)


Description

Four learning styles have been proposed by Jackson's LSP (2002). These are initiator, reasoner, analyst and implementer, which appear to be similar to the Honey and Mumford (2000) styles. Jackson does not relate them to the stages in the learning cycle.

The LSP instrument consists of 80 items with 20 items for each of the four styles. The participants using LSP are asked to select one of the three options - yes, no or cannot decide. Jackson (2002) manual on LSP describes the compiled results as profile characteristics and offers
suggestions for improving deficient learning style characteristics. The results of LSP are tabulated as percentile scores along with explanations of the results.

**Evaluation and Reliability**

Jackson’s manual (2002) describes reliability for each to the styles based on only three studies. The largest study entails a sample size of \( n = 1524 \). The alphas reported ranged from 0.72 to 0.75. These are encouraging numbers since retest studies also report moderate reliability in two studies.

**Validity**

Jackson’s learning style (2002) does resemble four learning styles of Honey and Mumford (2000). Jackson argues that the names chosen to describe the learning styles may be inappropriate to decipher the constructs. Four learning styles as per LSP are:

- **Initiator** is represented by sensation seeking, impulsive, extroverted individuals.
- **Reasoner** demonstrates intellectual, rational, objective, has ‘theory of mind.’
- **Analyst** exhibits introverted, responsible, cautious, wise, methodological, insightful characteristics.
- **Implementer** displays expedient, realistic, practical preferences.

**Implications for pedagogy**

According to Jackson, LSP has wide variety of uses ranging from appraisal, planning, team organisation, creating learning culture and selection. The feedback from computerised questionnaire is extensive and provides recommendations for improvement on the weaker areas and using the stronger area of the learning characteristics. However, the relevance of the suggestions has not been investigated adequately. Jackson suggests that some learning styles characteristics can be more amended than others. For example, analyst style is conscious, goal oriented and driven by interest, whereas initiator style are governed by instincts and exhibit to be impulsive.
and difficult to amend their style. Jackson recommends having a variety of strengths and using strengths that are natural to the learners.

Table 3.5: Jackson’s Learning Styles Profiler (LSP)

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>The LSP is grounded in a theoretical base with computerised format. It is used in business and education fields.</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Design of the model</td>
<td>It describes four learning styles - Initiator, Analyst, Reasoner and Implementer.</td>
</tr>
<tr>
<td></td>
<td>The constructs of the four learning have not been defined clearly.</td>
</tr>
<tr>
<td>Reliability</td>
<td>There is evidence of retest reliability to be satisfactory.</td>
</tr>
<tr>
<td></td>
<td>The Reasoner scale has poor retest reliability.</td>
</tr>
<tr>
<td>Validity</td>
<td>The authors claim factorial validity on the basis of a four-factor solution.</td>
</tr>
<tr>
<td></td>
<td>Further refinement of the scale is needed.</td>
</tr>
<tr>
<td>Implications for pedagogy</td>
<td>The feedback from computerised questionnaire is extensive and provides recommendations for improvement on the weaker areas and using the stronger area of the learning characteristics.</td>
</tr>
<tr>
<td></td>
<td>However, the relevance of the suggestions has not been investigated adequately.</td>
</tr>
<tr>
<td>Evidence of pedagogical impact</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The contextual value of feedback has not been evaluated.</td>
</tr>
<tr>
<td>Overall assessment</td>
<td>The model and the LSP have potential for a wider use in education field and organisations.</td>
</tr>
</tbody>
</table>

Conclusions

A large number of research papers have not been published since the first publication of the LSP by Jackson. It is still relative a new instrument, thus research is still not available on subjects relating to the reliability or validity. The use of LSP, pedagogical and development aspects need to be
3.3.6 Kolb’s Learning Style Inventory (LSI)

David Kolb (1984) described learning theory and LSI in his book – ‘Experiential learning: experience as the source of learning and development.’ This book provides an extensive coverage to his learning theory and its use in various fields, and how LSI measures individual learning. Kolb’s work on experiential theory has been extensively used in various fields like accounting, computer studies, education, law, management, medicine, nursing psychology and medicine (Kolb, 2000; Mainemelis and Kolb, 2002). Kolb (1999) argued that understanding different learning styles would be useful in team work environment in conflict resolution and better communication. Kolb’s LSI instrument has been translated into few languages.

Description

Kolb’s theory of experiential learning states identifies ‘learning’ as a ‘process’ that creates ‘knowledge’ through ‘transformation of experience’ (Kolb, 1984). As per Kolb, the experiential learning has the following characteristics:

1. Learning is a process.
2. Learning process stems from experience.
3. Learning is associated with the conflict resolution in terms of ‘dialectically opposed modes of adaptation to the world.’ Kolb identifies four types of abilities to learn concrete experiences (CE), reflective observations (RO), abstract conceptualisations (AC), and active experimentations (AE). These types of abilities are represented in figure 3.1. He claims that the conflict resolution is attained by choosing one of these adaptive modes, and that becomes preferred learning style.
4. Learning is a ‘holistic’ process.
5. Learning involves ‘transactions’ between the learner and the
environment.


According to Kolb’s theory (1984), experiential learning process is cyclical and has four-stages. The four adoptive learning modes are CE, RO, AC and AE. Kolb defines learning styles from these four adoptive learning modes. It is through socialisation that we resolve conflicts between different adoptive learning modes: for example, being active and reflective or immediate and analytical. Thus, four types of knowing for formed: divergence, assimilation, convergence and accommodation. In this way, Kolb (2000, 5) arrived at four basic learning styles, as shown in Figure 3.1.

New terminology has been used by Kolb (2002) to describe previously known terms as diverger, assimilator, converger and accommodator as ‘the diverging style’, ‘the assimilating style’, ‘the converging style’ and ‘the accommodating style’ to address the concerns that learning styles are mischaracterised as static. The main characteristics of the four styles are summarised below (Kolb, 2002).

‘Type 1: the converging style (abstract, active) relies primarily on abstract conceptualisation and active experimentation; is good at problem solving, decision making and the practical application of ideas; does best in situations like conventional intelligence tests; is controlled in the expression of emotion and prefers dealing with technical problems rather than interpersonal issues.’

‘Type 2: the diverging style (concrete, reflective) emphasises concrete experience and reflective observation; is imaginative and aware of meanings and values; views concrete situations from many perspectives; adapts by observation rather than by action; interested in people and tends to be feeling-oriented.’

Figure 3.1: Kolb’s four learning styles
Figure 3.2: The experiential learning theory of growth and development
Source: Kolb (2000)

Type 3: the assimilating style (abstract, reflective) prefers abstract conceptualisation and reflective observation; likes to reason inductively and to create theoretical models; is more concerned with ideas and abstract concepts than with people; thinks it more important that ideas be logically sound than practical.

Type 4: the accommodating style (concrete, active) emphasises concrete
experience and active experimentation; likes doing things, carrying out plans and getting involved in new experiences; good at adapting to changing circumstances; solves problems in an intuitive, trial-and-error manner; at ease with people but sometimes seen as impatient and pushy.‘

The Learning Style Inventory (LSI)

There are four versions of LSI that have evolved over the years – 1976, 1985, 1999 and 2005. The 2005 version provides forced choices to rank preferred learning modes – AC, CE, AE and RO (Kolb et al., 2002; and Kolb and Kolb, 2005). The participants are asked to rank (1, 2, 3 and 4, where 4 being the best and 1 the least preference ranking) 12 statements with four endings, for example (source: Kolb’s Learning Style Inventory, 2002):

When I learn

<table>
<thead>
<tr>
<th>2</th>
<th>1</th>
<th>4</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am happy</td>
<td>I am careful</td>
<td>I am fast</td>
<td>I am logical</td>
</tr>
</tbody>
</table>

These four scores, AC, CE, AE and RO, measure an individual’s preference for the four modes, and two dimensional scores indicate an individual’s relative preference for one pole or the other of the two dialectics, conceptualising/experiencing (AC–CE) and acting/reflecting (AE-RO) Kolb (2002).

Reliability

Various authors have criticised psychometric properties of LSI since its inception in 1976. The test-retest of reliability of LSI has been criticised by Stumpf and Freedman (1981) stating that ‘LSI is rather volatile, unlike the theoretical constructs being investigated.’ Kolb (1981) claimed that the reliability coefficients for the two combined scores AC–CE and AE–RO were ‘reasonable’, but those for the four basic scales were ‘somewhat less satisfactory’ and recommends that ‘researchers should rely on the combination scores AC–CE and AE–RO and use the single scales primarily for qualitative description’. Stumpf and Freedman (1981, 297) argue that
learning styles were not stable in a short period of time (few weeks) in same learning environment. They reported medium to low reliability, and questioned ‘How is someone classified as an assimilator to know whether the classification is due to personal characteristics, situational factors or measurement error?’

Kolb (2002) claimed that learning styles become stable over time. Kolb cross-sectional studies suggest that learning styles do change. For example, career bench engineers have the converging (abstract and active) learning style, but engineers with managerial responsibilities become more concrete because of the interpersonal job demands of that role. (Kolb, quoted by Delahoussaye 2002, 34)

**Validity**

The experiential theory claims that conflict resolution is a must for learning to occur. Kolb's (2000) LSI addressed validity briefly along with bibliography on validity. However, it does not provide literature on the argument except for Hickox's (1991) reference. This is contradicted by Freedman and Stumpf (1978) stating that LSI has face validity to win over students, but the factor analysis provides weak support for the theory. The variance accounted for by the LSI may be simply a function of the scoring system.

**Implication for Pedagogy**

Kolb's theory of experiential learning does provide a useful structure for the design and management of learning experiences. According to Kolb (1984, 196) after studying the students' instructional preferences in the field of business and architecture, a table was created to present detailed characteristics of learning environment and study the learning of students with four different learning styles.
### Table 3.6: Kolb's Learning Style Inventory (LSI)

**Key Source:** Kolb 1999

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td></td>
</tr>
<tr>
<td>Learning styles are flexibly stable. The model and the LSI instrument have evolved over 30 years of research.</td>
<td>Over relatively short period learning style should not change. Some empirical research has demonstrated such change.</td>
</tr>
<tr>
<td><strong>Design of the Model</strong></td>
<td></td>
</tr>
<tr>
<td>It is based on the experiential theory of learning.</td>
<td>LSI mixes learning cycle (four stages), level and style.</td>
</tr>
<tr>
<td>With experience there is change in the development of learning styles.</td>
<td></td>
</tr>
<tr>
<td><strong>Reliability</strong></td>
<td></td>
</tr>
<tr>
<td>Over the years changes have been made for improvement.</td>
<td>Reliability is still under question by the critics.</td>
</tr>
<tr>
<td><strong>Validity</strong></td>
<td></td>
</tr>
<tr>
<td>LSI has been developed to provide self-assessment. The construct validity is questionable.</td>
<td></td>
</tr>
<tr>
<td><strong>Implications for pedagogy</strong></td>
<td></td>
</tr>
<tr>
<td>The proof of performance improvement upon matching is absent. The findings are contradictory. There is lack of large body of researched evidence is missing to support recommendation for pedagogy.</td>
<td></td>
</tr>
<tr>
<td><strong>Overall assessment</strong></td>
<td></td>
</tr>
<tr>
<td>A pioneering work on learning style based on experiential learning theory with deficiencies about reliability and validity.</td>
<td></td>
</tr>
</tbody>
</table>

It was demonstrated that the students with highest score in AE, were learning better in small-group discussions and peer group rather than through lectures by the lecturers.

**Conclusion**

The evidence relating to the experiential learning and learning style...
inventory has been presented by Kolb et al. (2002). They have based their analysis on two main research works by Hickox and Iliff. Hickox (1991) reported that experiential learning theory received support by 61.7 percent, mixed support by 16.1 percent and no support by 22.2 percent. Iliff (1994) evaluated 101 studies found that 48.5 percent supported LSI, 39.6 percent demonstrated mixed support and the rest did not support the LSI. Iliff has argued that LSI’s purpose is to be used as self-assessment exercise. Loo (1999) recognises the limitations in LSI and supports the effectiveness of LSI as a tool. In the past seven years, Kolb and his team have reported two more instruments: Adaptive Style Inventory (ASI) and Learning Skills Profile (LSP). The ASI measures flexibility in learning styles and the LSP assesses skill development to cope with different learning circumstances (Kolb et al., 2002).

Garner (2000) found that Kolb’s works have theoretical incongruity based on flexible learning styles to become stable. He is not convinced about the influence of environment on learning styles and finds Kolb’s work to entail deeper theoretical contradiction – “how it can be described or measured?”

According Kolb and Kolb (2005) learning is most effective when learners go through the four stages of learning cycle. Learning could begin at any stage of the four stage learning cycle. However, researchers adopting the learning cycle insist that it should be undertaken in a sequence.

3.3.7 Honey and Mumford’s Learning Styles Questionnaire (LSQ)

Peter Honey and Alan Mumford (1982) proposed Learning Style Questionnaire after using Kolb’s LSI instrument for number of years to study managerial learning. Since the LSI had face validity issues, Alan and Mumford started exploring various approaches to examine differences in learning preferences. The LSQ was an outcome of these studies. Unlike in Kolb’s LSI asking learners to describe how they learn, Honey and Mumford explored general tendencies instead of learning. The LSQ has continued to evolve since 1982 with the research contributions of Peter Honey. He has written various versions of the manuals and booklets (Honey, 2006)
Description

According to Honey and Mumford (1992) learning style is defined as 'a description of the attitudes and behaviour which determine an individual’s preferred way of learning'. They have described four types of learning styles preferences as activists, reflectors, theorists and pragmatists. A brief summary of characteristics associated with each learning style is presented in Table 3.7.

Honey and Mumford (2000) have explicitly stressed that any of the four styles does not have an advantage of the other learning style. Each of the learning styles could be essential or significant in particular learning circumstances, and not in other situations. They recognise various factors that influence individual's learning besides learning styles such as experience, learning opportunities, environment for learning, influence of teachers or training provider etc.

The scope of use of the LSQ has been described by the authors in organisational and personal development. For the accuracy of results of the LSQ, the participants are advised to respond honestly. Honey and Mumford have provided answers to the frequently asked questions. Some of the examples of these questions are described below:

Can learning style preferences change?

Learning styles 'are modifiable at will' – for example, to strengthen an underdeveloped style; or 'by a change of circumstances' (Honey and Mumford 2000, 19) – for example, a change of job to a firm with a different learning culture.

How accurate are self-perceptions?

It is admitted that 'self-perceptions can be misleading [and that] the answers are easy to fake if someone is determined to give a misleading impression' (Honey and Mumford 2000, 20). The latter is considered less likely if people have been assured that the LSQ is a tool for personal development.
Why does the LSQ allow a binary choice – tick or cross?

‘To keep it simple’ (Honey and Mumford 2000, 21). This does not obviate the difficulty many people find in being forced to respond ‘Yes’ or ‘No’ to such items as ‘I tend to be open about how I’m feeling’ or ‘I’m always interested to find out what people think’.

**Figure 3.3:** Dimensions of Honey and Mumford’s Learning Cycle  
*Source:* Mumford and Honey 2000

In Figure 3.3, the labels were used to describe stages of the learning cycle in a simplified way so that any ‘misleading judgements’ are removed (2000, 21).

On Peter Honey’s website (source: [http://peterhoney.com](http://peterhoney.com)), two sets of LSQs are presented – 80 items and 40 items. Honey has discussed the usefulness of both types of questionnaires:

‘Advantages of the 80-item questionnaire

Ideal for people who want a more comprehensive questionnaire (i.e. 20 items per style instead of 10)

Better for a longer session where there is time to explore learning styles and the suggestions for action in more depth

More appropriate for people who can relate to the business references
More likely to appeal to traditionalists who want to use the original Honey & Mumford questionnaire

Advantages of the 40-item questionnaire

Ideal as an initial introduction for people who have not previously given much consideration to how they learn

Useful if time is at a premium - the questionnaire takes less time to complete and score

Helps people stay focused - there are fewer suggestions for action to choose between

The wording is concise and better suited to a more diverse audience.'

Reliability and validity

Honey and Mumford (2000) have provided data on reliability regarding LSQ based on test and retest study consisting of 50 participants. This study describes correlation ($r = 0.89$) between two studies conducted two weeks apart making a claim for face validity of LSQ.

Recent versions of LSQ illustrate strength of preferences in the form of a scale ranging from very low, low, moderate, strong and very strong. The LSQ, in terms of percentile shows scores for all four styles of a participant.

Peter Honey (2002) reported results of a study consisting of a random sample $n = 300$ managers that the managers exhibited preference of one or more number of styles. A description in terms of percentages is as follows:

Managers with strong preference for one style were 35%, for two styles were 24%, for three style preferences were 20%. Managers with four style preferences were 2% and no preference for any style were 19%.

Therefore, it can be reported that the majority of managers (59%) exhibit one or two strong preferences of learning styles, and nearly two-thirds (65%) have more than one strong preference.
### Table 3.7: Activities and preferences

**Source:** Honey and Mumford (2002)

| Activist prefer:                      | Action learning  
|                                      | Business game simulations  
|                                      | Discussion in small groups  
|                                      | Job rotation  
|                                      | Outdoor activities  
|                                      | Role playing  
|                                      | Training others  
| Reflectors prefer:                   | E-learning  
|                                      | Learning reviews  
|                                      | Lectures/presentations  
|                                      | Role playing  
|                                      | Reading  
|                                      | Self-directed studies  
| Theorist prefer:                     | Analytical reviews  
|                                      | Lectures  
|                                      | Self-directed learning  
|                                      | Independent studies  
|                                      | Video presentations  
| Pragmatists prefer:                  | Action learning  
|                                      | Problem solving  
|                                      | Small group workshops  
|                                      | Applied learning group work  
|                                      | Project work  

Peter Honey (2002) has reported association of learning styles with occupational groups, gender and countries. There is no significant difference reported between males and females and their association with learning styles. For countries, differences have been claimed to exist between Scandinavian countries and Italy. The sample size (n = 234) used in the study was relatively small therefore, these results may not be generalisable.

**Implications for pedagogy**

Honey and Mumford (2000) have claimed that learning styles preferences are associated with learning activities. They have carried correlations studies between the preferred learning styles and learning activities and have reported list of activities preferred by each learning style as exhibited in Table 3.7.
<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>LSQ is based on exploring attitudes and behaviours and uses that as a basis to diagnose learning style preferences. It is used for personal or organisational development. It is inappropriate for assessment or selection. It is not a psychometric instrument to measure learning styles rather a response based list of how people learn.</td>
</tr>
<tr>
<td>Design of the model</td>
<td>The background of the design of the model is from Kolb's model. It identifies four different terms for learning styles based on the stages in the learning cycle.</td>
</tr>
<tr>
<td>Reliability</td>
<td>Moderate internal been found.</td>
</tr>
<tr>
<td>Validity</td>
<td>The authors of LSQ have claimed face validity.</td>
</tr>
<tr>
<td>Implication of pedagogy</td>
<td>It has been used to help develop personal development plans by the managers and their staff. LSQ provides a platform for starting discussions with a knowledgeable tutor for engaging in learning activities that match with the learner's learning style. Honey and Mumford make suggestions about how to develop the underdeveloped learning styles and use activities that will strengthen an under-utilised style.</td>
</tr>
<tr>
<td>Overall assessment</td>
<td>LSQ is a widely used instrument in the industry, education and various corporate training environments. The weaknesses need to be addressed.</td>
</tr>
</tbody>
</table>
Conclusion

According to Honey and Mumford (2000), there are two main uses of LSQ: 1. it assists in developing plans for personal development; 2. it demonstrates different learning styles to the managers for helping staff under them by selecting activities that would conform to the preferred learning styles of the staff. They also claim that the managers, who facilitate staff learning, will likely encourage staff according to their own preferred learning styles. The LSQ lacks empirical evidence of pedagogical impact.

3.3.8 Herrmann ‘Whole Brain’ Model and the Herrmann Brain Dominance Instrument (HBDI)

Herrmann’s whole brain model is based on the split brain research by the Nobel Laureate Roger Sperry (1964). Herrmann (1982) identified electroencephalographic correlations of left and right side brain functions. He proposed four categories of preferences or styles and their characteristics based on association with the part of the brain (Herrmann, 1989).

‘Theorists (cerebral, left: the rational self) - Theorists are said to find it difficult to accommodate the feeling self and the humanitarian style.

Organisers (limbic, left: the safe-keeping self) - Organisers are said to find it difficult to accommodate the experimental self and the innovatory style.

Humanitarians (limbic, right: the feeling self) - Humanitarians are said to find it difficult to accommodate the rational self and the theoretical style.

Innovators (cerebral, right: the experimental self) - Innovators are said to find it difficult to accommodate the safe-keeping self and the organising style.’

Herrmann’s model described combination of preferences and claimed that ‘left brain’ quadrant A and B and ‘right brain’ quadrant C and D are more harmonious than the combinations of D and B or A and C. He reported that conflict may arise in ‘diagonal quadrants.’
Herrmann designed the instrument called HBDI using 120 items to classify mental preferences or thinking styles. These styles are also called learning styles. The 'whole brain' model is not based on biological determinism.

Indeed, Herrmann (1989, 20-21) is persuaded that 'the way a person uses the specialised brain results from socialisation – parenting, teaching, life experiences, and cultural influences – far more than from genetic inheritance'. He believes that it is in the interest of individuals and organisations to develop sufficient flexibility to respond, against their natural preferences, to meet particular situational demands; and, where necessary, to make longer-lasting value-based adjustments, especially if this can release latent creativity in an individual or in an organisation.

The Herrmann Brain Dominance Instrument (HBDI)

The HBDI is a self-reporting instrument that provides participants with the categorisation of their thinking styles and performance rating in the following areas:

- **Handedness**
- **Strong and weak school subjects**
- **Work elements** (e.g. administrative, innovating, teaching/training)
- **Key descriptors** (e.g. verbal, emotional, factual), hobbies (e.g. fishing, photography, travel)
- **Energy level** (e.g. day person, night person)
- **Motion sickness** (frequency and connection with reading)
- **Adjective pairs** (forced choice: e.g. controlled/creative)
- **Introversion/Extraversion** (nine-point scale)
- **20 questions** (five-point scale: e.g. 'I dislike things uncertain and unpredictable').

Reliability

The Herrmann Group have published a number of articles, case studies, white papers, and research papers. However, they have only one reliability
statistics published by the Herrmann Group (1989) based on a sample (n = 78) participants. A high reliability is reported. No rigorous and independent research study has been done to establish reliability of the instrument.

Validity

The proposed categories of thinking or learning styles in the whole brain model of Herrmann shows construct validity. The HBDI has been widely used in the field of education and business. To date there are not many independent studies that have researched reliability and validity of the instrument. There is absence of longitudinal studies of the instrument as well.

Many testimonials from the participants of HBDI indicate high face validity. Herrmann, in his book, provides a detailed account of feedback description of the individuals and groups, and these seem to cluster around individual’s experiences.

There are structural similarities between Gregorc’s Mind Styles Model and Herrmann Brain Dominance Instrument as both have four categories by which they organise learning styles. Gregorc’s abstract sequential characteristics appear to be similar to Herrmann’s theorist category, but they are differently organised: abstract sequential qualities, resembling those of Herrmann’s theorists, are diametrically opposed to those of Herrmann’s innovators, likewise concrete sequential qualities, resembling those of Herrmann’s organisers, are contrasted with those of his humanitarians.

There are several authors that have proposed models in the same light as Herrmann’s model. Allinson and Hayes (1996) have proposed Cognitive Style Index contrasting left-brained analysis with right-brained intuition. McCarthy’s 4MAT model (1990) described in ‘4MAT in Action: Creative Lesson Plans for Teaching to Learning Styles with Right/Left Mode Techniques.’ Kirton (1976) describes his model ‘Adaption - Innovation Inventory’ and distinguishes between adapters and innovators just as
Herrmann does between organisers and innovators. Sternberg (1999) describes the ‘Mental Self-Government Model’ in terms of legislative, executive and judicial thinking styles exhibits structural similarities to that of Herrmann’s innovators, organisers and theorists, respectively.

Martin (2003) describes various combinations of Herrmann’s quadrants in a large UK sample consisting of 3400 profiles. ‘Harmonious’ combinations (A-B and C-D) are the most common patterns of profiles (62%), followed by the upper (A-D) and lower (B-C) pairings (31%) and then by the conflicting diagonal pairings (A-C and B-D) which occur in only 7% of cases.

Implications for teaching and learning

Herrmann (1996) emphasises the importance of alignment between learners and the courses. He assumes that ‘every classroom represents a complete spectrum of learning style preferences’ and that lack of alignment causes ‘wastage of efforts up to 50% due to the lack of alignment.’ Thus, makes recommendation for ‘whole brain teaching and learning’ focusing on main learning points to be taught in three or four different ways.

He describes an application of this approach in teaching creative thinking, in which the use of metaphor plays a central part. After an initial interest in the subject has been established, the phases of preparation, verification, incubation and illumination correspond to the A, B, C and D quadrants of experience, with didactic and experiential approaches complementing each other. As well as providing a wide range of creative materials and individual and group activities to encourage people to move beyond their comfort zones, the leaders set up problem-solving activities, first in groups of homogeneous learning style, then in heterogeneous pairs, and eventually in heterogeneous communities of six, so that participants can encounter ‘both the enhancements and challenges of having different mental modes at work in the same group’ (Herrmann, 1989).
### Table 3.9: Herrmann’s Brain Dominance Instrument (HBDI)

**Key Source:** Herrmann (1989)

<table>
<thead>
<tr>
<th>Strength</th>
<th>Weakness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>General</strong></td>
<td>HBDI is based on 20 years of research work and has evolved over the years.</td>
</tr>
<tr>
<td></td>
<td>Several models describe learning styles, and the whole brain model constructs are compatible with those of other learning style models.</td>
</tr>
<tr>
<td><strong>Design of the model</strong></td>
<td>HBDI is a brain-based on theoretical framework and focuses on growth, development and creativity.</td>
</tr>
<tr>
<td></td>
<td>HBDI definition of learning styles are not fixed personality traits, but patterns of behaviour.</td>
</tr>
<tr>
<td><strong>Reliability and Validity</strong></td>
<td>HBDI is widely used in the world and analyses pertaining to the reliability and validity can be done by using very large sample.</td>
</tr>
<tr>
<td></td>
<td>HBDI does have internal studies for face validity.</td>
</tr>
<tr>
<td><strong>Implication of pedagogy</strong></td>
<td>Herrmann provides rich accounts of how people think and learn, valuing diversity and arguing for mutual understanding.</td>
</tr>
<tr>
<td></td>
<td>Teachers, students, managers and workers may be stimulated to examine and refine their ideas about communication and learning. Herrmann argues that all learners need to develop stylistic flexibility and, where appropriate, extend their range of competence.</td>
</tr>
<tr>
<td><strong>Overall assessment</strong></td>
<td>This model has not been used widely in education and training, despite the potential of its use. It does focus on development of people and organisations.</td>
</tr>
</tbody>
</table>

The reliability and validity have not been established through independent empirical studies.
Conclusion

Unlike other models that have categorised learning styles into four categories and two dimensions and provided a simplistic view, Herrmann whole brain model does not label individuals or organisations. He positively encourages change and growth, whether for short-term adaptive purposes or for the longer term, on the basis of more mature values and attitudes.

On the positive side, Herrmann Group has facilitated the model and HBDI with revision based on empirical research. However, the instrument needs improvement with focus of its use by the participants who do not have business or corporate experience and responsibilities, and are younger, less experienced and less educated. Overall Herrmann has provided a creative space for discussions and research in light of other models and instruments of learning styles.

The HBDI does have psychometric properties, but lack support from an independent research study to establish reliability and validity. Like other models and instruments (LSI and LSQ), the potential of HBDI to improve the quality of teaching and learning, has not yet been ascertained by independent empirical research studies. The HBDI does show support from its followers in education as well as in corporate businesses.

3.4 Summary of Models For Comparison to Focus on Selection of a Model

In this chapter, 8 models of learning style have been reviewed. They reflect a spectrum of variability in terms of their scope and therefore, the selection of instrument for further investigation about relationships between learning styles and eLearning Web site features matters for a detailed and relevant research study. The models and instruments reviewed in section 3.3 exhibit strengths and weaknesses in terms of design of the model, reliability, validity, implications of pedagogy and overall assessment. A summary of remarks is presented for each model, and a ground is laid out for selection of
a model to be used for further research as described in the next chapter.

**Gregorc's GSD**

Gregorc emphasises his work on the basis of alignment between learners' styles and demand placed on the learner by teaching methods and styles. He describes that teachers who have understanding of their own teaching style and learners styles can benefit the student on the basis of a range of skills (Gregorc, 2002). According to Gregorc, teachers and learners should not change their natural styles as it would do more harm than good.

The evidence in the form of published research is lacking in support of Gregorc's claims about learning styles and alignment of learning styles or types with teaching styles.

**Dunn and Dunn's LSI**

Dunn and Dunn's model describes preferences, and LSI measures preferences rather than strengths. The model focuses on preferences. There is a lot of support for the model and emphasis is made by the supporters that improvement in the achievement is possible, if there is a match between the individualised instructions and change to the environment.

Evidence from the independent evaluations of LSI is lacking. However, there are many research claims about the impact of Dunn and Dunn's LSI, but the limitations in those studies have raised doubts about the instrument.

**Riding's CSA**

Riding's CSA reliability is weak and studies need to be replicated to establish validity of the CSA. The empirical evidence is still required to be gathered in support of the model and the instrument. A number of recommendations have been made without empirical studies.

**Myers-Briggs' MBTI**

There is no conclusive proof of MBTI types being linked with the
information processing. Also, it has not been established that matching teacher and learners has an effect on the achievement of the learners. The amount of literature reviewing the instrument and personality measure in learning styles has been limited.

Jackson’s LSP

Jackson’s LSP being a new instrument among learning style measurement instruments needs more exhaustive research scrutiny for it to be adopted by the academic research or practitioner community. This model is influenced by biology, experience and conscious control, and needs to be tested by more number of independent researchers.

Kolb’s LSI

The LSI is based on experiential learning model of Kolb, which states that learner’s experiences transform into concepts, and choices for new experiences are directed by the previous experiences. Effective learning according to Kolb (1999) is directed by four stages of learning cycle. The learners may not necessarily start at the same place in the cycle and different learners may have different starting points in the learning cycle. Wierstra and de Jong (2002), based on their statistical analysis have questioned the Kolb’s model and its structure.

Honey and Mumford’s LSQ

Honey and Mumford’s model is based on learning cycle. The stages in the learning cycle provide insights to the learners to improve upon their weaknesses by adopting strategies that would help them enhance their learning. Honey (2002) states that learning cycle makes learning stages discernable in clear terms. The authors of LSQ have offered explanation about the model of learning based learning cycle. The instrument for measuring learning style has been used for the last two decades extensively in the UK and US in many areas of education – colleges and universities, corporations and other learning environments.
Herrmann’s HBDI

To sum up, HBDI has a wide range of use among learners, teachers and managers. It is useful in group dynamics situation as well as in individual environment, and focuses on work environment externally and internally. The HBDI could be most useful in training because it cultivates creative thinking and problem solving skills. But, it is not a popular model in terms of its wide use. However, it is not a closed model, but an optimistic and encompasses flexibility. More research investigation is needed to be done using this instrument in education and corporate training.

Model Selection for Learning Style investigation

Based on the comparison table (Table 3.10), Honey and Mumford’s LSQ instrument was selected to measure learning style of the eLearners. The matrix table reveals that Honey and Mumford’s Model is more suitable given the analysis used in this chapter on the basis of design, reliability and validity of the instrument, pedagogical implications, and overall assessment of the model and instrument.

Table 3.10: Comparison of Models of Learning Style and Instruments

<table>
<thead>
<tr>
<th>Models of learning style</th>
<th>Design</th>
<th>Reliability</th>
<th>Validity</th>
<th>Implications of pedagogy</th>
<th>Overall assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gregorc’s GSD</td>
<td>✓✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Dunn and Dunn’s LSI</td>
<td>✓✓</td>
<td>✓</td>
<td>✓✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Riding’s CSA</td>
<td>✓✓</td>
<td>✓</td>
<td>✓✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Myers-Briggs’ MBTI</td>
<td>✓✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Jackson’s LSP</td>
<td>✓✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Kolb’s LSI</td>
<td>✓✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Honey and Mumford’s LSQ</td>
<td>✓✓✓</td>
<td>✓</td>
<td>✓✓</td>
<td>✓</td>
<td>✓✓✓</td>
</tr>
<tr>
<td>Herrmann’s HBDI</td>
<td>✓✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>
3.5 Opportunities for this Research Context

The literature review regarding eLearning website systems and Learning Styles reveals that there is absence of research that establishes relationship between learning styles of eLearners and their preference of eLearning Website features.

In the next chapter, researcher explores opportunities that exist in terms of developing understanding of a framework of relationships between Learning Styles of eLearners and eLearning Web site features or online learning Web site features. Some of the questions being examined are:

1. Is there preference amongst eLearners toward eLearning website features?
2. Is the preference of eLearning website features dependent on Learning Style of the eLearners?
3. What are the preferred eLearning website features of an eLearner with a particular learning style?
4. Can eLearners be grouped based on eLearner website feature preference?
5. Do these groups of eLearners have preferences of eLearning website feature?
6. Can learning styles be grouped based on based on their demographic information of eLearners?

3.6 Summary

Based on analysis of the models, a comparative matrix provides assistance selection of Honey and Mumford's model for further research in exploring understanding of a framework of relationship between learning styles and eLearning Web site features.
To seek answers to the above mentioned questions in section 3.5, and explore related issues, a framework of research is being proposed to study relationships between learning styles and preferred eLearning Website features in an eLearning environment. A questionnaire design is proposed based on learning styles and description of eLearning Website features preferences indicated by eLearners and etechnologists/instructional designers.
Chapter 4
Methodology

4.1 Introduction

In this chapter, researcher describes approach for studying the specific research question - “How do learning styles impact the eLearner’s preference of eLearning website features?” It is investigated through the approach described in the following sections. Prior to describing the research approach, it is deemed relevant by the researcher to provide information on characteristics of the learning styles as per Honey and Mumford model (2006) and describe the characteristics of website features of the Blackboard website system. This follows the approach of the research- how a relationship is envisioned between the Learning Styles and eLearning website features, description of how data collection instrument, the questionnaire, has been designed to collect data on two aspects of the research study – learning style and eLearning website features. Subsequently, the description of hypotheses and related research questions, how the instrument is administered, and what mode is used to collect data for the statistical testing, follows, and finally, a plan for data analysis is presented.

Thus, the chapter has been divided in six sections. Section 4.1 introduces the chapter with the aims of the chapter and description of what it entails. Section 4.2 describes the characteristics of learning styles and eLearning website features being researched. Section 4.3 describes the proposed framework of relationship being examined. Section 4.4 describes research questions and hypotheses to be tested in this research study. Section 4.5 reviews instrument design and mode of data collection. Section 4.6 reviews data analysis to be undertaken for hypotheses testing and statistical analysis in chapter 5.

4.2 Characteristics of Learning Styles and eLearning Website Features

This section is described in two parts – Characteristics of learning styles and eLearning website features of Blackboard website system.
Characteristics of learning styles

Four learning styles are described as per Honey and Mumford model are activist, reflector, theorist and pragmatist. The activists, generally, exhibit

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Learning Style Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Activist</strong></td>
<td>Activists tend to be flexible, open minded and happy to try out new things. They enjoy getting involved and participating with others</td>
</tr>
<tr>
<td><strong>Learn more when:</strong></td>
<td></td>
</tr>
<tr>
<td>• there are new experiences/problems/ opportunities from which to learn</td>
<td></td>
</tr>
<tr>
<td>• engross in short 'here and now' activities</td>
<td></td>
</tr>
<tr>
<td>• excitement/drama/crisis and things chop and change with a range of diverse activities to tackle with a lot of the limelight are involved</td>
<td></td>
</tr>
<tr>
<td>• allowed to generate lots of ideas with a task difficult/challenging</td>
<td></td>
</tr>
<tr>
<td>• involve other people, e.g. bouncing ideas off them</td>
<td></td>
</tr>
<tr>
<td><strong>Learn less when:</strong></td>
<td></td>
</tr>
<tr>
<td>• have a passive role, e.g. listening to lectures, monologues, explanations, statements of how things should be done, reading, watching</td>
<td></td>
</tr>
<tr>
<td>• asked to stand back and not be involved</td>
<td></td>
</tr>
<tr>
<td>• required to engage in solitary work, e.g. reading, writing, thinking on your own</td>
<td></td>
</tr>
<tr>
<td>• asked to repeat essentially the same activity over and over again, e.g., when practicing</td>
<td></td>
</tr>
<tr>
<td>• have precise instructions to follow with little room for manoeuvre</td>
<td></td>
</tr>
<tr>
<td>• asked to do a thorough job, e.g. attend to detail, tie up loose ends, dot i's and cross t's.</td>
<td></td>
</tr>
<tr>
<td>• solving problems as part of a team</td>
<td></td>
</tr>
</tbody>
</table>

flexibility, open mindedness, are adventurous and like participation in groups. Their learning preference involves new experiences, hands-on activities, excitement, drama, limelight, like to generate ideas etc.
Activist, however find it difficult to have a passive role, not be involved, solitary and monotonous work, tie up loose ends, and solving problem as part of the teams.

Reflectors are mostly methodical, thorough, careful and structures.

**Table 4.2: Learning Style: Reflector**


<table>
<thead>
<tr>
<th>Dimension</th>
<th>Learning Style Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reflectors</td>
<td>Reflectors tend to be methodical, thorough and careful. They enjoy gathering data by reading and listening.</td>
</tr>
</tbody>
</table>

**Learn more when:**
- engage in thorough preparation prior to decision making/problem solving
- set time aside to mull over experiences, clarify lessons learned and think through what to do better or differently
- more patient with researching a topic, gathering relevant data and generally checking things out
- more respectful of other people's experiences and a better listener.

**Learn less when:**
- rush into things with inadequate preparation and thought for the possible consequences
- it is difficult to make time to pause and review experiences/identify lessons learned
- become impatient with data collection, reading extensively and listening hard for long periods
- pay insufficient attention to benefiting from other people's experiences and therefore make unnecessary mistakes and reinvent wheels.

They prefer preparation, set time aside for tasks, reflect upon experiences, think through, respectful of others, research a topic thoroughly, listen to others patiently etc. However, reflectors find it more difficult to rush into things, find it difficult to make time to pause, re-invent the wheels.
Theorists analyse and rationalize; They like logical approach, structure and probing questions and seek to point out flaws and inconsistencies.

**Table 4.3: Learning Style - Theorist**


<table>
<thead>
<tr>
<th>Dimension</th>
<th>Learning Style Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Theorist</td>
<td>Theorists tend to be rational and analytical. They like logical structures and to ask probing questions to expose flawed, inconsistent thinking.</td>
</tr>
</tbody>
</table>

**Learn more when:**
- questioning and probing inconsistencies and weaknesses in people’s arguments.
- more interested in relating your actions to an overall strategy
- more disciplined with tidier, more organised working practices
- more tolerant of models and theories and of explaining their potential relevance/usefulness to your work.

**Learn less when:**
- take things at face value and jump to conclusions that are flimsy and unsubstantiated
- prefer short term tactics to longer term strategy and fail to appreciate the importance of the big picture
- dislike the discipline of routines, processes and procedures
- regard theories, frameworks, and models as being rather academic and esoteric.

Theorists prefer questioning, more interested in the overall picture, have a global view of things, like discipline, organisation in work environments, and examine usefulness of theories and models in their own work. On the other hand, theorists find it difficult to accept things at face value and jump to regarding unsubstantiated conclusions. Theorists do not prefer short term tactics appreciate the importance of the big picture. They do not like routine processes.
Pragmatist have tendency to be practical, realistic, and prefer hints and techniques.

Table 4.4: Learning Style: Pragmatist


<table>
<thead>
<tr>
<th>Dimension</th>
<th>Learning Style Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pragmatist</td>
<td>Pragmatists tend to be practical, down to earth and realistic. They like ‘how to’ hints and techniques.</td>
</tr>
</tbody>
</table>

**Learn more when:**
- Prepared to try out new ideas, theories and techniques sooner rather than later to see if they work in practice
- Open to the latest techniques and prepared to adapt them so that they are tailor-made for your circumstances
- More business-like in meetings and discussions
- More focused on objectives, targets, and outcomes that make a difference/add value.

**Learn less when:**
- hanker after perfect solutions to problems rather than settling for something practical and less elegant
- dismiss techniques as gimmicks and fads with limited usefulness
- engage in discursive, open-ended dialogue with little focus and vague outcomes
- wary of specific plans and actions that commit one to deliverables and target dates.

Theorists like to try new ideas, theories and techniques, and are open to adoption of new techniques. They focus on objectives and outcomes, and do not log for perfect solution; less than perfect solution is acceptable to them, and do not like very specific actions, plans and targets.
Characteristics of eLearning website feature in Blackboard

The following table describes features of eLearning features of Blackboard website system.

Table 4.5: Description of eLearning website features selected

<table>
<thead>
<tr>
<th>eLearning Website feature</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announcement</td>
<td>Announcement feature is used to display class assignments, exam schedules, due dates etc.</td>
</tr>
<tr>
<td>File Exchange</td>
<td>File exchange tools allow learners to upload files from their local computers and share these files with instructors or other students in an online course. File attachments to messages are part of Internal Email and Discussion Forums. File Exchange tools enable downloading files and upload or posting files over the Web from within the course (a.k.a. assignment drop box).</td>
</tr>
<tr>
<td>Email</td>
<td>Email tools enable messages to be read and sent exclusively inside the course or alternatively the tools enable links to external email addresses of those in the course so that contacting course members is facilitated. Internal email may include an address book and some address books are searchable.</td>
</tr>
<tr>
<td>Group Discussion board</td>
<td>Discussion forums are online tools that capture the exchange of messages over time, sometimes over a period of days, weeks, or even months. Threaded discussion forums are organized into categories so that the exchange of messages and responses are grouped together and are easy to find.</td>
</tr>
<tr>
<td>Real-time chat</td>
<td>Real-time chat is a conversation between people over the Internet that involves exchanging messages back and forth at virtually the same time. Chat includes facilities like Internet Relay Chat (IRC), instant messaging, and similar text exchanges in real time. Some chat facilities allow the chats to be archived for later reference. Some chats can be moderated. Other chats can be monitored, where an instructor can view the conversation in a room without their presence being broadcast.</td>
</tr>
<tr>
<td>Online Journal notes</td>
<td>Online Notes/Journal enable students to make notes in a personal or private journal. Students can share personal journal entries with their instructor or other students but cannot share private journal entries. Online Note/Journal tool enables students to make notes about course experiences. The Online Notes tool can also be used to record reflections about personal learning accomplishments and how to apply this new knowledge.</td>
</tr>
<tr>
<td>Calendar</td>
<td>Calendar/Progress Review tools enable students to document their plans for a course and the associated assignments in a course. Calendar/Progress Review tools often enable students to check their marks on assignments and test, as well as their progress through the course material.</td>
</tr>
<tr>
<td>Bookmark</td>
<td>Bookmarks allow students to easily return to important pages within their course or outside their course on the web. In some cases bookmarks are for an individual students private use, and in others can be shared with an instructor or amongst an entire class. Some systems also allow bookmarks to be annotated.</td>
</tr>
<tr>
<td>Self-assessment</td>
<td>Self-assessment tools allow students to take practice or review tests online. These assessments do not count toward a grade. Self assessments encourage students to take responsibility for their own learning and to monitor their learning progress. Self assessments can also facilitate student motivation if students receive feedback on the self-assessments and if there is a direct connection between the self assessments and the measurement instruments the instructor uses to determine final course grades.</td>
</tr>
</tbody>
</table>
The listed features have been identified to be investigated in this research study. The selection of features is based on the analysis of the website features in Blackboard website system, focus groups and interview with instructional design technologists.

4.3 Proposed framework

As described earlier in the chapter, Honey and Mumford’s (2006) LSI has been selected for investigating relationship between learning style and eLearner website feature preference. Based on the discussion in Chapter 2 on eLearning website Systems, Blackboard was selected for this research, and its eLearning features were identified for the relationship investigation. The eLearning website features preference indicated by six focus groups consisting of graduate and undergraduate students at a US university, were used in the analysis and selection of eLearning website features preference. In addition, input from six interview conversations with eLearning Technologists/Instructional Technologists were incorporated in identifying the eLearning website features. Nine eLearning websites feature preferences were identified for this research included - Announcement, File Exchange, Email, Group Discussion board, Real-time chat, Online Journal notes, Calendar, Bookmark and Self-assessment. A description of these features has been provided in Table 4.5.

A diagrammatic representation of the research framework pertaining to the association of learning style and eLearning website features and is presented. Figure 4.1 describes the proposed framework, where the four learning styles are associated with eLearning website feature preference of the eLearner. Similarly, in the Figures 4.2 and 4.3 a framework of relationship is envisioned between ten combinations of four learning styles and eLearning website feature preference.
Learning Styles and eLearning website features

Activists learn new experiences/problems/opportunities from which to learn, engross in short 'here and now' activities, like to be allowed to generate lots of
ideas involving other people, e.g. bouncing ideas off them. This study proposes that an eLearner with dominant activist learning may prefer some eLearning website feature like discussion board, chat room, blogs or wiki.

Reflector may prefer access to resources like reading material, course material, instructor notes, reusable learning objects, library resources that can be accessed via eLearning site, web-bibliography and online journal. Reflectors prefer preparation prior to decision making, mull on experience and research thoroughly.

Theorists may prefer investigating and probing inconsistencies and organised work practices. They may prefer eLearning website features that would enhance their productivity in terms of organisation and research on course content, such as bookmark, searching tools with in the course and outside course, calendar, work-offline/synchronisation etc.

Pragmatists may prefer to try new ideas, technology, unproven concepts, short and focused discussions, and therefore, would be inclined to eLearning website features that provide integration of new technologies like learning object library, net meeting for discussions, self-assessment tools, calendar, progress monitoring features etc.

Combinations of Learning Styles and eLearning website features

The eLearners with a combination of Activist and Reflector learning styles may prefer an eLearning website feature or certain eLearning website features amongst nine features that would provide for both aspects of the learning styles. The Activist and Theorist combination style eLearners may prefer a specific eLearning website feature or a set of eLearning website features. The eLearners with Activist and Pragmatist may desire an eLearning website feature(s) that will accommodate both aspects of learning styles. The Reflector and Theorist style eLearners may choose an eLearning website feature or features to serve their learning styles.
Figure 4.2: Framework of relationship between Combinations of Learning Styles and eLearning website features

1. ActRef: Activist and Reflector
2. ActTH: Activist and Theorist
3. ActPrg: Activist and Pragmatist
4. RefTH: Reflector and Theorist
5. RefPrg: Reflector and Pragmatist
6. THPrg: Theorist and Pragmatist
7. ART: Activist, Reflector and Theorist
8. ATP: Activist, Theorist and Pragmatist
9. RTP: Reflector, Theorist and Pragmatist
10. PRA: Pragmatist, Reflector and Activist
Figure 4.3: Framework of relationship between Combinations of Learning Styles and eLearning website features (Continued from Figure 4.2)

1. ActRef: Activist and Reflector
2. ActTH: Activist and Theorist
3. ActPrg: Activist and Pragmatist
4. RefTH: Reflector and Theorist
5. RefPrg: Reflector and Pragmatist
6. THPrg: Theorist and Pragmatist
7. ART: Activist, Reflector and Theorist
8. ATP: Activist, Theorist and Pragmatist
9. RTP: Reflector, Theorist and Pragmatist
10. PRA: Pragmatist, Reflector and Activist
Similarly, the eLearners with Reflector and Pragmatist learning styles may specify their preference for an eLearning website feature or a combination of features. The Theorist and Pragmatist learning styles eLearners may select their preference for an eLearning website feature or combination of features. Likewise, the eLearners with a combinations three learning styles (Activist, reflector and Theorist; Activist, Theorist and Pragmatist; Reflector, Theorist and Pragmatist; and Pragmatist, Reflector and Activist) may indicate their preference of an eLearning website feature or many features. Undertaken research proposes to examine the relationship between Learning styles and eLearning website feature preferences. In the next section, research questions and hypotheses pertaining to the research are described.

4.4 Research Questions and Hypotheses

In the previous chapters for this study (a) eLearning website Systems were described and Blackboard was selected for researching the eLearning website feature preference, (b) various models of learning styles were analysed and Honey and Mumford’s LSI was selected for examining the learning style of eLearners.

The following broad research question was investigated in the study:

What impact (if any) does an eLearner’s learning style have on their preferences for specific features in an eLearning website System?

To answer this broad research question three specific research questions were undertaken:

Research Question 1:

How can an eLearner’s learning style be meaningfully categorised?

Research Question 2:

How can an eLearning website System be meaningfully selected to study eLearning website features preference?

Research Question 3:

How do learning styles impact the eLearner’s preference of eLearning website features?
Research Question 3 is the most extensive one, and was not addressed by a literature review alone (as Question 1 and Question 2), but by a full-fledged empirical cycle. The cycle involved setting up research hypotheses and conducting a survey.

There were fourteen null hypotheses, linking four learning styles (Activist, Reflector, Theorist and Pragmatist) and ten combinations of learning styles (Activist and Reflector (ActRef), Activist and Theorist (ActTH), Activist and Pragmatist (ActPrg), Reflector and Theorist (RefTH), Reflector and Pragmatist (RefPrg), Theorist and Pragmatist (THPrg), Activist, Reflector and Theorist (ART), Activist, Theorist and Pragmatist (ATP), Reflector, Theorist and Pragmatist (RTP), and Pragmatist, Reflector and Activist (PRA)) to nine eLearning website feature preference. The fourteen hypotheses tested were:

Four Learning Style and eLearning website features

1. **Activist: and eLearning website features:**

   \( H_0 \): There is no association between the two variables – the degree to which students perceive themselves to be Activists and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

2. **Reflector and eLearning website features**

   \( H_0 \): There is no association between the two variables – the degree to which students perceive themselves to be Reflectors and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

3. **Theorist and eLearning website features**

   \( H_0 \): There is no association between the two variables – the degree to which students perceive themselves to be Theorist and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board,
4. Pragmatist and eLearning website features

H₀: There is no association between the two variables – the degree to which students perceive themselves to be Pragmatists and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

Ten Learning Style Combinations and eLearning website features

5. ActRef and eLearning website features

H₀: There is no association between the two variables – the degree to which students perceive themselves to be a combination of Activists and Reflectors learning styles, and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

6. ActTH and eLearning website features

H₀: There is no association between the two variables – the degree to which students perceive themselves to be a combination of Activists and Theorists learning styles, and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

7. ActPrg and eLearning website features

H₀: There is no association between the two variables – the degree to which students perceive themselves to be a combination of Activists and Pragmatists learning styles, and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).
8. **RefTH and eLearning website features**

H₀: There is no association between the two variables — the degree to which students perceive themselves to be a combination of Reflectors and Theorist learning styles, and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

9. **RefPrg and eLearning website features**

H₀: There is no association between the two variables — the degree to which students perceive themselves to be a combination of Reflectors and Pragmatists learning styles, and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

10. **THPrg and eLearning website features**

H₀: There is no association between the two variables — the degree to which students perceive themselves to be a combination of Theorists and Pragmatists learning styles, and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

11. **ART and eLearning website features**

H₀: There is no association between the two variables — the degree to which students perceive themselves to be a combination of Activists, Reflectors and Theorists learning styles, and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

12. **ATP and eLearning website features**

H₀: There is no association between the two variables — the degree to which students perceive themselves to be a combination of Activists, Theorists and Pragmatists learning styles, and eLearning website features preference.
(Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

13. RTP and eLearning website features

H₀: There is no association between the two variables – the degree to which students perceive themselves to be a combination of Reflectors, Theorists and Pragmatists learning styles, and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

14. PRA and eLearning website features

H₀: There is no association between the two variables – the degree to which students perceive themselves to be a combination of Pragmatists, Reflectors and Activists learning styles, and eLearning website features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

4.5 Data Collection and Instruments

Three types of data were collected from student respondents electronically using two online platforms – ZARCA Survey platform and Perterhoney’s website hosting Learning Style Instrument via www.dba.peterhoney.com (Appendix – C and D). The first types of data were demographic information of participating students. The second types of data were about the preference of eLearning website features. The third types of data related to the Learning Styles of participants, and were collected using Alan Mumford and Peter Honey’s Learning Style instrument (LSI).

The demographic information gathered included gender, academic status, name of the degree program, age group, eLearning experience in terms of number of eLearning classes and types of eLearning – hybrid/blended or online, employment status – part time or full time (Questions 1 to 11).

The eLearning website features included questions indicating preference about nine eLearning website features identified via eLearning website system described in Chapter 2 along with an additional question on percent preference
of each of these three with total score not exceeding 100 (Questions 12 to 30). The respondents were asked to rate the features on a scale of 1 to 7: [1 - (Not desirable at all) - 2 - 3 - 4 (Neutral) - 5 - 6 - 7 (Extremely desirable)]. For each feature preference, additional comments were solicited. These features were Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment.

The third type of data was collected based on Mumford and Honey's Learning Style Instrument consisting of forty questions being hosted at www.DBA.peterhoney.com. It was a two-choice questionnaire. A registration was required to keep track of survey respondents and align each eLearner's data record in ZARCA platform with data on learning style from Peterhoney's site. The eLearners who participated only in one platform (ZARCA or Peterhoney's site) were not included in the data set for statistical analysis.

Sampling

A population, or universe, for undertaken research consisted of total registered students 5347 in a US university on two campuses – Fredericksburg and Stafford, sharing common set of characteristics in terms of eLearning experience via Blackboard platform, which is the official eLearning website system used in the university. The population elements, in this case, were individuals registered in any program at the university. A sample, representing the registered student population, consisted of the subset of the population at the College of Graduate and Professional Studies (CGPS), located in Stafford, was used to estimate perceived eLearning website feature preferences of the population. The sampling frame comprised of population elements, 638 registered students at the CGPS, from which the sample was drawn.

Types of Sampling

Of two major sampling types - probability and non-probability techniques, the non-probability sampling technique was used. The probability sampling consists of many techniques, such as simple random sampling, systematic sampling, stratified sampling, cluster sampling and multi-stage sampling. The
non-probability sampling techniques include convenience sampling, judgment sampling, quota sampling and snowball sampling.

In the context of this research, convenience sampling was undertaken for the reasons of easy access, convenience and cost. Using convenience sampling, a number of responses were quickly obtained. However, the limitations of convenient sampling call for a caution against projecting or generalizing results beyond specific sample. Since the 'association of eLearning website feature preference and learning style' research is exploratory in nature, the use of convenient sampling was justified.

Non-response Error

The non-response errors are caused due to the refusal to participate in the survey or the email address listed in the student roster was inaccurate and the invitation to participate was not accommodated by the student. Thus, the sample may be less than perfectly representative of the population.

Response Rate

A response rate of 16.45 percent was obtained during six weeks launch of the survey. Two reminders were sent in week 3 and week 5 to the non-respondents. Help from faculty colleagues at CGPS was sought for announcement of the survey to their classes.

Confidence Level

The level of expected error is the difference between stated level of confidence and perfect confidence of 100 percent. The level of expected error is also called level of significance. In this research study, 95 percent confidence level is used for statistical analyses.

Participants

Of 638 invitations, only 105 undergraduate and graduate students participated from a US university in the survey. All participants, who completed three parts
of the survey on background information, eLearning website feature preference and learning styles were included in the data set.

Types of Scales Used

A scale is defined as any series of items that are arranged progressively according to the value of the magnitude, into which an item can be placed according to its qualifications (Wolman, 1976). In other words, scaling is a continuous spectrum or series of categories. The purpose of scaling for the undertaken research was to represent quantitatively demographic, perceived eLearning website feature preference and perceived learning styles data. Three kinds of scales were used to represent three different types of data variables.

Nominal Variables – These variable codes merely indicate a difference in category, class or kind. These variables have named categories. The numbers or letters assigned to objects serve as labels for identification or classification. Demographic data in the research study were classified as nominal data – gender, academic status, age group, type of eLearning, eLearning experience and employment status.

Ordinal Variables – Like nominal variables, ordinal data variables name categories, but they have an additional property of allowing categories to be ranked from highest to lowest, best to worst or first to last. The ordinal scale arranges objects or alternatives according to their magnitude in an ordered relationship. In the current research, perceived eLearning website feature preferences were identified as ordinal data variables ranging from the least desirable to most desirable.

Interval Variable – These variables have characteristics of nominal and ordinal variables, plus a defined numerical unit of measurement. Interval variable identify differences in the amount, quantity, degree, or distance and assigned numerical score. Interval scales not only indicate the order, but also measure order in units of equal intervals. For this research, perceived learning style categories were measured in-terms of raw and percentile scores via LSI (Honey and Mumford, 2006) using interval scale.
Survey Instrument(s)

Two instruments were used in the survey – Honey and Mumford’s Learning Style Instrument and eLearning website feature preference survey. The LSI consisted of forty questions with answer options agree and disagree. For each of the participants learning style, raw and percentile scores were generated by the instrument automatically. The LSI has been in use for the last 25 years by a wide variety of institutions including universities and colleges. It is already a validated instrument. Therefore, no instrument validation was deemed necessary. The eLearning website feature preferences were rated using nine questions to indicate preference of the participant on a seven point scale from the least desirable to most desirable about an eLearning Website feature. Since these questions directly indicated preferences of the participants, and no constructs were being created, no construct validity was carried out as recommended or done in instrument development methodology (Churchill, 1979).

Initial Study

Prior to the launch of the initial study, the questionnaire was sent to the researcher’s supervisors at the University of Surrey, four colleagues at CGPS and five students for content review. The suggestions were examined to revise the demographic questions such as age group range and number of eLearning class taken. Invitations via ZARCA platform with all three parts of the survey as described earlier in the section 4.5 were sent to thirty five participants and only fourteen complete responses (all parts) were received. A Cronbach’s alpha of 0.842 was obtained for nine eLearning website feature preferences, indicating an acceptable reliability. Then, the survey invitation was sent to all 638 registered students at CGPS and the survey was kept open for six weeks.

4.6 Data Analysis

Data analysis was carried out in four parts: descriptive statistics, relevant hypotheses testing using non-parametric statistical tests, Cluster Analysis, and Kruskal-Wallis ANOVA.
The descriptive statistics examine the participant data with regards to the variables—gender, academic status, name of the degree program, age group, eLearning experience in terms of number of eLearning classes and types of eLearning—hybrid/blended or online, employment status—part time or full time. Cross-tabulation and bar charts were used to analyze the demographic description of the data.

The aggregated summaries of the eLearning website feature preference with regard to nine features—announcement, file exchange, email, group discussion, real-time chat, online journal, calendar, bookmark and self-assessment were described using frequency, median and IQR. The description of learning style was accomplished using means, standard deviation, range of learning style raw scores, median and IQR of percentile scores.

Non-parametric tests

The rationale for the use of non-parametric statistical analyses by the researcher was justified based on the grounds that the assumptions of normality were not made for the sample studied. Thus, sampling distribution assumptions were not deemed to be normal. Also, the data consisted of ordinal or nominal data types. Data analyses of nominal and ordinal scale typically uses non-parametric statistical tests. Non-parametric tests have advantage. They avoid the error caused by assuming that a population is normally distributed when it is not (Zikmund, 2003).

The hypotheses were tested to find out the impact in terms of the magnitude and direction of the association between learning styles and eLearning website feature preferences. The calculation of Spearman Rho correlations involved four learning styles (Activist, Reflector, Theorist and Pragmatist), ten combinations of learning styles and nine eLearning website features (Announcement, File exchange, Email, Group discussion board, Real-time chat, Online-journal notes, Bookmark and Self-assessment).

Hierarchical Cluster analysis was undertaken to identify homogeneous group of cases based on learning styles of the eLearners. Dendrogram using average
linkage between groups were analysed. A single solution consisting of four cluster membership was obtained that included all 105 cases. The average score of four learning styles in each cluster were analysed and characteristics groups were described. Cross-tabulations of the cluster groups and demographics including age, gender, academic status, eLearning experience, eLearning type and discipline were carried out.

In Order to compare the ranked mean scores on Clusters and eLearning website feature preferences Kruskal-Wallis Test was conducted. Nine hypotheses were tested to find out if there is no difference in eLearning website feature preference – (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment) among respondents in four Clusters – Knowledge Seeker, Thinker, Knowledge cultivator and Campaigner.

4.7 Summary

This study was designed to investigate relationship between learning styles and eLearning website feature preference. The descriptive statistical analysis has been carried to provide statistical information about the Study Participants, eLearning website feature preferences and learning styles. Correlation studies and hypotheses testing have been carried out to study the direction and magnitude of relationship between learning styles and combinations of learning styles. Cluster analysis is performed to investigate how learning styles can be clustered, and if there is a possibility of correlation between clusters and website features. Lastly, Kruskal-Wallis ANOVA of clusters and eLearning website features has been done to examine the difference between clusters and eLearning website feature preference. The details of results obtained from these analyses are presented in Chapter 5.
Chapter 5
Results

5.1 Introduction

This research was designed to investigate understanding relationships between Learning Styles and eLearning website feature preference. Mumford and Honey's (2006) model has been used to study the four learning styles of eLearners. Nine eLearning website features have been identified based on eLearning website Systems' analysis. The data analysis has been carried out in terms of descriptive statistics, correlations, cluster analysis, and Kruskal-Wallis ANOVA. The statistical findings are presented in this chapter and the description of the results is organised into four parts. The first part presents the descriptive statistics (5.2, 5.3, and 5.4). The second part describes statistics relevant to testing the experimental hypotheses relating to correlations (5.5). The third part illustrates cluster analysis and reviews relationship between clusters and eLearning website feature preference (5.6 and 5.7). Lastly, the fourth part deciphers results from Kruskal-Wallis ANOVA (5.8).

Part I

5.2 Descriptive Statistics about the Study Participants

This section describes the study participants with regards to the following variables: gender, academic status, name of the degree program, age group, eLearning experience in terms of number of eLearning classes and types of eLearning (hybrid/blended or online), and employment status (part-time or full-time).

Descriptive Statistics: Gender and Age of the Participants

One hundred and five participants completed all three parts of the survey out of 638 invitees. The majority of participants were female (59%), and the minority (41%) were male. Figure 5.1 graphically presents distribution of participants by gender. The target population of the study was a group of
eLearners at a U.S. university consisting of 5 age groups: 18 to 20, 21 to 24, 25 to 30, 31 to 35, and 36 and older. Fifty-five participants (52.4%) reported their age group as 36 and above, nineteen (18.1%) between 31 and 35, twenty (19.0%) between 25 and 30, seven (6.7%) between 21 and 24, while four (3.8%) were between 18 and 20 years of age.

**Figure 5.1:** The Distribution of Participant by Gender

![Figure 5.1: The Distribution of Participant by Gender](image)

**Figure 5.2:** Distribution of Age Group

![Figure 5.2: Distribution of Age Group](image)

Age group distribution is shown in the Figure 5.2.
Descriptive Statistics of Participants’ Age Groups by Gender

The age group 36 and above consisted of 22 males (51.2%) and 33 females (53.2%). Eight males (7.6%) and 11 females (10.5%) were in the age group of 31 to 35. Eight males (7.6%) and 12 females (11.4%) comprised the 25 to 30 age group. Five males (4.8%) and 2 females (1.9%) were in the 21 to 24 age group. The age group 18 to 20 consisted of 4 females (3.8%) only.

Figure 5.3 and 5.4 show distribution of age groups by gender.

Table 5.1: Gender * Age Group Cross tabulation

<table>
<thead>
<tr>
<th></th>
<th>18-20</th>
<th>21-24</th>
<th>25-30</th>
<th>31-35</th>
<th>36 and above</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>0</td>
<td>5</td>
<td>8</td>
<td>8</td>
<td>22</td>
<td>43</td>
</tr>
<tr>
<td>% of Total</td>
<td>.0%</td>
<td>4.8%</td>
<td>7.6%</td>
<td>7.6%</td>
<td>21.0%</td>
<td>41.0%</td>
</tr>
<tr>
<td>Female</td>
<td>4</td>
<td>2</td>
<td>12</td>
<td>11</td>
<td>33</td>
<td>62</td>
</tr>
<tr>
<td>% of Total</td>
<td>3.8%</td>
<td>1.9%</td>
<td>11.4%</td>
<td>10.5%</td>
<td>31.4%</td>
<td>59.0%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>4</td>
<td>7</td>
<td>20</td>
<td>19</td>
<td>55</td>
<td>105</td>
</tr>
<tr>
<td>% of Total</td>
<td>3.8%</td>
<td>6.7%</td>
<td>19.0%</td>
<td>18.1%</td>
<td>52.4%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Figure 5.3: Distribution of Age Groups and Gender – Bar Chart
Gender and age group cross tabulation shows that majority of the participants are females in the age group of 36 and above (Table 5.1)

**Descriptive Statistics of Participants’ Academic Status, Age Groups by Gender**

There were more graduate (69) than undergraduate (36) participants. Male participants consisted of 36.1% undergraduate and 43.5% graduate. Female participants represented 63.9% undergraduate and 56.5% graduate. The 36 and above age group had more participants across gender and academic status (see Table 5.2).

**Table 5.2: Gender * Academic Status * Age Group cross tabulation**

<table>
<thead>
<tr>
<th>Academic status</th>
<th>Undergraduate</th>
<th>Graduate</th>
<th>18-20</th>
<th>21-24</th>
<th>25-30</th>
<th>31-35</th>
<th>36 and above</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender Male</td>
<td>0</td>
<td>4</td>
<td>2</td>
<td>4</td>
<td>3</td>
<td>13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>.0%</td>
<td>11.1%</td>
<td>5.6%</td>
<td>11.1%</td>
<td>8.3%</td>
<td>36.1%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female Count</td>
<td>4</td>
<td>1</td>
<td>3</td>
<td>2</td>
<td>13</td>
<td>23</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>11.1%</td>
<td>2.8%</td>
<td>8.3%</td>
<td>5.6%</td>
<td>36.1%</td>
<td>63.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Count</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>16</td>
<td>36</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of Total</td>
<td>11.1%</td>
<td>13.9%</td>
<td>13.9%</td>
<td>16.7%</td>
<td>44.4%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| Gender Male     | 1 | 6 | 4 | 19 | 30 |               |       |
| % of Total      | 1.4% | 8.7% | 5.8% | 27.5% | 43.5% |               |       |
| Female Count    | 1 | 9 | 9 | 20 | 39 |               |       |
| % of Total      | 1.4% | 13.0% | 13.0% | 29.0% | 56.5% |               |       |
| Total Count     | 2 | 15 | 13 | 39 | 69 |               |       |
| % of Total      | 2.9% | 21.7% | 18.8% | 56.5% | 100.0% |               |       |

Figure 5.4 demonstrates distribution of Graduates, Age Group and Gender while Figure 5.5 the distribution of Undergraduate participants, Age Group and Gender.
Figure 5.4: Distribution of Graduates: Age Groups and Gender – Bar Chart

Figure 5.5: Distribution of Undergraduate: Age Groups and Gender – Bar Chart
Descriptive Statistics of Participants’ eLearning experience – by number of eLearning classes, Age Group and Gender

Out of forty three male participants, twenty five indicated to have eLearning classes between 1 and 5, of which, Fourteen (32.6%) in the age group of 36 and above, four (9.3%) in the age group of 31 and 35, 3 (7%) in the age group of 25 and 30, and four (9.3%) in the age group of 21 and 24, while none between 18 and 20.

Table 5.3: Number of eLearning Classes * Gender * Age Group cross tabulation

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of eLearning classes taken</th>
<th>Between 1 and 5</th>
<th>Count</th>
<th>Between 6 and 10</th>
<th>Count</th>
<th>11 plus</th>
<th>Count</th>
<th>Total Count</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Number of eLearning classes taken</td>
<td>Between 1 Count</td>
<td>4</td>
<td>3</td>
<td>4</td>
<td>14</td>
<td>5</td>
<td>25</td>
<td>58.1%</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>9.3%</td>
<td>7.0%</td>
<td>9.3%</td>
<td>32.6%</td>
<td>58.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>Number of eLearning classes taken</td>
<td>Between 1 Count</td>
<td>2</td>
<td>2</td>
<td>9</td>
<td>8</td>
<td>27</td>
<td>48</td>
<td>77.4%</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>3.2%</td>
<td>3.2%</td>
<td>14.5%</td>
<td>12.9%</td>
<td>43.5%</td>
<td>77.4%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Between 6 and 10</td>
<td>Count</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>0</td>
<td>4</td>
<td>8</td>
<td>12.9%</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>3.2%</td>
<td>.0%</td>
<td>3.2%</td>
<td>.0%</td>
<td>6.5%</td>
<td>12.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>11 plus</td>
<td>Count</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
<td>33</td>
<td>62</td>
<td>9.7%</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>.0%</td>
<td>.0%</td>
<td>1.6%</td>
<td>4.6%</td>
<td>3.2%</td>
<td>9.7%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>Count</td>
<td>4</td>
<td>2</td>
<td>12</td>
<td>11</td>
<td>33</td>
<td>62</td>
<td>100.0%</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>6.5%</td>
<td>3.2%</td>
<td>19.4%</td>
<td>17.7%</td>
<td>53.2%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Male participants with 6 to 10 eLearning classes were fewer: two participants were in the age group 36 and above, three in 31 and 35; one in 25 and 30; one in 20 and 24 while none in the 18 and 20. Eleven male participants had more than 10 eLearning classes with six (14%) in the 36 and above age group.
Figure 5.7: Crosstab: Number of eLearning Class by Age Groups and Female

![Crosstab: Number of eLearning Class by Age Groups and Female](image)

Of sixty two female participants, forty eight had taken 1 to 5 eLearning classes. Eight participants indicated to have between 6 and 10 eLearning classes, while six participants had eLearning experience of more than 11 classes. Cross tabulation of Number of eLearning classes, age group and gender is shown in Table 5.3

**Descriptive Statistics of Participants' eLearning experience – by the Type of eLearning classes, Age Group and Gender**

Twelve male participants indicated to have taken online eLearning classes while thirty one blended/hybrid type of eLearning format. Of forty three male participants, twenty two were in the age group of 36 and above, while eight were 31 and 35 and 25 and 30, respectively. Five were in the age group of 21 and 24.
### Table 5.4: Type of eLearning Classes * Age Group * Gender cross tabulation

<table>
<thead>
<tr>
<th>Gender</th>
<th>Type of Online eLearning class experience</th>
<th>Age Group</th>
<th>% of Total Count</th>
<th>Total Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td></td>
<td>18-20</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Male Type of Online eLearning class experience</td>
<td>1</td>
<td>2.3%</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Female Type of Online eLearning class experience</td>
<td>2</td>
<td>3.2%</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Blended/ Hybrid</td>
<td>21-24</td>
<td>4.7%</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Blended/ Hybrid</td>
<td>25-30</td>
<td>2.3%</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Blended/ Hybrid</td>
<td>31-35</td>
<td>18.6%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Blended/ Hybrid</td>
<td>Above</td>
<td>27.9%</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>18-20</td>
<td>9.3%</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>21-24</td>
<td>14.0%</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>25-30</td>
<td>16.3%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>31-35</td>
<td>32.6%</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>Above</td>
<td>72.1%</td>
<td>14</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>18-20</td>
<td>11.6%</td>
<td>7</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>21-24</td>
<td>18.6%</td>
<td>12</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>25-30</td>
<td>18.6%</td>
<td>8</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>31-35</td>
<td>51.2%</td>
<td>22</td>
</tr>
<tr>
<td>Female</td>
<td></td>
<td>Above</td>
<td>100.0%</td>
<td>43</td>
</tr>
</tbody>
</table>

### Figure 5.8: Cross tabulation: Type of eLearning Classes by Age Group and Female
Twenty-two female participants indicated their type of eLearning experience as online while forty indicated their online experience as hybrid/blended.

**Figure 5.9:** Cross tabulation: Type of eLearning Classes by Age Group and Male

---

### 5.3 Description of eLearning Website Feature Preferences

In this section, aggregated summaries of the eLearning website feature preference is described with regard to nine features: announcement, file exchange, e-mail, group discussion, real time chat, online journal, calendar, bookmark, and self-assessment. The median of features relating to the communication with the lecturer (Announcement, File exchange, and E-mail) is 7. However, eLearning website features for collaboration (Group Discussions, Real-time Chat, Online Journal Notes) with students had median values 4 to 6. Group Discussion had a median of 6, Real-time chat had a media of 5, and Online Journal Notes had a median of 4. The eLearning website features relating to students’ productivity were Calendar,
Bookmark, and Self-assessment. The median value for Calendar was 5; for Bookmark, 6, and for Self-assessment, 6.

Table 5.5: Aggregated summaries of eLearning Website Feature preferences

<table>
<thead>
<tr>
<th></th>
<th>Announcement</th>
<th>File Exchange</th>
<th>E-mail</th>
<th>Group Discussion Board</th>
<th>Real Time Chat</th>
<th>Online Journal Notes</th>
<th>Calendar</th>
<th>Bookmark</th>
<th>Self Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>N Valid</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Median</td>
<td>7.0</td>
<td>7.0</td>
<td>7.0</td>
<td>6.0</td>
<td>5.0</td>
<td>4.0</td>
<td>5.0</td>
<td>5.0</td>
<td>6.00</td>
</tr>
<tr>
<td>Percentiles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>6.00</td>
<td>6.00</td>
<td>6.00</td>
<td>5.00</td>
<td>4.00</td>
<td>3.00</td>
<td>3.00</td>
<td>4.00</td>
<td>5.00</td>
</tr>
<tr>
<td>50</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>6.00</td>
<td>5.00</td>
<td>4.00</td>
<td>5.00</td>
<td>5.00</td>
<td>6.00</td>
</tr>
<tr>
<td>75</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>5.50</td>
<td>6.00</td>
<td>6.00</td>
<td>7.00</td>
<td>7.00</td>
</tr>
<tr>
<td>100</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
<td>7.00</td>
</tr>
</tbody>
</table>

The first quartile of eLearning website preference score was 6 for Announcement, File exchange, and E-mail. For Group discussions preference score was 5, Real-time Chat, 4, Online Journal, 3, Calendar, 3, Bookmark, 4, Self-assessment, 5.

The second quartile preference score was 7 for Announcement, File Exchange, and E-mail. Group discussion had 6, Real time chat, 5, and Online Journal notes, 4. Calendar, Bookmark, and Self-assessment had all 5.

The third quartile preference score was 6 for Real-time Chat and Calendar. For Online Journal Notes, it was 5.5, and for the rest of the website features it was 7.

The frequency of least to most desirable preference was measured on a 1 to 7 scale. For announcement, 63.8% eLearners indicated seven as the rating preference. File exchange feature was preferred most desirable by 58.1% eLearners, and E-mail by 68.1% eLearners as most desirable (see Table 5.6).
Features relating to collaboration with other eLearners were also ranked on 1 to 7 preference scale. For Group Discussions, 33.3% eLearners indicated 7 as the rating preference, while 28.6% rated their preference as 6.
Table 5.7: Summary of eLearning Website Feature Preference - Group Discussion Board, Real time chat, and Online Journal notes

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid%</th>
<th>Cumulative%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Group Discussion board</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Valid Least Desirable</td>
<td>1</td>
<td>1.0</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>3.8</td>
<td>3.8</td>
<td>4.8</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>5.7</td>
<td>5.7</td>
<td>10.5</td>
</tr>
<tr>
<td>Neutral</td>
<td>11</td>
<td>10.5</td>
<td>10.5</td>
<td>21.0</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>17.1</td>
<td>17.1</td>
<td>38.1</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>28.6</td>
<td>28.6</td>
<td>66.7</td>
</tr>
<tr>
<td>Most Desirable</td>
<td>35</td>
<td>33.3</td>
<td>33.3</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
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<th>Cumulative%</th>
</tr>
</thead>
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<tr>
<td><strong>Real-time chat</strong></td>
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<td></td>
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<tr>
<td>Valid Least Desirable</td>
<td>4</td>
<td>3.8</td>
<td>3.8</td>
<td>3.8</td>
</tr>
<tr>
<td></td>
<td>2</td>
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<td>8.6</td>
<td>12.4</td>
</tr>
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<td>7.6</td>
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<tr>
<td>Neutral</td>
<td>19</td>
<td>18.1</td>
<td>18.1</td>
<td>38.1</td>
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<td>21.0</td>
<td>59.0</td>
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<tr>
<td></td>
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<td>17.1</td>
<td>76.2</td>
</tr>
<tr>
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<td>23.8</td>
<td>23.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
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<th>Cumulative%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Online Journal notes</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
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<td>11</td>
<td>10.5</td>
<td>10.5</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>11.4</td>
<td>11.4</td>
<td>21.9</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>10.5</td>
<td>10.5</td>
<td>32.4</td>
</tr>
<tr>
<td>Neutral</td>
<td>25</td>
<td>23.8</td>
<td>23.8</td>
<td>56.2</td>
</tr>
<tr>
<td></td>
<td>20</td>
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<tr>
<td></td>
<td>18</td>
<td>17.1</td>
<td>17.1</td>
<td>92.4</td>
</tr>
<tr>
<td>Most Desirable</td>
<td>8</td>
<td>7.6</td>
<td>7.6</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>100.0</td>
<td>100.0</td>
<td>100.0</td>
</tr>
</tbody>
</table>

The Real-time chat feature was indicated as most desirable (rated seven) by 23.1% and Online Journal notes by 7.6% of the eLearners. A neutral
preference for Group Discussion was indicated by 10.5%, Real-time chat by 18.1% and Online Journal by 23.8% (see Table 5.7).

**Table 5.8:** Summary of eLearning Website Feature Preference-Bookmark, Calendar, and Self-assessment

### Calendar

<table>
<thead>
<tr>
<th>Valid</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid%</th>
<th>Cumulative%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least Desirable</td>
<td>9</td>
<td>8.6</td>
<td>8.6</td>
<td>8.6</td>
</tr>
<tr>
<td>2</td>
<td>12</td>
<td>11.4</td>
<td>11.4</td>
<td>20.0</td>
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<tr>
<td>3</td>
<td>8</td>
<td>7.6</td>
<td>7.6</td>
<td>27.6</td>
</tr>
<tr>
<td>Neutral</td>
<td>23</td>
<td>21.9</td>
<td>21.9</td>
<td>49.5</td>
</tr>
<tr>
<td>5</td>
<td>15</td>
<td>14.3</td>
<td>14.3</td>
<td>63.8</td>
</tr>
<tr>
<td>6</td>
<td>20</td>
<td>19.0</td>
<td>19.0</td>
<td>82.9</td>
</tr>
<tr>
<td>Most Desirable</td>
<td>18</td>
<td>17.1</td>
<td>17.1</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
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<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

### Bookmark

<table>
<thead>
<tr>
<th>Valid</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid%</th>
<th>Cumulative%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least Desirable</td>
<td>5</td>
<td>4.8</td>
<td>4.8</td>
<td>4.8</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1.9</td>
<td>1.9</td>
<td>6.7</td>
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<tr>
<td>3</td>
<td>7</td>
<td>6.7</td>
<td>6.7</td>
<td>13.3</td>
</tr>
<tr>
<td>Neutral</td>
<td>24</td>
<td>22.9</td>
<td>22.9</td>
<td>36.2</td>
</tr>
<tr>
<td>5</td>
<td>19</td>
<td>18.1</td>
<td>18.1</td>
<td>54.3</td>
</tr>
<tr>
<td>6</td>
<td>21</td>
<td>20.0</td>
<td>20.0</td>
<td>74.3</td>
</tr>
<tr>
<td>Most Desirable</td>
<td>27</td>
<td>25.7</td>
<td>25.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>

### Self assessment

<table>
<thead>
<tr>
<th>Valid</th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid%</th>
<th>Cumulative%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Least Desirable</td>
<td>2</td>
<td>1.9</td>
<td>1.9</td>
<td>1.9</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>1.9</td>
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<td>3</td>
<td>2</td>
<td>1.9</td>
<td>1.9</td>
<td>5.7</td>
</tr>
<tr>
<td>Neutral</td>
<td>8</td>
<td>7.6</td>
<td>7.6</td>
<td>13.3</td>
</tr>
<tr>
<td>5</td>
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<td>6</td>
<td>30</td>
<td>28.6</td>
<td>28.6</td>
<td>54.3</td>
</tr>
<tr>
<td>Most Desirable</td>
<td>48</td>
<td>45.7</td>
<td>45.7</td>
<td>100.0</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td>100.0</td>
<td>100.0</td>
<td></td>
</tr>
</tbody>
</table>
Features relating to eLearners' productivity were also ranked on a 1 to 7 preference scale. For Calendar, 17.1% eLearners chose seven as the rating preference and 19.0% as 6, while 21.9% rated their preference as neutral.

The Bookmark feature was indicated most desirable by 25.7% and Self-assessment by 45.7% of the eLearners. A neutral preference for Calendar was indicated by 21.9%, Bookmark by 22.9% and Self-assessment by 7.6% (see Table 5.8).

5.4 Description of Learning Styles

This section describes the study participants with regard to their learning style: Activist, Reflector, Theorist, or Pragmatist. Means, standard deviations, and the ranges of learning style raw scores are presented in the Table 5.9, and median and IQR (Inter-Quartile range) of percentile scores are presented in Table 5.10.

| Table 5.9: Means, Standard deviation and Range of learning style raw scores |
|-----------------|----------|----------|----------|----------|
| N Valid         | Activist | Reflector| Theorist | Pragmatist|
| Mean            | 4.65     | 7.64     | 7.78     | 7.59      |
| Std. Deviation  | 2.341    | 1.927    | 1.765    | 1.627     |
| Range           | 10       | 8        | 8        | 7         |
| Minimum         | 0        | 2        | 2        | 3         |
| Maximum         | 10       | 10       | 10       | 10        |

The mean scores of different learning style ranged from 4.65 to 7.59 with activist being the lowest (4.65) and theorist being the highest (7.78). The standard deviation for Activist was 2.341, while for Reflector it was 1.927; for Theorist, 1.765, and for Pragmatist, 1.627.

The median of percentile scores of learning styles ranged from 57 to 68, with a minimum from 2 to 3 and a maximum of 100. The median score for Activist, Reflector, Theorist, and Pragmatist were 57, 61, 66, and 68, respectively.
Table 5.10: Median, IQR and Range of learning style percentile

<table>
<thead>
<tr>
<th></th>
<th>Activist Percentile</th>
<th>Reflector Percentile</th>
<th>Theorist Percentile</th>
<th>Pragmatist Percentile</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
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<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Median</td>
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<td>66.00</td>
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<td>98</td>
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<tr>
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</tr>
<tr>
<td></td>
<td>75</td>
<td>71.00</td>
<td>82.00</td>
<td>85.00</td>
</tr>
</tbody>
</table>

The first quartile scores of Activist, Reflector, Theorist, and Pragmatist were 26, 28, 41, and 24, respectively. The second quartile scores for Activist, Reflector, Theorist, and Pragmatist were 57, 61, 66, and 68. The third quartile for Activist and Reflector were 71 and 82. For Theorist and Pragmatist, scores were 85 and 90.

Part II – Hypotheses

5.5 Correlation: Learning Styles and eLearning Website Preferences.
Spearman’s Rho correlations were calculated to find out the magnitude and direction of the association between learning styles and eLearning website feature preference. Four learning styles (Activist, Reflector, Theorist, and Pragmatist) and ten combinations of learning styles with the nine eLearning website features (Announcement, File exchange, E-mail, Group Discussion board, Real-time chat, Online-journal notes, Bookmark, and Self-assessment) were used to calculate Spearman Rho Correlations (Table 5.11).

The results of data analyses of the 14 null hypotheses are provided in the following section.

1. Activist: and eLearning Website Features:

H₀: There is no association between the two variables – the degree to which students perceive themselves to be Activists and eLearning website features
preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

Table 5.11: Correlation Matrix of nine eLearning Website Features and four Learning Styles

<table>
<thead>
<tr>
<th>Learning Style</th>
<th>Spearman rho</th>
<th>Announcement</th>
<th>File Exchange</th>
<th>E-mail</th>
<th>Group Discussion Board</th>
<th>Real Time Chat</th>
<th>Online Journal Notes</th>
<th>Calendar</th>
<th>Bookmark</th>
<th>Self Assessment</th>
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</thead>
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<tr>
<td>Activist</td>
<td>Correlation Coefficient</td>
<td>.050</td>
<td>.030</td>
<td>.022</td>
<td>.194(*)</td>
<td>.132</td>
<td>.116</td>
<td>.143</td>
<td>-.056</td>
<td>.096</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
<td>.615</td>
<td>.762</td>
<td>.823</td>
<td>.047</td>
<td>.180</td>
<td>.237</td>
<td>.146</td>
<td>.572</td>
<td>.331</td>
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<td>105</td>
<td>105</td>
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<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Reflector</td>
<td>Correlation Coefficient</td>
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<td>.136</td>
<td>-.046</td>
<td>.101</td>
<td>.083</td>
<td>.144</td>
<td>.102</td>
<td>.066</td>
<td>-.038</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
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<td>.301</td>
<td>.562</td>
<td>.699</td>
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<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Theorist</td>
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<td>.197(*)</td>
<td>.050</td>
<td>.026</td>
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<td>-.075</td>
<td>-.108</td>
<td>-.032</td>
<td>-.065</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
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<td>.612</td>
<td>.793</td>
<td>.536</td>
<td>.450</td>
<td>.275</td>
<td>.743</td>
<td>.508</td>
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<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>Pragmatist</td>
<td>Correlation Coefficient</td>
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<td>.133</td>
<td>-.086</td>
<td>-.024</td>
<td>.202(*)</td>
<td>.085</td>
<td>-.026</td>
<td>.137</td>
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</tr>
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<td>Sig. (2-tailed)</td>
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<td>.385</td>
<td>.123</td>
<td>.806</td>
<td>.039</td>
<td>.386</td>
<td>.792</td>
<td>.163</td>
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<td>105</td>
<td>105</td>
<td>105</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).

H₁: There is an association between the two variables in regard to the degree to which students perceive themselves to be Activist and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal notes, Calendar, Bookmark, and Self-assessment).

The Activist learning style was positively and significantly correlated to the Group Discussion website feature ($r = 0.194$) at the 0.05 level. It is negatively and non-significantly correlated to the Bookmark eLearning website feature ($r = -0.056$). However, there were statistically non-significant, but positive correlations between Activist and other 7 eLearning website features ranging from $r = 0.022$ to $r = 0.143$ (Table 5.11).
2. **Reflector and eLearning Website Features**

H₀: There is no association between the two variables in regard to the degree to which students perceive themselves to be Reflectors and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

H₁: There is an association between the two variables in regard to the degree to which students perceive themselves to be Reflectors and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

The Reflector learning style was negatively correlated to E-mail (r = -0.045) and Self-assessment (r = -0.038). The positive correlations were non-significant ranging from r = 0.066 to r = 0.136.

3. **Theorist and eLearning Website Features**

H₀: There is no association between the two variables in regard to the degree to which students perceive themselves to be Theorist and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

H₁: There is an association between the two variables in regard to the degree to which students perceive themselves to be Theorists and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

The Theorist learning style was positively and significantly correlated (r = 0.197) to the File Exchange eLearning feature. Statistically non-significant and negative correlations were observed between Theorist and Announcement (r = -0.077), Real-time Chat (r = -0.061), Online Journal.
Notes \((r = -0.075)\), Calendar \((r = -0.108)\), Bookmark \((r = -0.032)\), and Self-assessment \((r = -0.065)\).

4. Pragmatist and eLearning Website Features

H₀: There is no association between the two variables in regard to the degree to which students perceive themselves to be Pragmatists and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

H₁: There is an association between the two variables in regard to the degree to which students perceive themselves to be Pragmatists and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

A significant positive correlation was observed between the learning style, Pragmatist and Online Journal Notes feature \((r = 0.202)\). Negative correlations were noted between Pragmatist and a number of eLearning website features, namely, Announcement \((r = -0.002)\), E-mail \((r = -0.085)\), Real time chat \((r = -0.024)\), and Bookmark \((r = -0.026)\).

Learning Style Combinations and eLearning Website Features

The ten combinations of learning styles and eLearning website feature were used to calculate the Spearman’s Rho correlation matrix, which is presented in Table 5.12. Ten combinations of learning styles were Activist and Reflector (ActRef), Activist and Theorist (ActTH), Activist and Pragmatist (ActPrg), Reflector and Theorist (RefTH), Reflector and Pragmatist (RefPrg), Theorist and Pragmatist (THPrg), Activist, Reflector and Theorist (ART), Activist, Theorist and Pragmatist (ATP), Reflector, Theorist and Pragmatist (RTP), and Pragmatist, Reflector, and Activist (PRA).
5. **ActRef and eLearning Website Features**

H°: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Activists and Reflectors learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

H¹: There is an association between the two variables in regard to the degree to which students perceive themselves to be combination of Activists and Reflectors learning styles and eLeaming website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal notes, Calendar, Bookmark, and Self-assessment).

The ActRef combination was significantly correlated to the Group Discussion Board (r = 0.248), Online Journal Notes (r = 0.203), and Calendar (r = 0.212). Non-significant, but positive correlations were observed with rest of the eLearning website features ranging from r = 0.00 to r = 0.132.

6. **ActTH and eLearning Website Features**

H°: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Activists and Theorists learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

H¹: There is an association between the two variables in regard to the degree to which students perceive themselves to be combination of Activists and Theorists learning styles and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal notes, Calendar, Bookmark, and Self-assessment).
A significantly positive correlation of $r = 0.230$ was noted between ActTH and Group Discussion Board feature. Negative correlation were observed between ActTH and E-mail ($r = 0.022$), Bookmark ($r = -0.083$).

7. ActPrg and eLearning Website Features

$H_0$: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Activists and Pragmatists learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

$H_1$: There is an association between the two variables in regard to the degree to which students perceive themselves to be combination of Activists and Pragmatists learning styles and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal notes, Calendar, Bookmark, and Self-assessment).

ActPrg was positively and significantly correlated to Group Discussion Board feature ($r = 0.230$), and negatively correlated to E-mail ($r = -0.022$) and Bookmark ($r = -0.083$).

8. RefTH and eLearning Website Features

$H_0$: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Reflectors and Theorist learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).
Table 5.12: Correlation Matrix of eLearning Website Features and Learning Style Combinations

<table>
<thead>
<tr>
<th>Combinations</th>
<th>Spearman's rho</th>
<th>Announcement</th>
<th>File Exchange</th>
<th>E-mail</th>
<th>Group Discussion</th>
<th>Real Time Chat</th>
<th>Online Journal</th>
<th>Calendar</th>
<th>Bookmark</th>
<th>Self Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>ActRef</td>
<td></td>
<td>.132</td>
<td>.122</td>
<td>.015</td>
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<td>.098</td>
<td>.022</td>
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<td>.186</td>
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<td>.083</td>
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<tr>
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<td></td>
<td>.665</td>
<td>.321</td>
<td>.822</td>
<td>.018</td>
<td>.336</td>
<td>.057</td>
<td>.129</td>
<td>.402</td>
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<td>.022</td>
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<td>.095</td>
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<td>.242(*)</td>
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<td>.157</td>
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<td>.110</td>
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<td>.997</td>
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<td>.110</td>
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<tr>
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<td>.827</td>
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<td>.936</td>
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<tr>
<td>Correlation Coefficient</td>
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<td>.016</td>
<td>.271(*)</td>
<td>.140</td>
<td>.254(*)</td>
<td>.215(*)</td>
<td>.012</td>
<td>.154</td>
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<tr>
<td>Sig. (2-tailed)</td>
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<td>.869</td>
<td>.005</td>
<td>.154</td>
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<td>105</td>
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</tbody>
</table>

** Correlation is significant at the 0.01 level (2-tailed); * Correlation is significant at the 0.05 level (2-tailed).

Combination Notations:
1. ActRef: Activist and Reflector
2. ActTH: Activist and Theorist
3. ActPr: Activist and Pragmatist
4. RefTH: Reflector and Theorist
5. RefPr: Reflector and Pragmatist
6. THPr: Theorist and Pragmatist
7. ART: Activist, Reflector, and Theorist
8. ATP: Activist, Theorist, and Pragmatist
9. RTP: Reflector, Theorist, and Pragmatist
10. PRA: Pragmatist, Reflector, and Activist

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H1: There is an association between the two variables in regard to the degree to which students perceive themselves to be combination of Reflectors and Theorists learning styles and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal notes, Calendar, Bookmark, and Self-assessment).

There were no significant correlations observed between RefTH and nine eLearning website features. However, none of the correlations were zero (r = 0).

9. RefPrg and eLearning Website Features

H0: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Reflectors and Pragmatists learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

H1: There is an association between the two variables in regard to the degree to which students perceive themselves to be combination of Reflectors and Pragmatists learning styles and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal notes, Calendar, Bookmark, and Self-assessment).

RefPrg combination was noted to be significantly correlated to File Exchange (r = 0.219) and Online Journal Notes (r = 0.226). RefPrg was negatively correlated to the E-mail feature (r = -0.078).

10. THPrg and eLearning Website Features

H0: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Theorists and Pragmatists learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

THPrg and eLearning Website Features

H0: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Theorists and Pragmatists learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).
H₁: There is an association between the two variables in regard to the degree to which students perceive themselves to be a combination of Theorists and Pragmatists learning styles and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal notes, Calendar, Bookmark, and Self-assessment).

There was a significant correlation observed between THPrg and File Exchange feature ($r = 0.253$) at 0.01 level of significance. Negative correlations were noted between THPrg and Announcement ($r = -0.044$), Calendar $r = -0.003$) and Bookmark ($r = -0.031$).

11. ART and eLearning Website Features

H₀: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Activists, Reflectors and Theorists learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

H₁: There is an association between the two variables in regard to the degree to which students perceive themselves to be a combination of Theorist and Pragmatist learning styles and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal notes, Calendar, Bookmark, and Self-assessment).

For ART combination of learning styles significantly positive correlation was observed with File Exchange ($r = 0.236$) and Group Discussion Board ($r = 0.229$).

12. ATP and eLearning Website Features

H₀: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Activists, Theorists and Pragmatists learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion
Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment).

H₁: There is an association between the two variables in regard to the degree to which students perceive themselves to be a combination of Activists, Theorists and Pragmatists learning styles and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

ATP and File Exchange were noted to be positively and significantly correlated (r = 0.223). The combination ATP was also significantly correlated to the Group Discussion Board (r = 0.242).

13. RTP and eLearning Website Features

H₀: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Reflectors, Theorists and Pragmatists learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

H₁: There is an association between the two variables in regard to the degree to which students perceive themselves to be a combination of Reflectors, Theorists and Pragmatists learning styles and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

A positively significant correlation was noted between combination RTP and File Exchange (r = 0.246) at 0.05 level.
14. **PRA and eLearning Website Features**

**H₀**: There is no association between the two variables in regard to the degree to which students perceive themselves to be a combination of Pragmatists, Reflectors and Activists learning styles, and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark, and Self-assessment).

**H₁**: There is an association between the two variables in regard to the degree to which students perceive themselves to be a combination of Pragmatists, Reflectors and Activists learning styles and eLearning website features preference (Announcement, File Exchange, E-mail, Group Discussion Board, Real-time Chat, Online Journal notes, Calendar, Bookmark, and Self-assessment).

The PRA combination was positively and significantly correlated to the Discussion Board ($r = 0.271$) and Online Journal Notes ($r = 0.245$) at 0.01 level of significance. The PRA was noted to be positively correlated to the Calendar feature ($r = 0.215$) at 0.05 level of significance.

**Part III**

5.6 **Cluster Analysis**

The hierarchical cluster analysis was carried out to identify homogeneous groups of cases based on learning styles of the eLearners. In hierarchical clustering, the algorithm used starts with each case in a separate cluster and iteratively combines until all cases are in one cluster. The prevalent SPSS Ward Method was used for clustering. Cluster membership is assessed by calculating the total sum of squared deviations from the mean of a cluster. The criterion for fusion is that it should produce the smallest possible increase in the error sum of squares. The process continues until all cases are grouped into one large cluster.
Appendix - E shows the Hierarchical Cluster Analysis representing Dendrogram. Each case is associated in a rescaled distance cluster combine. A single solution consisting of four clusters was obtained that included all 105 cases. The Dendrogram provided information about the magnitude of differences between clusters at each step of the process.

Clusters and learning styles

The mean scores of four learning style were computed for each of the four clusters. Table 5.13 represents mean scores in a four by four table.

Table 5.13: Mean Scores of Four-Clusters and Learning Styles

<table>
<thead>
<tr>
<th></th>
<th>Knowledge Cultivator</th>
<th>Knowledge Thinker</th>
<th>Knowledge Seeker</th>
<th>Knowledge Campaigner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activist</td>
<td>3.77551</td>
<td>5.238095</td>
<td>3.235294</td>
<td>7.666667</td>
</tr>
<tr>
<td>Reflector</td>
<td>8.367347</td>
<td>8.047619</td>
<td>8.176471</td>
<td>4.666667</td>
</tr>
<tr>
<td>Theorist</td>
<td>9</td>
<td>5.952381</td>
<td>8.529412</td>
<td>5.888889</td>
</tr>
<tr>
<td>Pragmatist</td>
<td>8.530612</td>
<td>6.52381</td>
<td>5.588235</td>
<td>8.166667</td>
</tr>
</tbody>
</table>

Based on the cluster means for the clustering variables (learning styles), the clusters were labelled. Cluster 1, Knowledge Cultivator: has high mean score in Reflector, Theorist and Pragmatist. Cluster 2, Thinker: has a high mean score in Reflector and moderate score in Pragmatist, and low scores in Activist and Theorist. Cluster 3, Knowledge Seeker: has high mean scores in Reflector and Theorist, and low scores in Activist and Pragmatist. Cluster 4, Campaigner: has the high mean score in Activist and Pragmatist, and low scores in Reflector and Theorist (Table 5.14).

Table 5.14: Characteristics of Four-Cluster Solution

<table>
<thead>
<tr>
<th></th>
<th>Knowledge Cultivator</th>
<th>Knowledge Thinker</th>
<th>Knowledge Seeker</th>
<th>Knowledge Campaigner</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activist</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Reflector</td>
<td>High</td>
<td>High</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Theorist</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Pragmatist</td>
<td>High</td>
<td>Moderate</td>
<td>Low</td>
<td>High</td>
</tr>
</tbody>
</table>
Relevance notations:
High 7.0 and above
Moderate 6.9 to 6.01
Low 6.0 and below

Figure 5.10 shows a graphic profile of the four clusters. Each cluster is represented by a line along with four points on the line representing mean scores of the learning styles.

**Figure 5.10:** A Graphic Profile of the Four-Cluster Solution using Hierarchical Cluster Method

![Learning Style and Clusters](image)

Figure 5.11 describes the line chart of the learning style. Each learning style is represented by a line along with four points on the line representing mean scores of the learning styles for a specific cluster.
**Figure 5.11:** A Graphic Profile of the Four-Clustering variables using Hierarchical Cluster Method

![Clusters and Learning Styles](image)

**Additional Characteristics of Clusters**

**Cross Tabulation: Clusters and Age Group**

Clusters by age group cross tabulation reveals that 36 and older constitute the largest group of eLearners within each cluster: Knowledge seekers (27.6%), Thinkers (7.6%), Knowledge Cultivators (8.6%), and Campaigner (8.6%).

**Table 5.15:** Cross tabulation of Clusters and Age Groups

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Knowledge Seeker</th>
<th>Thinker</th>
<th>Knowledge Cultivator</th>
<th>Campaigner</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Count</td>
<td>% of Total</td>
<td>Count</td>
<td>% of Total</td>
<td>Count</td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>2</td>
<td>1.9%</td>
<td>2</td>
<td>1.9%</td>
<td>10</td>
</tr>
<tr>
<td>Thinker</td>
<td>0</td>
<td>0.0%</td>
<td>2</td>
<td>0.0%</td>
<td>5</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>1</td>
<td>1.0%</td>
<td>1</td>
<td>1.0%</td>
<td>3</td>
</tr>
<tr>
<td>Campaigner</td>
<td>1</td>
<td>1.0%</td>
<td>2</td>
<td>1.9%</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>4</td>
<td>3.8%</td>
<td>7</td>
<td>6.7%</td>
<td>20</td>
</tr>
</tbody>
</table>

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Figure 5.12: Bar Chart: Clusters and Age Groups

Figure 5.12 shows a bar chart of clusters and age groups. Knowledge Seeker is the greatest the clusters followed by Thinker, Campaigner, and Knowledge Cultivator.

Cross Tabulation: Clusters and Gender

Of all eLearners in the study, 23.8% females and 22.9% males were Knowledge Seekers. Thinkers comprised of 12.4% females and 7.6% males. Amongst Knowledge Cultivators 10.5% were females and 5.7% males. In the Campaigner cluster, females were 12.4%, and only 4.8% were males (see Table 5.16). Figure 5.13 gives the graphic description of gender for the four clusters.
Table 5.16: Cross tabulation of Clusters and Gender

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Knowledge Seeker</th>
<th>Count</th>
<th>% of Total</th>
<th>Male</th>
<th>Female</th>
<th>Total</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Seeker</td>
<td>Count</td>
<td>24</td>
<td>22.9%</td>
<td>22.9%</td>
<td>23.8%</td>
<td>46.7%</td>
<td></td>
</tr>
<tr>
<td>Thinker</td>
<td>Count</td>
<td>8</td>
<td>7.6%</td>
<td>7.6%</td>
<td>12.4%</td>
<td>20.0%</td>
<td></td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>Count</td>
<td>6</td>
<td>5.7%</td>
<td>5.7%</td>
<td>10.5%</td>
<td>16.2%</td>
<td></td>
</tr>
<tr>
<td>Campaigner</td>
<td>Count</td>
<td>5</td>
<td>4.8%</td>
<td>4.8%</td>
<td>12.4%</td>
<td>17.1%</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>43</td>
<td>41.0%</td>
<td>41.0%</td>
<td>59.0%</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>

Figure 5.13: Bar Chart: Clusters and Gender

Bar Chart

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Seeker</td>
<td>25</td>
</tr>
<tr>
<td>Thinker</td>
<td>13</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>11</td>
</tr>
<tr>
<td>Campaigner</td>
<td>13</td>
</tr>
</tbody>
</table>

Gender
- **Male**
- **Female**
Cross Tabulation: Clusters and Academic Status

The graduate eLearners amongst Knowledge Seekers were 30.5% while the undergraduates were 16.2%. Thinkers consisted of 13.3% graduate and 6.7% undergraduate eLearners. Knowledge Cultivators is comprised of 11.4% graduates and 4.8% undergraduates. Campaigner included 10.5% graduate and 6.7% undergraduate students.

Table 5.17: Cross tabulation of Clusters and Academic Status

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Academic status</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Undergraduate</td>
<td>Graduate</td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>17</td>
<td>32</td>
</tr>
<tr>
<td>% of Total</td>
<td>16.2%</td>
<td>30.5%</td>
</tr>
<tr>
<td>Thinker</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>7</td>
<td>14</td>
</tr>
<tr>
<td>% of Total</td>
<td>6.7%</td>
<td>13.3%</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>5</td>
<td>12</td>
</tr>
<tr>
<td>% of Total</td>
<td>4.8%</td>
<td>11.4%</td>
</tr>
<tr>
<td>Campaigner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Count</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>% of Total</td>
<td>6.7%</td>
<td>10.5%</td>
</tr>
<tr>
<td>Total</td>
<td>36</td>
<td>69</td>
</tr>
<tr>
<td>% of Total</td>
<td>34.3%</td>
<td>65.7%</td>
</tr>
</tbody>
</table>

Figure 5.14: Bar Chart: Clusters and Academic Status
Figure 5.14 shows a bar chart of clusters and academic status. Knowledge Seeker is the biggest cluster followed by Thinker, Campaigner, and Knowledge Cultivator. The graduate students were in the majority in all clusters.

**Cross Tabulation: Clusters and eLearning Experience**

Cross tabulation of clusters by eLearning experience shows that the majority of eLearners have taken 1 to 5 eLearning classes (69.5%). The eLearners who have taken between 6 to 10 classes, constituted 14.3% and eLearners with 11 plus classes 16.2%.

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Number of eLearning classes taken</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Between 1 and 5</td>
<td>Between 6 and 10</td>
<td>11 plus</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>Count</td>
<td>35</td>
<td>7</td>
<td>7</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>33.3%</td>
<td>6.7%</td>
<td>6.7%</td>
<td>46.7%</td>
</tr>
<tr>
<td>Thinker</td>
<td>Count</td>
<td>10</td>
<td>4</td>
<td>7</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>9.5%</td>
<td>3.8%</td>
<td>6.7%</td>
<td>20.0%</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>Count</td>
<td>12</td>
<td>2</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>11.4%</td>
<td>1.9%</td>
<td>2.9%</td>
<td>16.2%</td>
</tr>
<tr>
<td>Campaigner</td>
<td>Count</td>
<td>16</td>
<td>2</td>
<td>0</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>15.2%</td>
<td>1.9%</td>
<td>.0%</td>
<td>17.1%</td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>73</td>
<td>15</td>
<td>17</td>
<td>105</td>
</tr>
<tr>
<td></td>
<td>% of Total</td>
<td>69.5%</td>
<td>14.3%</td>
<td>16.2%</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

A cluster by eLearning experience cross tabulation reveals that eLearners with 1 to 5 classes constitute the largest group of eLearners amongst all clusters with 33.3% Knowledge seekers, 9.5% Thinkers, 11.4% Knowledge Cultivator, and 15.2% Campaigner.
Figure 5.15: Bar Chart: Clusters and eLearning Experience

Figure 5.15 shows a bar chart of clusters and eLearning experience. Knowledge seeker is the biggest group in the cluster. The eLearners who have taken 1 to 5 classes were in the majority followed by eLearners with 11 plus classes and eLearners between 6 and 10 classes.

Cross Tabulation: Clusters and eLearning Type

Clusters by eLearning type cross tabulation reveals that eLearners who have taken online classes constitute the smaller group (32.4%) amongst all clusters (Table 5.19). However, eLearners with eLearning type blended/hybrid make up the larger group (67.6%). Amongst the Blended/ Hybrid eLearner type 29.5% were knowledge seeker; 14.3% were Thinkers; 11.4% were Knowledge Cultivators and 12.4% were Campaigners. Figure 5.16 shows a bar chart of clusters and eLearning experience.
### Cross Tabulation: Clusters and Discipline

Clusters by discipline cross tabulation shows that eLearners in the M.B.A. program were the largest group (34.3%) among all disciplines, followed by BS CTEC (23.8%), M.Ed. (22.9%) and BPS (12.4%). Knowledge Seekers were the largest cluster in all four clusters. In the Knowledge Seeker
cluster, M.B.A. (17.1%) was largest group followed by M.Ed. (12.4%) as shown in Table 5.20.

**Table 5.20: Cross Tabulation of Clusters and Discipline**

<table>
<thead>
<tr>
<th>Clusters</th>
<th>Discipline (example, BS Chemistry)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BPS</td>
<td>BS CTEC</td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>Count</td>
<td>5</td>
</tr>
<tr>
<td>% of Total</td>
<td>4.8%</td>
<td>9.5%</td>
</tr>
<tr>
<td>Thinker</td>
<td>Count</td>
<td>5</td>
</tr>
<tr>
<td>% of Total</td>
<td>4.8%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>Count</td>
<td>1</td>
</tr>
<tr>
<td>% of Total</td>
<td>1.0%</td>
<td>4.8%</td>
</tr>
<tr>
<td>Campaigner</td>
<td>Count</td>
<td>2</td>
</tr>
<tr>
<td>% of Total</td>
<td>1.9%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Total</td>
<td>Count</td>
<td>13</td>
</tr>
<tr>
<td>% of Total</td>
<td>12.4%</td>
<td>23.8%</td>
</tr>
</tbody>
</table>

Figure 5.17 shows a bar chart of clusters and discipline. M.B.A. was the larger group amongst all clusters except the Knowledge Cultivator, and Campaigner clusters. In the Thinker cluster, M.Ed. and all other disciplines are equally represented. In the Knowledge Cultivator cluster, M.Ed. is the largest group followed by BS CTEC, M.B.A. BPS, and others.

**Figure 5.17: Bar Chart: Clusters and Discipline**
5.7 Correlation: Clusters and eLearning Website Feature preference

Spearman’s Rho correlations between learning style clusters and eLearning website feature preference were calculated to examine the magnitude and direction of the association. Announcement, E-mail, Real-time, Chat and Calendar were positively, but non-significantly correlated to clusters with $r = 0.027$, $r = 0.039$, $r = 0.122$ and $r = 0.063$, respectively (Table 5.21).

Table 5.21: Correlation – Clusters and nine eLearning Website Features

<table>
<thead>
<tr>
<th></th>
<th>Announcements</th>
<th>File Exchange</th>
<th>E-mail</th>
<th>Group Discussion</th>
<th>Real-time</th>
<th>Chat</th>
<th>Online Journal</th>
<th>Calendar</th>
<th>Bookmark</th>
<th>Self-assessment</th>
<th>Clusters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spearman's rho</td>
<td>0.027</td>
<td>-0.212(*)</td>
<td>0.039</td>
<td>-0.016</td>
<td>0.122</td>
<td>-0.046</td>
<td>-0.063</td>
<td>-0.088</td>
<td>-0.004</td>
<td>1.000</td>
<td></td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
<td>0.782</td>
<td>0.030</td>
<td>0.694</td>
<td>0.670</td>
<td>0.213</td>
<td>0.640</td>
<td>0.525</td>
<td>0.371</td>
<td>0.964</td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).

The Group Discussion board, Online Journal notes, Bookmark, and Self-assessment were negatively and non-significantly correlated to clusters with $r = -0.016$, $r = -0.046$ and $r = -0.088$ and $-0.004$, respectively as shown in Table 5.21. Only File Exchange was negatively, but significantly correlated ($r = -0.212$).

Part IV

5.8 Kruskal-Wallis ANOVA of Clusters and eLearning Website Feature Preference

A Kruskal-Wallis Test was conducted to compare the ranked mean scores on clusters and eLearning website feature preferences. Four clusters were identified as the category variable and nine eLearning features as dependent variable. The ranks are presented in the Table 5.22. Statistics from the Kruskal-Wallis Test are presented for each of the nine eLearning website features and clusters in the Table 5.23.
Table 5.22: Mean Ranks of eLearning Website Features

<table>
<thead>
<tr>
<th>Clusters</th>
<th>N</th>
<th>Mean Rank</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announcement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>49</td>
<td>52.11</td>
</tr>
<tr>
<td>Thinker</td>
<td>21</td>
<td>55.14</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>17</td>
<td>50.82</td>
</tr>
<tr>
<td>Campaigner</td>
<td>18</td>
<td>54.97</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>File Exchange</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>49</td>
<td>58.67</td>
</tr>
<tr>
<td>Thinker</td>
<td>21</td>
<td>51.90</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>17</td>
<td>46.21</td>
</tr>
<tr>
<td>Campaigner</td>
<td>18</td>
<td>45.25</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>E-mail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>49</td>
<td>52.56</td>
</tr>
<tr>
<td>Thinker</td>
<td>21</td>
<td>50.19</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>17</td>
<td>55.71</td>
</tr>
<tr>
<td>Campaigner</td>
<td>18</td>
<td>54.92</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>Group Discussion board</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>49</td>
<td>54.71</td>
</tr>
<tr>
<td>Thinker</td>
<td>21</td>
<td>48.21</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>17</td>
<td>49.91</td>
</tr>
<tr>
<td>Campaigner</td>
<td>18</td>
<td>56.83</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>Real-time chat</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>49</td>
<td>49.36</td>
</tr>
<tr>
<td>Thinker</td>
<td>21</td>
<td>53.71</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>17</td>
<td>57.44</td>
</tr>
<tr>
<td>Campaigner</td>
<td>18</td>
<td>57.89</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>Online Journal notes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>49</td>
<td>54.95</td>
</tr>
<tr>
<td>Thinker</td>
<td>21</td>
<td>49.93</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>17</td>
<td>51.82</td>
</tr>
<tr>
<td>Campaigner</td>
<td>18</td>
<td>52.39</td>
</tr>
<tr>
<td>Total</td>
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<td></td>
</tr>
<tr>
<td>Calendar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>49</td>
<td>50.57</td>
</tr>
<tr>
<td>Thinker</td>
<td>21</td>
<td>56.05</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>17</td>
<td>54.94</td>
</tr>
<tr>
<td>Campaigner</td>
<td>18</td>
<td>54.22</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>Bookmark</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>49</td>
<td>54.37</td>
</tr>
<tr>
<td>Thinker</td>
<td>21</td>
<td>55.60</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>17</td>
<td>56.47</td>
</tr>
<tr>
<td>Campaigner</td>
<td>18</td>
<td>42.97</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td></td>
</tr>
<tr>
<td>Self-assessment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowledge Seeker</td>
<td>49</td>
<td>54.27</td>
</tr>
<tr>
<td>Thinker</td>
<td>21</td>
<td>50.62</td>
</tr>
<tr>
<td>Knowledge Cultivator</td>
<td>17</td>
<td>45.50</td>
</tr>
<tr>
<td>Campaigner</td>
<td>18</td>
<td>59.42</td>
</tr>
<tr>
<td>Total</td>
<td>105</td>
<td></td>
</tr>
</tbody>
</table>
Hypotheses

*Announcement and Clusters*

Ho 1. There is no difference in eLearning website feature preference in regard to the Announcement feature among respondents in four clusters: Knowledge Seeker, Thinker, Knowledge Cultivator, and Campaigner.

The Kruskal-Wallis was used to test for differences in mean preferences for the Announcement feature preference resulting in significance level value 0.936, which is greater than 0.05. Based on this test, the differences amongst clusters with regard to Announcement eLearning feature preference is not statistically significant. Therefore, null hypothesis was not rejected. The SPSS output is presented in the Table 5.23.

*File Exchange and Clusters*

Ho 2. There is no difference in eLearning website feature preference in regard to the File Exchange feature among respondents in four clusters: Knowledge Seeker, Thinker, Knowledge Cultivator, and Campaigner.

The Kruskal-Wallis Test for difference in clusters relating to the File Exchange feature preference resulted in significance level 0.190, which is higher than 0.05. Based on this test, the differences amongst clusters with regard to File Exchange eLearning feature preference is not statistically significant. Null hypothesis was not rejected. The statistical test output is presented in the Table 5.23. The mean rank for File Exchange feature preference ranged from 45.25 to 58.67 for four clusters (Table 5.22).

*E-mail and Clusters*

Ho 3. There is no difference in eLearning website feature preference in regard to the E-mail feature among respondents in four clusters: Knowledge Seeker, Thinker, Knowledge Cultivator, and Campaigner.
Because of the observed significance of 0.900, which is higher than 0.05, the differences amongst clusters with regard to E-mail eLearning feature preference is not statistically significant. Null hypothesis was not rejected. The statistical test output is presented in the Table 5.23. The mean rank for E-mail feature preference ranged from 50.19 to 55.71 for four clusters (Table 5.22).

**Group Discussion Board and Clusters**

Ho 4. There is no difference in eLearning website feature preference in regard to the Group Discussion Board feature among respondents in four clusters: Knowledge Seeker, Thinker, Knowledge Cultivator, and Campaigner.

The Kruskal-Wallis Test for difference in clusters relating to the Group Discussion Board feature preference resulted in significance level 0.749 which is higher than 0.05. Therefore, the difference amongst clusters with regard to Group Discussion Board eLearning feature preference is not statistically significant. Null hypothesis was not rejected. The statistical test output is presented in the Table 5.23. The mean rank for Group Discussion Board feature preference ranged from 48.21 to 56.83 for four clusters (Table 5.22).

<table>
<thead>
<tr>
<th>Table 5.23: Output Kruskal-Wallis Test Statistics (a, b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announcement</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>Chi-Square</td>
</tr>
<tr>
<td>Asymp. Sig.</td>
</tr>
</tbody>
</table>

a  Kruskal Wallis Test  
b  Grouping Variable: Clusters 1 to 4
Real-time Chat and Clusters

Ho 5. There is no difference in eLearning website feature preference in regard to the Real-time Chat feature among respondents in four clusters: Knowledge Seeker, Thinker, Knowledge Cultivator, and Campaigner.

The Kruskal-Wallis Test for difference in clusters relating to the Real-time Chat feature preference resulted in significance level, 0.661, which is higher than 0.05. Therefore, the difference amongst clusters with regard to Real-time Chat eLearning feature preference is statistically non-significant. Null hypothesis was accepted. The statistical test output is presented in the Table 5.23. The mean rank for Real-time Chat feature preference ranged from 49.36 to 57.89 for four clusters (Table 5.22).

Online Journal notes and Clusters

Ho 6. There is no difference in eLearning website feature preference for the Online Journal notes feature among respondents in four clusters: Knowledge Seeker, Thinker, Knowledge Cultivator, and Campaigner.

Because of the observed significance of 0.927, which is higher than 0.05, the differences amongst clusters with regard to Online Journal notes eLearning feature preference is non-statistically significant. Null hypothesis was not rejected. The statistical test output is presented in the Table 5.23. The mean rank for Online Journal notes feature preference ranged from 49.93 to 54.95 for four clusters (Table 5.22).

Calendar and Clusters

Ho 7. There is no difference in eLearning website feature preference in regard to the Calendar feature among respondents in four clusters: Knowledge Seeker, Thinker, Knowledge Cultivator, and Campaigner.

Because of the observed significance of 0.888, which is higher than 0.05, the differences amongst clusters with regard to Calendar eLearning feature preference is non-statistically significant. Null hypothesis was accepted.
The statistical test output is presented in the Table 5.23. The mean rank for Calendar feature preference ranged from 50.57 to 56.05 for four clusters (Table 5.22).

**Bookmark and Clusters**

Ho 8. There is no difference in eLearning website feature preference in regard to the Bookmark feature among respondents in four clusters: Knowledge Seeker, Thinker, Knowledge Cultivator, and Campaigner.

The Kruskal-Wallis Test for difference in clusters relating to the Bookmark feature preference resulted in significance level, 0.469, which is higher than 0.05. Therefore, the difference amongst clusters with regard to Bookmark eLearning feature preference is statistically non-significant. Null hypothesis was accepted. The statistical test output is presented in the Table 5.23. The mean rank for Bookmark feature preference ranged from 42.97 to 56.47 for four clusters (Table 5.22).

**Self-assessment and Clusters**

Ho 9. There is no difference in eLearning website feature preference in regard to the Self-assessment feature among respondents in four clusters: Knowledge Seeker, Thinker, Knowledge Cultivator, and Campaigner.

The Kruskal-Wallis Test for difference in clusters relating to the Self-assessment feature preference resulted in significance level, 0.508, which is higher than 0.05. Therefore, the difference amongst clusters with regard to self-assessment eLearning feature preference is statistically non-significant. Null hypothesis was accepted. The statistical test output is presented in the Table 5.23. The mean rank for Self-assessment feature preference ranged from 45.50 to 59.42 for four clusters (Table 5.22).

All null hypotheses were accepted due to higher observed level of significance (Asymptotic Significance) than 0.05. Upon examination of the mean ranks of dependent variable (eLearning website feature preference), a variation was observed with regard to four clusters of learning styles.
5.9 Summary

This study employed quantitative analyses to investigate how learning styles impact the eLearners’ website feature preferences. The descriptive results about the demographic information of the sampled data from a US university revealed that the majority of students in the College of Graduate Studies were female working adults in the age group of over 36 years with limited eLearning experience on the selected eLearning platform (Blackboard) or any other platform. Majority of the students had their eLearning experience in a hybrid/blended mode. However, some participants had 100 percent online eLearning experience as well. The results of correlations analyses indicate that there are some variations in the association of variables in regard to the degree to which eLearners perceive themselves to be a specific learning style or a combination of learning styles and eLearning website feature preference(s). Also, results from cluster analyses provide some insights into the difference between eLearning website feature preferences and clusters of learning styles. A detailed discussion of results follows in Chapter 6.
Chapter 6
Discussion

6.1 Introduction

Students with diverse learning styles are seeking alternate educational opportunities at postsecondary institutions, and these institutions are offering an increasing number of alternatives in the form of hybrid/blended and online distance education courses. In the past, correspondence courses, independent study, and telecourses were most popular formats for distance educations; however, the growth of the Internet and World Wide Web has increased the popularity of an online format (eLearning) for distance education. With the evidence indicating that eLearning can be as effective as in-class based education in terms of students’ achievements (Chenoweth and Murday, 2003; Poirier and Feldman, 2004; Russel, 2003), fostering huge interest toward eLearning (Sanders and Morrison-Shetlar, 2001; Sankaran, 2000), and engendering eLearning course satisfaction (Collins, 2000; Poirer and Feldman, 2004; Stein, 2004), educators and researchers are investigating ways to understand students’ learning style that can be used to design instructions (Diaz and Cartel, 1999; Federico, 2000; Snnenwald and Li, 2003; Fahy, and Mohamed, 2005; Kayes, and Kayes, 2006). Along these lines, an exploratory research was undertaken to understand relationship between Learning Styles and eLearning website features preference of students in order to inform the designers and instruction technologists of eLearning Systems about its applicability.

Learning style researchers (Sims and Sims, 1995; Hickcox, 2006) suggested that education was most effective when diversity of students’ learning style preferences is addressed. However, addressing the learning style preferences of students requires information about their learning styles (The Institution of Higher Education Policy, 1999). This study gathered information about students’ learning styles involved in eLearning environments - online and hybrid/blended, and their eLearning website feature preferences. The discussions on the research study about the
relationship between learning styles and eLearning website feature preferences are presented in this chapter. The chapter deciphers discussions under three themes under various sections. Theme 1, discusses association between learning styles of individual eLearners and their eLearning website feature preferences in Section 6.2; Theme 2, describes future research and limitations in section 6.3; and Theme 3, expounds on managerial applicability for eLearning website system developers in section 6.4. A summary of the chapter is presented in section 6.5.

6.2 Association between Learning Styles and eLearning Website Feature preferences, and the wider context of user acceptance

The discussions about the association between learning styles and eLearning website feature preferences are divided into four parts. Part I, discusses the descriptive statistics on demographic information, learning styles of eLearners' and their eLearning website Feature preference. Part II, describes the discussions on statistics relevant to testing the experimental hypothesis. Part III, illustrates the discussions on cluster analysis and reviews relationship between learning style clusters and eLearning website feature preference, and the Part IV, reviews the discussions on results from Kruskal-Wallis ANOVA.

Additionally, researcher provides a discussion on the learning style differences in the wider context of user acceptance as it relates to the relationship between learning styles and eLearning website feature preferences.

Part I: Discussions on the descriptive Statistics on demographic information and eLearning website feature preference

The background information of eLearning students is an essential research issue because prior research has shown that distance education students have different characteristics than in-class/onsite students (Phipps, Wellman and Merisotis, 1998; Ashby, 2002; Wisab, Roy and Pscherer, 2001; and Serban and Fleming, 2002). The background information questions focused on five categories: gender, academic status and discipline, age, type and extent of
eLearning and employment status (Appendix – A). The analysis of results of background information indicated that females were in majority (59%). This finding is widely supported in the distance education literature: The National Postsecondary Student Aid Study (NPSAS) reported that 65% of the participants in their online were females. University of Maryland reported that 57% of the participants in their online courses and 60% in their hybrid courses were females. Santa Barbra College reported that 57% of their participants in the online courses were females, and Nova Southeastern University reported that 69% of its participants were females.

Concerning age, there were more (52.4%) non-traditional age (36 and above) participants in this research investigation. This trend has been reported in various studies. Ashby (2002) reported that distance education were older that in-classroom or site-based students, with average age of 30. The University of Maryland (Wisan, Roy and Pscherer, 2001) reported that 73% of the online and 76% of the hybrid were older than 25 years of age.

The findings concerning academic status indicated that there were more graduate students than undergraduate students. There are no similar data or results in the reports researched. Therefore, it has not been placed this finding in the context of prior research. However, it must be mentioned that site of data collection is a primarily a graduate campus.

The type of eLearning experience of the participants was predominantly hybrid/blended. Sixty seven percent of all participants had experience in hybrid/blended form of eLearning experience, which suggests that participants took advantage of having more than one learning environment option. Similar findings have been reported in Sloan-C Invitational Workshop on Blended Learning Report (2004) stating that hybrid/blended eLearning experience provided students flexibility in terms of time and space interaction.

The majority (69.5%) of eLearning experience, in terms of the number of eLearning classes taken, was represented by students who had taken online and hybrid/blended classes between one and five. The students having
number of eLearning class between six and ten and eleven plus, were trailing with 14.3 percent and 16.2 percent, respectively. Since eLearning is still developing and becoming popular in the US higher education as an alternate means education, apparently, an extensive eLearning experience is not very common amongst students yet.

Discussion on the description of eLearning Website Feature Preferences

Aggregated summaries of eLearning Website Feature preferences

A median value of seven was noted for Announcement, File exchange and Email eLearning feature preferences. Possibly, this could be due to the extent of use of the features needed for communication with the lecturer or other eLearners. However, the median for the features Group discussion and Real-time Chat was six and five, respectively. These features are essentially used for collaboration among students. These were not preferred at the same level as the features relating to communication. In a hybrid/blended eLearning environment, perhaps, student may use face-to-face time during classroom or outside classroom meetings, and other means such as telephone conferencing for collaboration. The eLearning features such as Self-assessment, Bookmark and Calendar, were also not as highly preferred as communication features. The median value for Self-assessment feature was six indicating productivity related feature had more rating on the preference scale. The lowest median value observed amongst all features was attributed to Online Journal Notes. Apparently, Online Journal Notes is relatively less preferred eLearning website feature. In the absence of previously published research on eLearning website feature preference, it is not possible place all these finding in the context of prior research.

Summaries of frequencies of eLearning Website Feature preference

The combined frequencies of six and seven ratings of eLearning website feature preferences were evaluated. The features relating to communication were the dominant group among all features. The feature Announcement was given a rating of six and seven by 85.7 percent of the eLearners.
Features File Exchange and Email were rated six and seven by 84.8 percent eLearners. The Self-assessment feature preference was indicated to be the highly preferred at 74.3 percent. It appears that in hybrid/blended eLearning environment students prefer features for communication and productivity than collaboration (Group Discussion, Real-time Chat and Online Journal Notes). This, possibly, could be explained by the nature of hybrid/blended environment as it provides on-site opportunities for collaboration, and students do not have to depend on the eLearning website features for collaboration to a large extent.

Discussions on the description of Learning Styles

Of four learning styles, the Activist had the lowest mean score and the Theorist the highest. The median percentile score was highest for the Pragmatist, followed by Theorist, Reflector and Activists. It appears that the median scores for Pragmatist (68%), Theorist (66%) and Reflector (61%) were the closer than Activist (57%). Since the data were collected primarily from the graduate campus population, the majority age group was 36 and above working students. There were less young eLearners in the sample. The common traits of Activists are associated with people who enjoy the immediate experience. They like exercises and problems, drama and excitement. They dislike simply observing (Honey and Mumford, 2006). Therefore, it could be suggested that there were fewer younger students, hence the lower mean and percentile scores for the Activist learning style.

Part II: Discussion on Correlation Analysis

Learning Styles and eLearning Website Feature preferences

Honey and Mumford (2000) claim that positive correlations exist between learning styles and learning activities. For example, Activists prefer action learning, business game simulations, discussion in small groups, job rotation, outdoor activities, role playing and training others; Reflectors prefer eLearning, learning reviews, lectures/presentations, role playing, reading and self-directed studies; Theorists prefer analytical reviews, lectures, self-directed learning, independent studies and video presentations;
and Pragmatists prefer action learning, problem solving, small group workshops, applied learning group work and project work.

The correlation analysis to examine the magnitude and direction of association between learning styles and eLearning website feature preferences (Table 5.11) revealed a statistically significant relationship among the Activist and Group discussion (0.194), Theorist and File Exchange (0.197), and Pragmatist and Online Journal Notes (0.202) at the 0.05 level of significance. Although, these correlations were positive and statistically significant but the magnitude of these correlations was low. Other correlations between learning styles and feature preference were very low in magnitude, and exhibited positive or negative direction as shown in the matrix (Table 6.1 and Figure 6.1). Therefore, researcher did not find a strong association between learning styles and eLearning website feature preference.

In the absence of prior research pertaining to the eLearning website feature preference; it is not feasible to place this finding in the context of existing research. However, from a design perspective of eLearning websites, learning styles, usability and accessibility have been recognized to be important (Person and Koppi, 2001; Tselios, Avouris, Dimitracopoulou & Daskalaki, 2001; Zaharias, 2002).

Learning Style Combinations and eLearning Website Features

According to Honey and Mumford (2000), there is not just one dominant learning style in learners, but there could be more than one prominent learning style in an individual. With this in view, Spearman’s Rho correlation matrix of ten combinations of learning styles and eLearning website features was analysed (Table 5.12). Sixteen positive and statistically significant correlations were observed between ten combination of learning styles (Activist and Reflector (ActRef), Activist and Theorist (ActTH), Activist and Pragmatist (ActPrg), Reflector and Theorist (RefTH), Reflector and Pragmatist (RefPrg), Theorist and
Table 6.1: Matrix of eLearning Website Features and Learning Styles

<table>
<thead>
<tr>
<th>eLearning Features</th>
<th>Activist</th>
<th>Reflector</th>
<th>Theorist</th>
<th>Pragmatist</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Positive</td>
<td>Negative</td>
<td>Significant</td>
<td>Positive</td>
</tr>
<tr>
<td>Announcement</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>File Exchange</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Email</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Group Discussions</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Real-time Chat</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Online J Notes</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calendar</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bookmark</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-assessment</td>
<td>+</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All Spearman Rho Correlations were below 0.202
- Significant at 0.05 level
Figure 6.1: Learning Styles and eLearning Website Features
(Spearman Rho Correlation)
Pragmatist (THPrg), Activist, Reflector and Theorist (ART), Activist, Theorist and Pragmatist (ATP), Reflector, Theorist and Pragmatist (RTP), and Pragmatist, Reflector and Activist (PRA) and nine eLearning website features.

Of nine eLearning website feature, only four features were significantly correlated to learning style combinations. File Exchange was positively and significantly correlated to RefTH (0.219), THPrg (0.253), ART (0.236), ATP (0.223) and RTP (0.246). Group discussion board was positively and significantly correlated to ActRef (0.248), ActTH (0.23), ActPrg (0.23), ART (0.229), ATP (0.242) and PRA (0.271). Online Journal notes feature was positively and statistically significantly correlated to ActRef (0.203), RefPrg (0.226) and PRA (0.254). Calendar feature was positively correlated with ActRef (0.212) and PRA (0.215). These correlations were positive.

The correlations matrix reveals that there were positive and negative correlations; however, the magnitude of these correlations was very low (Table 6.2 and Figure 6.2). Therefore, researcher did find a weak association between the degree to which an eLearner perceives oneself to be a combination of certain learning style and eLearning website features mentioned above. Again, it is not feasible to put these findings in the context of prior research due the absence of such research reported in the literature. However, these findings have design implications for eLearning website System designers and instructional technologists as discussed in the section 6.2 and 6.3.

**Part III: Discussions on Cluster Analysis**

Analysis of the Graphic profile of learning style clusters reveals that Knowledge Cultivator had a high mean score in all learning styles except in Activist.
Table 6.2: Matrix of eLearning Website Features and Combination of Learning Styles

<table>
<thead>
<tr>
<th>Feature</th>
<th>ActRef</th>
<th>ActTH</th>
<th>ActPrg</th>
<th>RefTH</th>
<th>RefPrg</th>
<th>THPrg</th>
<th>ART</th>
<th>ATP</th>
<th>RTP</th>
<th>PRA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Announcement</td>
<td>+</td>
<td>-</td>
<td>S</td>
<td>+</td>
<td>-</td>
<td>S</td>
<td>+</td>
<td>-</td>
<td>S</td>
<td>+</td>
</tr>
<tr>
<td>File Exchange</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>*</td>
<td>+</td>
<td>**</td>
<td>+</td>
<td>*</td>
<td>+</td>
</tr>
<tr>
<td>Email</td>
<td>+</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Group Discussions</td>
<td>+</td>
<td>*</td>
<td>+</td>
<td>*</td>
<td>+</td>
<td>+</td>
<td>*</td>
<td>+</td>
<td>*</td>
<td>+</td>
</tr>
<tr>
<td>Real-time Chat</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td></td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Online J Notes</td>
<td>+</td>
<td>*</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>*</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>**</td>
</tr>
<tr>
<td>Calendar</td>
<td>+</td>
<td></td>
<td>*</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Bookmark</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Self-assessment</td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

All Spearman Rho Correlations were below 0.271  
* Significant at 0.05 level  
** Significant at 0.01 level

Combination Notations:

1. ActRef: Activist and Reflector  
2. ActTH: Activist and Theorist  
3. ActPrg: Activist and Pragmatist  
4. RefTH: Reflector and Theorist  
5. RefPrg: Reflector and Pragmatist  
6. THPrg: Theorist and Pragmatist  
7. ART: Activist, Reflector, and Theorist  
8. ATP: Activist, Theorist, and Pragmatist  
9. RTP: Reflector, Theorist, and Pragmatist  
10. PRA: Pragmatist, Reflector, and Activist
Figure 6.2: Combination of Learning Styles and eLearning Website Features
(Spearman Rho Correlation)

LS Combinations and eLearning Website Features

- Spearman Rho Correlation

LS Combinations

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Similarly, Knowledge Seeker cluster had high scores in Reflector and Theorist, and low score in Activist. The score for Pragmatist was low as well. Knowledge Seeker, therefore, appears to have similar attributes as that of Knowledge Cultivator with lower Pragmatist scores. The mean score attributes for Thinker were high for reflector, moderate for Pragmatist, and low for Activist and Theorist. Therefore, it appears that the Thinker cluster is distinctly different than Knowledge Cultivator and Knowledge Seeker. Campaigner cluster has high mean scores in Activist and Pragmatist, and low mean scores in Reflector and Theorist. Again, the scores attributes of Campaigner are different than the rest of the clusters. There is no prior research to place these clusters in similar groups based on learning style characteristics.

**Additional characteristics**

The crosstabulation of clusters and age group revealed that Knowledge Seeker with 36 and above age group is the majority group. In the eLearning environment, generally, students are older (Ashby, 2000; Wisan, Roy and Pscherer, 2001). This study finds students to have higher mean score on Reflector style who would exhibit to be methodical, thorough and careful, and Theorist style who would to be rational and analytical, and like logical structures and to ask probing questions to expose flawed, inconsistent thinking according to Honey and Mumford (2006).

Clusters and gender crosstabulation shows that males (22.9%) and females (23.8%) were almost equal in the Knowledge Seeker cluster. Other clusters have higher percentage of female participants. This could be due to the majority of female participants in the current eLearning study. The crosstab analysis between clusters and academic status illustrates that graduate participants were dominant in all clusters. It could be a result of the nature of data collection site, where primarily graduate education is offered to working adults in the Washington, DC area.
Clusters and eLearning experience crosstab demonstrates that majority of eLearners have taken between 1 and 5 classes only in all clusters. An extensive eLearning experience was not prominent in the study. This could be explained by the fact that eLearning is still in developing environment, and in its nascent stages.

Hybrid/Blended mode was the dominant mode of eLearning amongst all clusters. This could be due to the desire for in-class experience, and time and space freedom requirement of the working adults.

Correlation: Clusters and eLearning Website Feature preference

The direction and magnitude of association between learning style clusters and eLearning website features demonstrated that only File exchange feature was negatively and significantly correlated ($r = -0.212$) at 0.05 level of significance. However, other features (Announcement, Email, Real-time chat and Calendar) were positively but non-significantly correlated (Figure 6.3). It could, therefore, be implied that clusters do not have a strong positive or negative association with the eLearning website feature preferences. The only significantly negative correlation was also weak in strength. Due to the lack of any related preceding research in literature, it is not feasible to put this finding in the context of prior research.

Part IV

Discussions on Kruskal-Wallis ANOVA of Clusters and eLearning Website Feature preference

According to Kruskal-Wallis ANOVA of clusters, there was no significant difference in the in eLearning website Features preference (Announcement, File Exchange, Email, Group Discussion Board, Real-time Chat, Online Journal Notes, Calendar, Bookmark and Self-assessment) among respondents in four Clusters – Knowledge Seeker, Thinker, Knowledge cultivator and Campaigner. It is possible that eLearning website features are not influenced by clusters of learning styles. It may be inferred that eLearning website feature preference is not swayed by the learning style of
the eLearners. However, Wang et al. (2004) have found a significant
difference in the academic achievement of different learning styles. Their
unique learning style constructs were based on attendance, interaction and
involvement, and material-reading in a cyber university, and not on any of
the learning style models or instruments reported in the literature.

**Figure 6.3: Clusters and eLearning Website Feature Preference**
(Spearman Rho Correlation)

![Clustering and eLearning Website Features](image)

In the absence of relevant prior research literature, it is not possible to place
the finding about learning styles and eLearning website preference in the
context of previous research. However, a study of clusters may be relevant
for further research in terms of a potential alternate theoretical basis to
consider issues of learning entailing the learning process or outcome and
engagement rather than learning styles only. An understanding of
structuring eLearning experiences with focus on quality of eLearning
engagement, interaction with the content, instructor, classmates and course
interface would expand traditional research interest of learning styles into
research opportunities relating to learning style clusters and eLearning
engagement issues.
6.3 Future research and limitations

This research is one of the first studies examining association between learning styles and eLearning website feature preferences. The results of the study have suggested that there is, largely, a non-significant correlation between learning styles and eLearning website preferences. Similarly, combinations of learning styles have, largely, non-significant correlation association with eLearning website feature preferences. There were three positive and significant correlations between learning styles and eLearning website feature preferences (Activist and Group Discussions; Theorist and File Exchange; and Pragmatist and Online Journal Notes). Also, there were sixteen positive and significant correlations (weak) between the combination of learning styles and eLearning website feature preference (Table 5: 12).

There are several opportunities for future research and limitations of the current research.

The learning style model used in this study was Honey and Mumford model, which diagnoses learning styles as Activist, Reflector, Theorist and Pragmatist. Researcher may consider using other models such as Kolb’s inventory of learning style which was developed based on the experiential learning or Grasha-Reichmann Student Learning Style Scale which was defined around student’s attitude toward learning in the classroom or some other learning model that may be designed specifically for eLearning Style measurement. Learning style categories identified by other learning style models or eLearning Style models may be more appropriate to diagnose or develop an understanding association between the learning styles of eLearners and their website feature preferences.

The eLearning website platform used for eLearning website feature preference selection, in the current study, was Blackboard which is a prominent eLearning website System. Therefore, eLearning website preferences used were based on only one platform, and that might have presented limited choices to the survey participants in terms of eLearners’ website feature preferences. Researchers may contemplate using other eLearning website platforms to have a broader selection of eLearners’
preference of eLearning website features. A broader selection of eLearning website platforms may, possibly, provide a more comprehensive view of the eLearners’ website feature preferences.

The sample size was limited to the graduate and senior undergraduate students enrolled in a US university using hybrid/blended mode of eLearning. Research questions and accompanying hypotheses were tested with data from one hundred and five participants only. Future studies should consider increase in the sample size to have more thorough statistical analysis. Having a larger sample size in the study is important because using a significance test with small sample size makes it less likely to detect significant effect (Moore and McCabe, 1999). Therefore, replication studies should be conducted with large number of eLearning participants to increase the power of results.

Sampling was done, primarily, on the graduate campus site of the university, where majority of the students are adult professionals. Thus, findings of this study do not represent the general population of online undergraduate students or eLearners. Future studies should utilize random selection of eLearner in both undergraduate and graduate campuses in online and hybrid/blended courses to increase the generalisability of their findings. Therefore, suggestions made based on the results of this study cannot be generalised beyond the sample student population. Conducting studies with random samples of students studying at different academic levels and disciplines increases the generalisability of findings to students of other academic status and disciplines. As a result, general principles and guidelines may be able to extend help instructional and eLearning website designers create more effective eLearning courses (online and hybrid/blended) for eLearners from across disciplines and academic levels.

Adult working professional students were used as the main participants in this study. Thus, future research should be considered replicating the study with other participants from different age groups to study the impact of perceived leaning style of students on their preference of eLearning website features. Studies conducted with students from other age groups may reveal
different results in terms of relationships between learning styles and eLearning website feature preferences. Therefore, it is important to replicate this study with students from different age groups to provide practical suggestions, if any, for instructional designers, in selecting eLearning website features to address the specific learning styles and needs of target students. However, it should be noted that the learning styles of younger individuals often change which suggests that researcher results on young students may be suspect and more importantly designing instructions for young individuals may require adding more flexibility in the types of research and activities used. Researchers who plan to replicate this study with non-adult individuals should consider that learning style of non-adult individuals are not, generally, stable and may change while studies are being conducted.

Conceptually matching student’s learning style and eLearning website feature preference would improve eLearning outcome of students. However, in this exploratory study, eLearning outcome have not been researched as a result of matching learning style and website feature preference. Future research should also measure the perceived learning outcome of students in conditions where the matching has taken place. There is a possibility that effects of treatment which is a matched condition may be detected by measuring learning outcome of students. Therefore, effects of matching learning styles with eLearning website features should be studied in relation to the learning outcome.

In this study, eLearning website features were primarily online text-based resources. Similar studies should also be replicated in online courses using eLearning website features with two-way synchronised audio and video communications. Integrating features requiring the use of synchronised communication may generate new associations between learning styles and eLearning website feature preferences, and that may bring new understanding to the research question. This may have instructional design implications.
As individual learners have different learning styles, their course instructors have various learning and teaching styles as well. This study did not take into account the learning or teaching styles of the instructor facilitating the online or hybrid/blended courses. There is a possibility that students whose learning style matched instructor's learning style and/or teaching styles find eLearning more effective than students whose learning styles did not match the instructor's learning or teaching style, and may exhibit a strong preference for certain eLearning website features. Future research should consider this possibility and integrate research questions to investigate the effects of matching students' learning styles and instructors' learning styles, and its association of eLearning website feature preferences.

A quantitative approach was used in this study. Future studies should consider also using qualitative method to provide a richer perspective in understanding the association between learning styles of eLearners and their preference of eLearning website features, the effects of matching learning and teaching styles on website feature preferences. Qualitative data may help to learn more about the nature of interaction among students and instructors that take place while students complete online and hybrid/blended courses, and how it influences the eLearning website feature preferences. This information would provide a deeper knowledge about the nature of association between learning styles and eLearning website feature preference in addition to the association measured through use of quantitative methods.

The statistical results in this study did not indicate strongly significant associations for the hypotheses tested. However, it is not clear whether these results could represent website feature preferences for a wider group of eLearners because there were several limitations including small sample size, data collection site predominantly being a graduate campus, age group of students, working adult learners, small degree of eLearning experience and only few disciplines.
6.4 Managerial Applicability

Early learning style inventories were formulated over 2500 years ago (Claxton and Murrell, 1987). Studies addressing the educational problem of adopting instructions to individual's learning styles, however, did not appear until the nineteenth century and since then researchers have been continuing to investigate the question (Snow et al., 2002). This research provided additional findings to the body of literature about understanding relationship between learning styles and eLearning website feature preferences in the eLeaming environment. This study is among the few studies conducted to investigate the question with adult students in online or hybrid/blended courses. Although, very few statistically significant with low magnitude results were found in this study, findings still suggest recommendations for online course designers, instructors and managers of online/eLearning course institutions, who invest enormous money in eLearning education. These suggestions can help eLearning instructors, instructional and eLearning website designers to design effective online courses, and also help institutions offering online courses to design online course policies.

Implications for eLeaming Course Instructors and Designers

Designing effective eLearning courses is challenging and many courses do not stand up to quality standards (Koszalka and Ganesan, 2004). The online technologies are developing more rapidly than the research studies being conducted to analyse how these technologies can be utilised to improve learning in eLearning environment. There is a lack of understanding as to how eLearning environments can be designed to be most effective is problematic for instructors, instructional technologists/designers as well as students. This dissertation studied this problem through a focused investigation about understanding relationships between perceived learning styles and eLearning website feature preference of eLearners. Mostly, non-significant results about the association between the perceived learning styles and website feature preferences shed light on instructional design and development issues. These findings provide prescriptions that caution should be exercised by the instructional designer and eLearning website
System designers in formulating eLearning website features for eLearning students with regard to learning styles.

The findings of this study suggested that eLearning website features, to a large extent, did not correlate with the learning styles, combinations of learning styles or clusters of learning styles of eLearners. This supports the premise that instructions designed to be rich in activities and resources can be effective regardless of the learning styles of students (Merrill, 2002) for online courses.

Online course instructional designers should not focus predominantly on creating eLearning website features and facilitating instructional activities specifically designed to match eLearners learning styles rather they should focus more on creating instructions that give eLearners choice in engaging with content in multiple ways. Technology may be limiting if used only as a delivery mechanism. Further research on content and the use of eLearning website features to strengthen engagement of eLearners may be useful. For example, interaction with the content: online discussion/learning may provide supportive for experimenting ideas, thinking, exploring multiple perspectives, complex understanding, and reflection (Parker and Gemino, 2004; Picciano, 2002). This may have implications for practice as it would encourage instructors to design online discussion through provocative, open-ended questions, modeling, support and encouragement for diverse points of view. The development of grading rubrics for discussion participation that reward desired cognitive behaviors would help eLearners engage more and effectively. Use of course activities to support written assignments, one-on-one tutorial, small group collaboration and self-testing may strengthen engagement of eLearners in the online learning environment. Use of eLearning website features may strengthen interaction with the instructor by eLearning receiving an ongoing assessment of student performance linked to immediate feedback and individualized instruction that supports learning. (Riccomini, 2002; Kashy, et al., 2003). Using eLearning website features instructors would be able to automate testing, provide frequent opportunities for testing and feedback, develop general learning modules with
opportunities for active learning, assessment and feedback that can be shared among courses and/or accessed by students for remediation or enrichment and could serve as an inventory of resources for eLearners without the constraints of time and space interaction.

**Implications for Institutions Offering eLearning Courses**

Online students are searching for and need high-quality eLearning courses and programs (Palloff and Pratt, 2003). Being able to use online eLearning website System may not necessarily fulfill the expectations of adult online students who, in general, enroll in online courses because of time and space interaction constraints, and expect to learn at least as much as they can possibly in face-to-face courses. Online courses should be designed with adult students in mind to ensure that online courses assist students in achieving their career goals. Course design policies should be developed to ensure the design and delivery of quality online courses that meet the expectations of adult students. Policies provide a framework for the operation of online courses (Simonson, Smaldino, Albright and Zvaeeek, 2003). The following suggestions are made for institutions offering online courses to develop design policies for online courses.

Institutions offering online courses should advocate the design of high quality online instruction by providing effective and appealing online courses to promote learning. This would mean developing instructions rich in resources and choices for instructional strategies in eLearning environment that appeal to a variety of eLearners. When eLearners are satisfied with their online courses, they are more likely to be successful in eLearning environment and less likely to withdraw from courses (Palloff and Pratt, 2003). Being able to provide well-designed online courses may reduce the drop out rates in online courses, which have been one of the major problems in online learning (Palloff and Pratt, 2003).

**6.5 Summary**

This exploratory study was primarily designed to investigate the relationships between learning styles and eLearning website feature
preference. Conceptually, it was expected that perceived learning styles, combinations of learning styles and clusters of learning styles of eLearners may exhibit associations with website feature preferences of eLearners. Findings of this study, however, did not support significant existence of relationships where adult eLearners were taking eLearning classes in hybrid/blended mode. Thus, non-existence of association largely, between learning styles and eLearning website feature preference should be carefully taken into account for designing eLearning website features.
Chapter 7

Conclusions

The Internet is used enormously for communication and knowledge sharing throughout the world. Courses are being offered on the Internet to provide options in terms of time and space interactions and reach large student populations who seek alternative settings where they can improve their knowledge and skills while studying from distance. This study investigated the relationships between learning styles and website features preferences of eLearners, particularly to research – how to categorise learning styles using an inventory of learning style models and instruments, eLearning website features from various eLearning website Systems, and how do learning styles impact the eLearner’s preference of eLearning website features? The results of the study are important to provide suggestions for online and hybrid/blended eLearning website System designers, instructional designers, instructors.

In an attempt to study primarily the relationships, correlation studies were carried out between learning styles and combinations of learning styles of the participants and eLearning website features preference. The results of this study indicated that largely there were non-significant correlations between the learning styles, combinations of learning styles and website feature preferences. There were few significant, but weak positive and negative correlations between the learning styles and combinations of learning styles suggesting that a caution should be exercised by the eLearning website System designers and instructional designer in formulating eLearning website features using eLearning students’ learning styles as a consideration.

Secondarily, the association of learning style clusters and eLearning website feature preferences were examined in this study. Knowledge Seekers were the dominant group among all four clusters. The results indicated that at least two clusters (Knowledge Cultivator and Knowledge Seeker) have similar characteristics with small difference in the Pragmatist score.
Kruskal-Wallis Test was conducted to compare the ranked mean scores on Clusters and eLearning website feature preferences. The results also showed that there is no difference in eLearning website feature preferences among respondents in four Clusters – Knowledge Seeker, Thinker, Knowledge cultivator and Campaigner.

As per this research study, it could be suggested that learning styles, combination of learning styles or clusters of learning styles do not have significant association with the eLearning website feature preferences. Since this is one of the few studies that have been conducted in this area, the results are not strong enough to offer generalisability. Questions remain as to whether these results represent reality. However, this research has suggested new avenues to explore and provide some insights that may lead to better understanding. Therefore, it is important to replicate and validate these findings. Such studies may help to identify principles and guidelines that can inform the development of effective and preferable eLearning website features in the eLearning environment. Future research should consider investigations with learning style instruments that are designed specifically for eLearners with larger sample sizes, more number of samples, younger eLearners, enhanced eLearning website features with audio and video integration, and more eLearning platforms to discover findings that could offer generalisability.

This research is one of the few studies conducted to provide suggestions for eLearning website system designers and online instructions designers about eLearning website feature preference based on learning styles. The results of this study suggested that there is no association between learning styles, combination of learning styles or clusters of learning styles and eLearning website features. Thus, future research should concentrate on exploring other stated factors that can be investigated in understanding relationships between learning styles and eLearning website features.
Reflective Diary

The researcher's reflective diary includes an account of his experiences during the entire Doctor of Business Administration programme and how experiences have impacted and improved his work in his university teaching and research. These experiences and impacts are categorised into two parts: Part I - reflections based on the taught modules, and Part II - the impacts based on research component. Overall DBA studies have impacted researcher's work in his job at the university in teaching and his ability to conduct research. The most noticeable improvements are in communication, both - oral and written – the researcher's in-class communication in the subject matter is more embedded in current academic and practice literature in his area of teaching - technology management and information systems. His time management has improved significantly in providing in-depth feedback on the assignments and research work of the students. The researcher is able to review research work of colleagues or research conference papers in the context of intensity of scholarly inquiry, conceptual underpinnings entailing the literature, justification of research undertaken, analytical view of the body of literature researched, methods of conducting research, philosophical view of research, epistemology and assumptions associated with methodology and ontology, and lateral thinking in organising discussions and implications more effectively now than before as a result of DBA studies.

Part I: Impact from Taught Modules

1. Philosophical Underpinnings of Research Methods

This modules has impacted researcher's basic orientation toward teaching and conducting academic research due to the exposure provided about the research process, phases, research designs, notions of objectivity and subjectivity, sociology of knowledge, epistemology and ontology, difference between inductive and deductive approaches, concepts relating to theory building- models, propositions and hypotheses, sample size, ways of integrating qualitative and quantitative approaches and ethics.
This module has influenced researcher’s ability to teach an MBA level course in ‘research methods’ at his university in terms of providing a thorough overview of the qualitative and quantitative methods and their appropriateness in a particular research case or topic. The content of the module has helped the researcher to reflect critically on the research concepts and terminologies used, which he is able to use for teaching courses in his job, in general.

2. **Qualitative Module: Influence Impact**

The qualitative module was particularly insightful for the researcher as it presented information pertaining to the acquisition of knowledge that researcher was not quite familiar with. It has influenced the researcher in his teaching and research at the university. As a result, he has been able to incorporate philosophical aspects of phenomenological techniques and their description such as text analysis, cognitive mapping, argument maps, integration of qualitative or quantitative approaches in research design in teaching his classes. The researcher has learned the usefulness of case study planning and analysis, focus group, projective techniques, interviews, reflective diaries and action research. In-class demonstrations of group discussions, interviewing sessions were useful in understanding the pitfalls of implementing such techniques that could be avoided. From the insight gained from the assessment assignment researcher has been able to teach qualitative approaches in developing a research proposal to his students more effectively.

3. **Quantitative Module**

The quantitative module was particularly helpful for the researcher’s dissertation as predominantly positivist approach has been adopted for this research. The module helped the researcher conceptualise the research design and implementation of the DBA research project. The assessment component of the module helped in preparing for non-parametric statistical techniques and assumptions used in the dissertation. The exposure of SPSS was invaluable in conducting the data analysis.
The module did set the stage for researcher to be able to use quantitative research methods for data collection, and understand the practical problems or issues involved in the use of quantitative approach.

4. **Critical Review**

The critical review module provided insights into the understanding pointers that were needed while reviewing or studying the management research literature. It has impacted researcher's teaching and research to appreciate in-depth analysis, evaluative judgement, understanding of complexity and managerial issues, developing critical perspective in the assessment academic literature, proposal and reports. The assessment component provided opportunity to demonstrate skills acquired via this module to review two academic journal articles from the perspective of examining the justification, conceptual underpinning, methodological approaches, criticality, research evaluation, addition to knowledge, logic, adequacy and extent of findings, clarity and style of storyline and communication, which researcher uses to do his teaching and research job more effectively.

5. **Research Planning and Proposal Writing**

The research planning and proposal writing module helped the researcher in developing a research proposal with academic rigour and practical relevance, and presented an opportunity to demonstrate and conceptualise the design of a research project for the dissertation via the assessment exercise. It served as a platform to write an acceptable proposal for the dissertation that included objectives, justification, data collection, proposed analysis and schedule of activities.

For the researcher, this module was useful in having an overall understanding of the research project and activities for rest of the DBA studies. The insights gained from this module have been useful in directing writing of a research proposal for his MBA students.
Part II: Impact from Research Component

1. **Seminars:**
   - Literature Review

The researcher collected literature relating to various aspects of eLearning, learning styles and eLearning website features from a variety of secondary sources and acquired knowledge of different learning style models and their effectiveness in measuring learning styles. During literature review a large number of eLearning website features were studied to evaluate feature of the websites for identifying eLearning website features for the undertaken study on understanding relationship between eLearning website feature preferences and learning styles.

In addition to the literature mentioned above, website quality literature was research initially, but discontinued as a concrete dissertation research topic was synthesised. This was a significant experience to understand the practical feasibility of research pursuits to be undertaken in the DBA programme. As a result of this experience, the researcher is able to direct his students in an appropriate manner keeping in mind the constraints and practical feasibility of the research project or topic.

- **Methodology**

The seminar on methodology provided an opportunity to receive a feedback on the proposed framework of relationship between eLearning website features and learning styles, and as a result the framework was modified. Also, it provided clarity in conceptualising and deciding on the specific hypotheses, statistical techniques, sampling and constraints of the methods. Because of this experience, the researcher has incorporated milestone seminars to monitor progress and provide adequate feedback to his students during the process in his job.
• Results

It presented an opportunity of describe results obtained from data analyses in the form of descriptive, hypotheses testing, correlations and cluster analyses. The feedback was positive and a good amount of work had been completed in this phase.

2. Dissertation writing

The researcher found this part to be the most rigorous part of the programme that required putting all pieces of the research process together. The organisation provided in various modules and supervision assistance given by the supervisors, particularly, in terms of providing the structure for the dissertation document and chapters, turned out to be quite useful. The dissertation write up was guided throughout by the supervisors and valuable suggestions were made. Overall review of the dissertation received positive comments, and the suggestions were incorporated.

The researcher enjoyed criticality of constructive feedback and efficiency of the supervisors during the write up process. It was a pleasant learning experience. This has impacted researcher’s ability to direct advisement and supervision of his students in a more directive and effective way. It has proved to be an efficient method for directing research projects and report writing.

3. Summary

The researcher has been able to integrate lessons learned from both components of the DBA programme. The experiences have impacted researcher’s university teaching and research in the manner described in sections above. His teaching assessment and job performance reflect an appreciation by the students, peers and supervisors.
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Appendix- A

(Glossary of terms relating to eLearning Website features)
Glossary of terms relating to eLearning Website features

(Key Source: various eLearning Websites)

Communication Tools

Discussion Forums

Discussion forums are online tools that capture the exchange of messages over time, sometimes over a period of days, weeks, or even months. Threaded discussion forums are organized into categories so that the exchange of messages and responses are grouped together and are easy to find.

File Exchange

File exchange tools allow learners to upload files from their local computers and share these files with instructors or other students in an online course. Note: File attachments to messages are part of Internal Email and Discussion Forums.

File Exchange tools enable downloading files and upload or posting files over the Web from within the course (a.k.a. assignment drop box).

Internal Email

Internal email is electronic mail that can be read or sent from inside an online course.

Email tools enable messages be read and sent exclusively inside the course or alternatively the tools enable links to external email addresses of those in the course so that contacting course members is facilitated. Internal email may include an address book and some address books are searchable.
Online Journal/Notes

Online Notes/Journal enable students to make notes in a personal or private journal. Students can share personal journal entries with their instructor or other students but cannot share private journal entries.

Online Note/Journal tool enables students to make notes about course experiences. These notes can be personal or private. Students can share personal notes with an instructor or other students. They cannot share private journal entries. This tool can be used to facilitate writing assignments where parts are written over time and then later assembled into a document. This tool also can be used to make personal annotations to pages of a course that can later be used as a study aide. The Online Notes tool can also be used to record reflections about personal learning accomplishments and how to apply this new knowledge.

Real-time Chat

Real-time chat is a conversation between people over the Internet that involves exchanging messages back and forth at virtually the same time. Chat includes facilities like Internet Relay Chat (IRC), instant messaging, and similar text exchanges in real time. Some chat facilities allow the chats to be archived for later reference. Some chats can be moderated, similar to the notion of "passing the microphone." Other chats can be monitored, where an instructor can view the conversation in a room without their presence being broadcast.

Video Services

Video services enable instructors to either stream video from within the system, or else enable video conferencing, either between instructors and students or between students. Video Services include tools for broadcasting video to those without a video input device. Some video services provide for two-way or multi-way video conferencing which may be point-to-point
connections or mediated through a central server. See also Real-Time Chat and Whiteboard.

**Whiteboard**

Whiteboard tools include an electronic version of a dry-erase board used by instructors and learners in a virtual classroom (also called a smartboard or electronic whiteboard) and other synchronous services such as application sharing, group browsing, and voice chat.

Application sharing allows a software program running on one computer to be viewed, and sometimes controlled from a remote computer. For example, an instructor using this feature can demonstrate a chemistry experiment or a software utility to an online student and allow the student to use the demonstration software from their own computer. Group Web Browsing allows an instructor to guide learners on a tour of web sites using a shared browser window. Voice chat allows two or more to communicate in real time via microphones, conference call style, over an Internet connection.

**Productivity Tools**

**Bookmarks**

Bookmarks allow students to easily return to important pages within their course or outside their course on the web. In some cases bookmarks are for an individual student's private use, and in others can be shared with an instructor or amongst an entire class. Some systems also allow bookmarks to be annotated.

Bookmarks allow students to easily return to important pages within their course or outside their course on the web. Systems vary in allowing students to store their bookmarks in a course folder, a personal folder, or a private folder. Course folders are open to all students and instructors in a course. Personal folders contain bookmarks that individual students can
share whereas bookmarks in private folders are for the students own use. Bookmarks can sometimes be annotated and categorized within folders.

Orientation/Help

Orientation/Help tools are designed to help students learn how to use the course management system. Typically, these tools are self-paced tutorials, user manuals, and email or telephone helpdesk support. Orientation/Help tools enable students to make the best use of the software. These tools provide instruction about and job aids for using various aspects of the course management system. Student support tools may include context sensitive help, hints, and wizard style assistants. Some product providers include courses in how to study effectively and/or how to work in online groups. A student helpdesk does not typically offer help with course content.

Searching Within Course

Searching within a course is a tool that allows users to find course material based on key words.

Searching tools enable students to locate parts of the course materials on the basis of word matching beyond the user's current browser page (which can be searched using the browser>edit>find menu).

Calendar/Progress Review

Calendar/Progress Review tools enable students to document their plans for a course and the associated assignments in a course. Calendar/Progress Review tools often enable students to check their marks on assignments and test, as well as their progress through the course material. Students can sometimes compare their marks on an assignment with the average score on that assignment, view total points earned, total points possible and percentages per unit, per item and overall course grade.

Work Offline/Synchronize
Work offline/synchronize is a set of tools that enable students to work offline in their online course and for their work to be synchronized into the course the next time they log-in. Sometimes students download course content to their local computers and sometimes they access content on a CD-ROM. Course content that resides on a CD-ROM can also be linked to dynamically within the online course. A course placeholder automatically returns students to the location in their course where they were working the last time they logged off.

The ability to work in a course environment offline and/or to automatically return to the location in the course where you were working the last time you logged off, is especially useful in situations where communication links are unreliable or expensive. The offline environment is essentially a local client application that embodies the important features of the online product without a continuous connection to the Internet. Tracking and student performance data are automatically uploaded into and synchronized with the student performance database the next time the student logs in. The course placeholder tool is essentially an automated bookmark that returns users directly to the page of the course where they had stopped working the last time they logged off.

Student Involvement Tools

Groupwork

Group Work is the capacity to organize a class into groups and provide group work space that enables the instructor to assign specific tasks or projects. Some systems also enable groups to have their own communications features like real-time chat and discussion forums.

Self-assessment

Self-assessment tools allow students to take practice or review tests online. These assessments do not count toward a grade. Self assessments encourage students to take responsibility for their own learning and to
monitor their learning progress. Self assessments can also facilitate student motivation if students receive feedback on the self-assessments and if there is a direct connection between the self assessments and the measurement instruments the instructor uses to determine final course grades. Note: For information on the different question formats, e.g., multiple choice or fill-in-the-blank, see Automated Testing and Scoring.

Student Community Building

Student Community Building tools allow students to create study groups, clubs, or collaborative teams.

Student Community Building tools can encourage and support the growth of student friendships and partnerships. Some products enable students to create and manage these groups. Some products also allow these groups to be formed at the system level, rather than the course level. See also Discussion Forums, File Exchange, Real-Time Chat, and Groupwork.

Student Portfolios

Student Portfolios are areas where students can showcase their work in a course, display their personal photo, and list demographic information.

Student Portfolios are often located on or are a part of students personal homepages in each course. Some products provide a private folder and a public course or team folder that students can use to display their work. Students personal homepages typically give them access to course content, internal email, course announcements, and the course calendar. See also Calendar/Progress Review for tools that allow students to track their progress in a course.

Course Delivery Tools

Course Management
Course management tools allow instructors to control the progression of an online class through the course material. Course Management tools are used to make specific resources in a course, such as readings, tests or discussions, available to students for a limited time only or after some prerequisite is achieved. This deliberate unfolding of the course resources can be used to prevent students from being overwhelmed and discouraged. Some systems enable this course management to be individualized so that course experience can be tailored to accommodate individual learner situations. Note: The management of testing is covered in the Automated Testing and Scoring feature.

**Instructor Helpdesk**

Instructor Helpdesk tools help faculty members use the course management software. These tools typically include telephone contact with the helpdesk of the product provider and documentation, instruction, and/or listserves. Instructor Helpdesk tools may also enable faculty members to participate with other faculty in online discussion forums to share ideas or build knowledge. Instructor Helpdesk tools often do not include assistance with content or instructional design.

**Online Grading Tools**

Online grading tools help instructors mark, provide feedback on student work, manage a gradebook.

Online Grading Tools enable instructors to mark assignments online, store grades, and delegate the marking process to teaching assistants. Some tools allow instructors to provide feedback to students, to export the gradebook to an external spreadsheet program, and to override the automatic scoring.

**Student Tracking**

Student Tracking is the ability to track the usage of course materials by students, and to perform additional analysis and reporting both of aggregate and individual usage.
Student Tracking tools include statistical analysis of student performance data and progress reports for individual students in the course. The progress reports generally consist of both activities and the time stamps of when the activity occurred.

**Automated Testing and Scoring**

Automated Testing and Scoring tools allow instructors to create, administer, and score objective tests.

Some products provide support for proctored testing in a suitable computer lab classroom as an approach to ensuring academic honesty. Note: See also Online Grading, Self Assessment, and Student Tracking.

**Curriculum Design**

**Accessibility Compliance**

Accessibility compliance means meeting the standards that allow people with disabilities to access information online. For example, the blind use a device called a screen reader to read the screen but Web pages need to be designed so that screen readers can read them.

In certain jurisdictions, there are legal requirements that web pages must meet in order to comply with existing accessibility legislation. A prominent example of this is Section 508 of the US Rehabilitation Act, sometimes referred to simply as Section 508, which dictates that U.S. institutions receiving federal funding must ensure their electronic content meet certain specific standards in order to ensure accessibility. See http://www.section508.gov/ for details. The other large accessibility initiative is The Web Accessibility Initiative (WAI), a World Wide Web Consortium (W3C) group which publishes the Web Consortium Accessibility Guidelines (WCAG). The are guidelines that web page authors (and the systems that produce web pages) should adhere to in order to make their content minimally accessible (Priority Level I), reduce accessibility issues (Priority Level II) and improve the accessibility for
most users (Priority Level III). For more information on the WCAG, see http://www.w3.org/TR/1999/WAI-WEBCONTENT-19990505/ A site called Bobby Services, is a free service that allows developers to test web pages, to help expose and repair barriers to accessibility and encourage compliance with existing accessibility guidelines, such as Section 508 and the W3C’s WCAG. For more information about Bobby, see http://bobby.watchfire.com/bobby/html/en/index.jsp.

Course Templates

Course templates are tools that help instructors create the initial structure for an online course. Instructors use templates to go through a step-by-step process to set up the essential features of a course. Course Templates are artifacts of particular pedagogical approaches to instructional content and process. The local value of particular templates will depend in part on the match between the template designer's approach and the specific instructor's approach.

Curriculum Management

Curriculum management provides students with customized programs or activities based on prerequisites, prior work, or results of testing.

Curriculum Management includes tools to manage multiple programs, to do skills/competencies management, and to do certification management. These tools may be similar to the tools used in student services as part of providing academic advising to students.

Customized Look and Feel

Customized Look and Feel is the ability to change the graphics and how a course looks. This also includes the ability to institutionally brand courses. Customized Look and Feel also includes the branding of content with institutional logos and navigation to provide a consistent look-and-feel across the entire institutional site and the integration of the system with additional institutional resources such as the library.
Instructional Standards Compliance

Instructional standards compliance concerns how well a product conforms to standards for sharing instructional materials with other online learning systems and other factors that may affect the decision whether to switch from this product to another.

Instructional Standards Compliance involves trying to make it possible for applications from different product producers to work well together. There are presently several proposed standards but the most prominent are the standards developed by the IMS Global Learning Consortium that define the technical specifications for interoperability of applications and services in distributed learning and support. The IMS standards can be found at www.imsproject.org. The SCORM standards-in-progress integrate the industry specifications from IMS, AICC, IEEE, and ADRIANE and are operational standards with corresponding compliance test suites for learning objects (www.adlnet.org/main.html). In terms of compliance there appear to be three levels: awareness of the standards, claimed partial compliance, and self-tested compliance with the SCORM test suites. Other migration considerations are situations that would make switching to another application more complicated, such as proprietary data formats for content which make it difficult to import course content into another application. Also there are sometimes situations that complicate the upgrading from one version of the software to a later version. To the extent that student data is maintained in the system there can be separate complications in migrating non-course information to other versions or platforms.

Instructional Design Tools

Instructional design tools help instructors creating learning sequences, for example, with lesson templates or wizards.

Content Sharing/Reuse
Content sharing/reuse enables specific content created for one course to be conveniently shared with another instructor teaching a different course perhaps even at a different institution. Sometimes the content is in the form of learning objects. The system may enable sharing and reuse with a special file server or digital content repository that includes some form of digital rights management that spans campuses and even institutions.

Content sharing/reuse is a specialized form of digital publishing that is tailored to online learning situations. It is similar to the sharing and reuse of course templates that are stored centrally and used in more than one course, but different in that the content generally includes learning materials like lessons or learning objects and the access is managed centrally. There are several technically different variations including: content management systems, digital repositories, and content syndication systems. These systems are also similar to databases of content where the access to specific content is managed with an authorization process that can protect the intellectual property.
Appendix- B
(eLearning Website Feature Description)
eLearning Website Feature Description

ANGEL Suite 7

(Key Source: http://www.angellearning.com)

This eLearning website system was created in mid-2000 at the Indiana University Research and Technology Corporation based on research done at the Cyber Lab, Purdue University. The eLearning website features being described in the following sections relate to students and instructors.

Student Learning Features:

Student learning features of ANGEL Suite 7 can be categorised into communication, collaboration, assessment, productivity and interaction. There is an additional feature that is prominent in the case of ANGEL eLearning website system, the Personalise Learning Space, consisting of an individualised learning space with 30 options for various tasks like add a calculator, announcement, bookmark, Google, custom theme etc. These can be added to the Personalise Learning Space using Drag-and-Drop personalisation icon.

**Personalized Learning Space**

Personalised Home is the central web interface for student’s courses, groups, news etc. It provides an individualised learning space. There are 30 personalization options features available for various tasks like add a calculator, announcements, bookmarks, RSS, Google, custom theme etc. using Drag-and-Drop Personalisation.

**Communication Features**

These features provide for communication and interactions with fellow students and instructor, and consist of synchronous communication tools
like Virtual office, Desktop sharing, Chat, Instant messaging, Email and whiteboard. In ANGEL system, Synchronous communication tools facilitate learner to instructor and learner to learner interaction.

Virtual Office Hours — It is a useful feature for allowing learners to interact with instructors and students in real-time in Virtual Office.

Desktop Sharing — It allows the instructors to demonstrate and share any application on their computers with one or multiple learners, course(s). This facilitates hands-on learning.

Chat and Instant Messaging — This feature allows communication online with instructors as well as students, and helps in reinforcing concepts and discussions.

Email — It provides the features to send messages to one or multiple recipients, BCC, and forward email to an internet email account.

Whiteboard — This tool is useful in explaining the diagrams, figures etc. to explain complex concepts.

Collaboration Features

Collaboration features consist of Discussions, Online journal and Student community building, and provide for collaboration amongst students and instructor.

Unlimited Threaded Discussions — This feature has a strong functionality as it allows for discussions to be shared across groups, a course, a department and entire institution. It impacts learning experience by allowing learners to categorize posts, explanations, scientific explanations, comments, evaluations, or summaries. In ANGEL eLearning system, multiple team permissions allow for debate among multiple teams.
Online Journal — Through this feature the learners are able to make private notes that can be shared along with attached resource.

Student Community Building — It is a collaborative feature by which students can use a shared chat space, calendar and announcements, and share material privately within the group. It also facilitates discussion forums, chat rooms from different courses. Learners create online clubs, interest and study groups using this feature.

**Instructional Features:**

ANGEL eLearning system focuses on practical aspects of online teaching and learning tools. These features are designed to be flexible, and accommodate individual pedagogical styles as well as institutional preferences. These features consist of Course homepage, Custom themes, Report console, Course communication, Calendar, Lesson Content developer and Gradebook.

**Course Home Page - Digital Dashboard**

Course home page presents critical course information, and is called “digital dashboard”. It contains visual summaries and navigation options along with updates on submissions, email, student logins or course grades, visual graphics that immediately communicate course information options for quick topical summaries and navigation.

**Customisation Tools**

These features provide customization of themes, design of the themes, selection of user levels and navigation styles.
Custom Themes - This feature allows for the selection of design-based themes and by subject “Biology,” “Composition,” “Criminal Justice” etc.

Design Your Own Theme – It also permits design of your own theme via theme editor. There is repository of themes available in the system.

Select Your User Level - Three levels of user access to the system is available - Beginner, Intermediate and Advanced. Help is provided in this feature via Drop down notes and links.

Navigation Style Choice – Relevant icons provide for an easy navigation throughout the system with one click one could access Home, Login, Help, Administrator Tools, Learning Object Repository, Preferences and Instant Messaging. With a course guide it provides alternative navigation option with collapse and expandable features.

Report Console - This feature provides for reporting capabilities, data mining technology, time-savings and increased workflow efficiencies.

Course Communications

ANGEL provides methods of communication that are intuitive and accessible.

Virtual Office Hours – It accommodates for Schedule hours, queue and manage students, share your desktop.

Desktop Sharing – It allows for demonstrating and sharing any desktop application, including Microsoft Suite and popular publisher software.
Whiteboard – It permits to illustrate and share imagery and complex concepts.

Secure Controlled Chat and Instant Messaging – These allow communication online and in real time. It facilitates in participating in peer-to-peer chat, which reinforce concepts and help in building community. It also frequently reduces questions and email to instructors.

Course Mail - It is a communication tool that handles folders, multiple attachments, and links for speed. It doesn't require an Internet email account. However, it provides for forwarding of an email to an Internet email account. Course mail supports sending blind carbon copies (BCC) and HTML format for messages.

Unlimited Discussion Forums – This feature supports an unlimited number of threaded discussions and establishes collaboration areas for groups including classes, clubs and/or for teams within groups. It provides instructors with the capability to define forums to stimulate discussions, allow multiple teams, pedagogy-based models.

Calendar - It is a course communication tool for posting course-related events and announcements.

Lesson Content Development

This feature accommodates learning and teaching styles. It provides content templates to make pedagogically sound content and learning objects.

Gradebook Efficiency

It allows for management of student grades with efficiency for online or offline grading, modifying weight assignments, re-grade,
mapping grades to scores and perform complex grading calculations with ease.

Atutor 1.5.3

(Key Source: http://www.atutor.ca/)

It is not a popular eLearning website system. The software was originally developed at the Adaptive Technology Resource Centre, University of Toronto. The eLearning website features are divided into Student learning features and instructional feature.

Student Learning Features

The student learning features include communication, file exchange, internal mail, online journal notes, real-time chat, whiteboard, help, calendar, groupwork, self assessment and student portfolio.

Course Communication

These features provide communications through a collection of features like Discussion board, file exchange, internal mail, real-time chat and whiteboard.

Discussion board

It allows posting to be viewed by thread with an option to expand or collapse. Instructor is provided capability to lock reading and/or writing. Active threads appear near the top of the thread list. These discussions can be shared across courses, departments, or any institutional unit.

File Exchange

This feature allows the student and instructors to upload files to a shared course library, or to a shared group library. It also facilitates sharing of files and folders among students, instructor or teaching
assistants. This function is commonly used by students to deposit their assignments in the drop box.

Internal email

This feature allows students to communicate within the eLearning website systems. Additionally, it serves as an Instant messaging tool for the students enrolled in the class.

Real-time Chat

This feature provides a synchronous communication environment, where students can chat in seminar or non-seminar settings. Instructors may monitor chats. A log of chat can be archived. Instructors can schedule chats using the group's calendar. Multiple chat sessions are permissible via this feature.

Whiteboard

The whiteboard feature provides an instructor controlled whiteboard with capability of using multiple instances in the same course via Acollab add on for Atutor.

Orientation and Help

This feature facilitates an online course for help students and instructors via context sensitive search capability for any other feature in the website system, tool and field within a tool.

Calendar

This feature is available via ACollab add on for Atutor. Different kinds assignments and deadlines can be tracked by using this feature.
Groupwork

It allows the instructors to create group activities, assign group leaders and manage groups. This feature facilitates collaboration by using a version control so that authors can annotate the edited work.

Online Journal/Notes

This feature can be useful as a reflective tool for students to keep private or shared notes, associate notes with private or shared files. The feature also provides the capability keeping notes private or sharing with other students or instructor.

Self-assessment

This feature facilitates creation of self-assessments for students to take multiple times and the have automatically scoring done by the eLearning System.

Student Building Community

This feature allows students to create study groups, send email to their groups, use a shared chat space and notice board, and share material privately within the group. Also, it facilitates interaction amongst students from different courses and share discussion forums.

Student Portfolio

It allows students to create folders - personal or public to be shared with other students or with a course instructor.

Instructor Features:

These features include course management tools, helpdesk, online grading tools, course templates, customisation tools, instructional design tools and content sharing.
Course management

This feature allows instructors to release course content and assessments based on specific start and end dates.

Instructor helpdesk

This feature provides help for instructors about functionality of the system via online support from the software provides website.

Online Grading tools

This feature facilitates viewing of grades by the students, feedback on assignments and annotations.

Course Templates

The feature provides support for creating templates of the course. File manager performs file upload, import or exported. It also allows instructors to add or remove course functions from course templates.

Customisation

The system provides default course look and feel templates, as well as others that can be downloaded and installed. It permits instructors to create their own templates. Instructors can use different images; logos etc. and modify the navigation tabs, tools icons, and the menu items for a course.

Instructional Design Tools

This feature facilitates organisation of course by lesson or topic and sequencing of learning objects.
Content sharing

This feature facilitates content sharing through a central learning objects repository. The eLearning website system supports sharing content across course and publicly accessible.

Avilar WebMentor LMS

(Key Source: http://home.avilar.com/)

This eLearning system consists of student learning features and instructional features. Avilar® Technologies, Inc. is the company responsible for development of the software.

Student Learning Features:

The student learning features include communication, internal mail, help, calendar and self assessment.

Communication

Discussion Board

This feature provides for the discussions to be viewed by two means - date and thread.

Internal mail

Internal mail feature facilitates internal communication amongst students and groups.

Help

This feature is presented in the form of a course, in the eLearning website system, to provide information about students in online instruction and how groups work in an online course.

Calendar
Through calendar feature students view their progress on course activities and see their grades.

Self assessment

Self assessment feature provides feedback to the students that are created by the instructors along with the hints.

Instructor Features

Course Management

This feature provides capability to the instructors to be able to release materials as per specific start and end dates.

Instructor Helpdesk

This feature functions in the form of a course for authors, instructors and students.

Automated Testing and Scoring

It allows instructors to post test for automated scoring such as multiple choice, true falls, fill in the blanks and other preset answers.

Curriculum Management

This feature allows instructors to organise course using multiple paths to accommodate different skill levels or job functions.

Customisation

This eLearning website system provides templates for different feel and look, and permits instructors to create their own templates as well.

Blackboard Academic Suite
Blackboard is the biggest eLearning website system, and has 45 percent make share in the eLearning website system industry. Since inception in 1997, Blackboard has acquired many companies. The Company's product line includes Blackboard Academic Suite and the Blackboard Commerce Suite. Blackboard's eLearning website features consists of student learning and instructional features.

**Student Learning Features**

These features consist of communication features, discussion board, file exchange, internal mail, journal entry notes, real-time chat, video services, whiteboard, bookmarks, help, calendar, groupwork, self assessment and student portfolio.

**Communication**

Communication feature provide access to announcement, discussion board, file exchange, group page, messages and internal mail features.

**Discussion Board**

This feature facilitates discussions to be view by date and thread. Instructors using this feature can control anonymous posting, and its access to other students. Discussions board posts can include URLs, files, mathematical equations using formatting text editor. It allows instructors to assign discussion space for groups and teaching assistants. Discussion threads can be expanded or collapsed.

**File Exchange**

This feature provides students functionality for uploading or downloading files into a private or shared folder. It allows students to submit their work using digital drop box. Similarly, instructors can use this feature to upload or download files. This feature also permits students to exchange files...
other students that are not part of the class. File exchange provides for sharing comments and tracking use.

Internal Mail

Internal email feature allows students to email individuals along with the attached files.

Journal Entry/Notes

It allows students to keep track of events in their course, take notes and maintain journal entry.

Real-time Chat

Real-time chat tool feature provides synchronous discussion and private messages with instructor moderation. This feature also permits archive of the chat transcript, which can be accessed by the students after the chat session. The virtual classroom tool supports these functions.

Video Services

Video functionality is not present in the Blackboard. However, third party systems can be integrated.

Whiteboard

This feature allows instructors to present PowerPoint slides, audio and video clips. Multiple instances of whiteboard are supported by the system. Also, whiteboard allows display of mathematical formula and web browsing.

Bookmarks

The bookmark feature facilitates creation of private folder, and their sharing.

Help
It allows students to access help on various topics about the Blackboard system including manual and product knowledge base,

**Calendar/Progress Review**

This feature provides for the posting of course-related events and announcements. The calendar is used by instructor to assign tasks to the students or permit option for students to check the performance at any given point of time.

**Groupwork**

The groupwork feature allows the instructor to create groups with shared file exchange, private group discussion forum, synchronous tools, and group email list capability.

**Self assessment**

The self assessment feature allows instructors to provide students timed or un-timed self assessment in the form of multiple choice, matching, fill-in-the-blanks and true-false questions. It also facilitates instructor-created feedback, links to the course resources, and a database of questions that can be used to generate a randomised test for self assessment.

**Student Community Building**

This feature provides functionality for community building activities such as online clubs, interest and study groups.

**Student Portfolio**

Using this feature students are able to create private or shared portfolios, which can be used to contribute links, documents or template-driven content to their portfolio.

**Instructional Features:**
This group of features consists of course management, helpdesk, online grading tools, course template and customisation features.

Course Management

It allows the instructors to release assessments, announcements and other course materials in a time bound manner with start and finish dates.

Helpdesk

This feature facilitates access to online manual, product information, reference and support communities that are useful to the instructors. Helpdesk also provides discipline specific resources and general interest forum. A 24/7 technical support is also available to instructors.

Online Grading Tools

This feature provides instructors functionality to grade written assignment and return them through the assignment dropbox. It allows instructors to provide feedback through annotations. The grades of students can be viewed by assignment and category. The import and export feature allows instructors to download/upload from and to an external spreadsheet program. The grading tool facilitates setting up of grading scale using raw scores, percentages, letter grades or pass/fail metrics.

Course Templates

It provides templates for creating course content using rich text editor. The course content can be categorised by the instructors as announcement, calendar entries, course units, discussion forums, lecture notes, links, syllabus, FAQs etc. The course creation wizard provides for templates for setting up of the course using a form.

Customisation
This allows posting of institutional images in headers and footers, changing of the navigation icons, colours and menu list. The customisation feature supports multiple departments and organisational units.

**eCollege**

*(Key Source: http://www.ecollege.com/indexflash.learn)*

The eLearning website system, eCollege has been in the market since 1996 serving private and public institutions, career colleges and school districts. It is a popular platform amongst online universities.

**Student Learning Features:**

These features consist of communication, discussion board, gradebook, gradebook calculator, user activity, dropbox, document sharing, classlive, webliography, journal and course checklist.

**Communication**

The communication features in the eCollege facilitates a flexible and intuitive user interface and provides a high-level interaction.

**Discussion board** - This feature allows students and faculty to access discussion by date and author.

**Gradebook** - It allows students submit their work via one easy-to-access location.

**Gradebook Calculator** – This feature calculates grades based on possible points and provides "grade-to-date" and a cumulative report.

**User Activity** – This feature enables faculty to view the student activity in a course.

**Dropbox** – This feature provides students facility for submitting their assignments and links them to the gradebook.
Document Sharing – It allows students and instructors to share documents, instructions and tutorial with the entire class or with specific groups of students.

ClassLive\textsuperscript{SM} – This feature is the synchronous chat platform for eCollege with presentation slide upload facility.

Webliography - It provides for Web links posting in the course for students and instructors.

Journal – This feature allows students to maintain an online journal.

Course Checklist – This feature provides a checklist or bookmark for students to keep a track of the course and assignment due dates.

Instructional Features:

The instructional features provide a unit-based design of the course that instructors can use to create content units, activities, assignments and discussions. The navigation provided is intuitive and units can be organized to correspond to the teaching style of the instructor.

CourseFlex Navigation\textsuperscript{SM} – This feature allows instructors to organize their course content suitable to their needs. For example, in a sequence like Unit 1, Unit 2 and so on- or by category like discussions, reading, exams etc.

Visual Editor – It enables an online editing and content creation. The Visual Editor allows creating and editing math and science equations.

Exam Builder Plus – It enhances exam functionality with features such as kick-out options, password protection and time-specific scheduler.

Microsoft Upload Tools - This feature automatically converts Microsoft Office documents to HTML for online course display.
File Manager - This feature provides the instructors functionality to upload streaming media in the course.

Content Manager – This feature enables management of Content Objects including delivery, reusability, centralised location, experience enhancement and tracking of the learning outcome.

Central Content Repository – It allows for the storage of all eLearning content at its most granular level, a content asset and provides each content asset a metadata surrounding the content.

Content Management – The content management includes the following features:

Search Engine – It provides for search of the content in the repository.

Version Control – This feature enables content "drafts" and keeps a history for each piece of content.

Workflow Management – It manages the creation, approval and deployment of content.

Usage Reporting - This feature identifies where content has been deployed.

SCORM v1.2 Compliance (import, export and play) – This feature provides support for the interoperability of content.

Metadata Management - This feature enhances the reusability of learning objects.

Security Management – It ensures that the security assignment within the system.

Accessibility
It provides for the needs of the disabled to learn online and also enables faculty with disability to author online courses.

Usability

This feature enables accessibility and integration of newer technologies such as JAWS.

WebCT Vista 4 (now Blackboard Vista)

(Key Source: http://www.webct.com/)

WebCT was founded in 1997 by Professor Murray Goldberg at the University of British Columbia. It has been acquired by Blackboard. Blackboard Vista Suite provides course preparation, delivery, and management. The main features of WebCT Vista, now called Blackboard Vistas can be categorised into student learning features and instructional features.

Student Learning Features:

It includes group communication features such as discussion board, file exchange, internal email, online journal/notes, real-time chat, whiteboard, bookmark, calendar, help, groupwork and student portfolio.

Communication:

Discussion Board

This feature allows discussion forums to be threaded, blog format or journals (individual or group). These can be viewed by topic, date, and
thread with an option to expand and collapse the threads. It allows for attaching URLs, files and web pages and editing using a text editor.

**File Exchange**

This feature enables students to have private folder for uploading and downloading files. Using drop box students submit their assignments.

**Internal Email**

The internal email feature provides for archiving, searching and attachments. It facilitates spell check of email messages, search addresses, forward emails to an external email address.

**Online Journal/Notes**

This feature allows students to share journal notes with instructors and students. It also facilitates creation of course content in the form of a printable student guide.

**Real-time Chat**

This feature enables group discussions, where instructors moderate chats and exercise control in the chat rooms. It also facilitates to archive chat transcripts.

**Whiteboard**

The whiteboard supports PowerPoint uploading, mathematical symbols and archiving of presentations for future use.

**Bookmark**

It allows students bookmarks on any content material in the course.

**Calendar**
The calendar feature provides a list of their enrolled courses, new email, and system wide events. It also provides access to student grades with comparative data.

**Help**

It provides help related to tools in the eLearning system via tutorials about the system.

**Groupwork**

This feature allows instructors to assign students to groups and also permits students to self-select their groups with a discussion forum, chat and whiteboard.

**Student Portfolio**

The student portfolio enables the students to create a personal home page, selectively display course information on the page, and export home page to others.

**Instructional Features:**

These features include automated testing management, online gradebook, course management, content sharing/reuse, course template, customisation, and instructional design tool.

**Automated Testing Management**

This feature allows instructors to create self-assessment, set the time limits on a test, allow multiple attempts, review past attempts of a quiz, provide feedback and proctor tests.

**Online Gradebook**
This feature provides linkage between the assignment feature and online gradebook. Offline assignments can be added by the instructor. Course grades can be employed as percent, letter grade, or pass/fail.

Course Management

The course management feature enables instructors to release assignments, assessments, and announcements in a timed manner. This feature allows the release of materials using criteria set by the instructors for single student or a group of students or the entire class.

Content Sharing/Reuse

Content sharing and reuse feature enables instructors to share content with other instructors and students via learning object repository.

Course Template

This feature provides for a template-based course creation. The course templates also permit criteria for release of custom gradebook. The system allows administrators to use an existing course or a pre-defined template as a basis for a new course.

Customisation

The customisation feature allows changes in the default course look. It permits instructors to change the navigation icons and colour schemes, change header and footer and use the institutional logos.

Instructional Design Tool

This feature allows instructors to organize learning objects, course tools, and content into reusable learning sequences. The learning sequences can be organised in linear or hierarchical manner.

Desire2Learn 8.1

(Key Source: http://www.desire2learn.com/)
Desire2Learn was founded in 1999 in Ontario, Canada. It is a popular eLearning website system consisting of student learning feature and instructional learning features.

Student Learning Features

These features consist of learners' personal tools, communication and collaboration tools, assessment and feedback tools. The following section describes features in each of the feature set.

Learner Personal Tools

These groups of features are described as below:

**Home** - It is a central site the course links related to news postings and upcoming events.

**Updates** - This feature provides information requiring attention upon login.

**Bookmarks** - Bookmarks can be pages, web links or files.

**Links** - This feature allows learners to add personal links to the home page.

**Locker/Briefcase** - This tool facilitates storage of personal files or documents.

Communication and Collaboration Tools

**Blog** - This feature enables students to Blog in a private or public environment.

**Email** – This feature allows email setup in multiple ways – internal email, forwarded to external account and full email system along with tracking and filtering system.
Calendar – This feature enables user easy access to a course, department, or organization's calendar.

Journal – It allows users to make personal journal entries and share them.

Learner Collaboration/Community – It facilitates interaction amongst learners from different courses using chat rooms or discussion forums.

Learner Portfolios – It enables building of ePortfolio for personal reflection and sharing with others.

Document Sharing – It allows students to share documents with a class or a group of students for collaboration.

Threaded Discussions – This feature document sharing, private group collaboration and multiple viewing options.

Dropbox – Dropbox feature allows students to submit assignments into various drop boxes within a course.

Chat – This feature enable students and instructors to communicate in real-time in an open chat room or private study room. Archives are automatically created. Learners can send instant private messages.

Instant Messaging/Pager – It enables students to find if other users are online and chat with them using private messaging.

Assessments and Feedback Features

Rubrics – This feature provides access to access to grading rubric explaining requirements and assessment of various activities.
My Progress – It allows students to see the progress through information on visited topics, assignments completed/submitted, grades received, quiz results, and discussion participation.

Grade Book – This feature provides access to gradebook with statistical and graphic information about students’ grade.

Self-Assessments – This feature provides tools for self-assessment of students.

Quizzing – This feature enable a versatile Desire2Learn quiz engine for efficient creation of formative and evaluative assessments using numerous question formats. Random values can be generated for variables to provide different questions to individual learners.

Survey Tool – This tool allows instructors to conduct survey to get feedback from learners on course elements.

Help – This feature provides online learner guide and extensive context sensitive help for each of the tools and interfaces. It is customisable.

Instructional Features:

Instructional features consist of content management, assessment and assignments, instructional and course delivery tools.

Content Management

The content management feature in Desire2Learn system provides tools to assist instructors in content design, creation and delivery.
Import and Conversion – This feature allows very granular import of content like quiz (or even one question), a module, and the dropbox files instead of the entire contents of a package.

Copying Components – It allows copying of granular component from previous course offerings to formulate a new course.

Exporting Courses – It allows granular exporting of content, quizzes, and all key tools and content and facilitates sharing of content with other organisations.

Upload Content – It provides upload and/or manage existing content directly from the desktop using drag-and-drop functionality.

Manage Content - The Desire2Learn system enables you to create a proper web-folder structure allowing you to organize your content, images and multimedia in appropriate folders and/or sub-folders.

Compose a Syllabus – It provides for designing a syllabus by simply uploading an existing file (HTML, Word, PDF, etc.).

Set Conditional Releases and Create Learning Paths – It allows setting conditional release on content topics/modules easily.

Access the Learning Object Repository – It provides catalogue and share content using the repository.

Create Course Templates – This feature facilitates design course templates containing either layout or content at any level above the specific section level.

Search and/or Compile and Download – It enables users to search, optionally compile, and download course content for printing. Discussion threads and Learning Object Repositories can also be searched by either using basic search features or advanced filters.
Integrate CD-ROM – It allows integration of multimedia rich content on CD or DVDs.

Assessments and Assignments

Quizzing – This feature enables search efficient creation of formative and evaluative assessments using numerous question formats, and provides scalability. The Desire2Learn HTML editor allows for easy upload of various file formats including: graphics, video, flash, and more to questions, question responses, and feedback.

Instructional and Course Delivery Tools

Learner Progress – This feature allows monitoring learners’ progress. This timesaving tool assists instructors to identify learners that may need further assistance or guidance.

Large Class-size, Section and Group Support – This feature supports sections and groups within a course allowing instructors to sort items such as the Gradebook by a particular group/section, or by filtering based upon a specific group or search criteria.

Learner Portfolios - It enables instructors, learners, and others to build an electronic portfolio of digital artefacts such as presentations, resources and accomplishments.

Broken Links Viewer – The Desire2Learn system will report any broken links immediately to the instructor and suggestions on how to fix the issue.

Help – It provides online help to instructors to quickly search on Learning Objects and help resources to share through the Desire2Learn Learning Community. Plus many more tools and features exist, including feedback systems, journals, home pages, glossary etc.
LON-CAPA 2.1

(Key Source: http://www.lon-capa.org/)

This eLearning website systems was developed through the collaboration between Michigan State University and University of Illinois in 2005 to provide course material over the web. The eLearning website features can be grouped into student learning and instructional features.

Student Learning Features:

The student features consist of discussion forum, file exchange, internal email, online journal, real-time chat, bookmark, calendar, work offline/synchronise, help, groupwork and student portfolio.

Discussion Forum

In addition to functionality of viewing by thread or author, a spell-checker is available for students and instructors.

File Exchange

This feature allows students to post their work via drop boxes.

Internal Email

This feature enables students to send emails within the system or to an external email address.

Online Journal

It provides students to attach their personal notes to any page.

Real-time Chat

It facilitates synchronous conversation.

Bookmark
It allows students to bookmark any content material in a course.

**Calendar**

This feature permits instructors and students to post events in the online calendar. It can be accessed from students’ personal home pages.

**Work offline/Synchronise**

It enables students to compile and download the content.

**Help**

Help feature provides students access to the context related help on any tool in the website system.

**Groupwork**

Groupwork feature allows instructors to assign students in groups, provide a discussion forum and group specific activities.

**Student Portfolio**

It allows students to create a personal home page and display their course work.

**Instructional Features:**

This feature includes testing management, gradebook, course management, student tracking, content sharing and reuse, course template, customisation and digital tools.

**Testing Management and Support**
This feature allows instructors to randomize the questions and answers, and create self-assessment for students. It also provides options for time limits, multiple attempts, review of past quizzes and tests.

Gradebook

Gradebook feature enables instructors to add assignments to the course and to the gradebook. It allows instructors to export scores to a spreadsheet and create a grading scale on the basis on score, percent points, letter grades or pass/fail.

Course Management

This feature allows instructors to release assignments, assessments, and announcements based on specific start and stop dates. Also, it enables instructors to specify course materials access based on group membership and student performance.

Student Tracking

It enables instructors to track the frequency and duration of student use of course components.

Content Sharing Reuse

Content sharing reuse allows access to a central learning objects repository.

Course Template

It allows instructors to use pre-defined templates for a course.

Customisation

This feature enables institutions to create their templates across the entire system with logos, headers and footers.

Design Tools
Design tools enable instructors to organize course design in terms of reusable learning objects, tools, and content.

**Moodle 1.5.2**

(Key Source: http://moodle.org/)

Moodle was launched in 2002 as an open source community. Moodle.com is responsible for the commercial aspects of the platform. It is supported by a network of companies for hosting and development.

**Student Learning Features:**

The student learning features consist of discussion board, file exchange, real-time chat, calendar, help and groupwork.

**Discussion Board**

Using this function students participate in discussions. Posting on the discussion board can be sent to the student’s email. It provides instructors a summary report for grading.

**File Exchange**

This feature facilitates assignment submission by the students.

**Real-time Chat**

Real-time chat allows synchronous communication amongst students and their instructor. It provides capability to the instructor to facilitate and moderate chat. System enables archive of the chat transcripts.

**Calendar**

Calendar function enables instructors to post announcements. It provides links for students to review their grades, class average.

**Help**
It provides students help on various tools and functions.

**Groupwork**

It allows instructors to assign group work by enabling them to form groups. This function allows students to have individual chat room, whiteboard, and specific assignments.

**Instructional Features:**

It includes features relating to automated testing measurement, online gradebook, course management, student tracking, course template, customisation and instructional design template.

**Automated Testing Management and Support**

This function allows instructors to randomise tests for self-assessment as well as tests contributing toward the grade in the class with time limits, provision for multiple attempts and instant feedback.

**Online Gradebook**

Gradebook can be linked to the assignments given by the instructor. Offline grading is also permitted by the system.

**Course Management**

Course management function allows instructors to release announcement, assessment and assignment. It also enables instructors to provide specific assignments according to the needs of the students.

**Student Tracking**

This feature allows activity of the student to be tracked in terms of their activity in different course components and completion.

**Course Template**
This function provides pre-defined course templates to get started with the course.

**Customisation**

This feature provides a set of templates for designing the appearance of the course. It allows instructors to change icons, colours, name of the icon, add institutional logos, headers and footers.

**Instructional Design Template**

It provides reusable templates for other courses or instructors.

**Sakai**

(Key Source: http://www.sakaiproject.org/)

The Sakai Project was created as an open community project in 2003. It now operates through Sakai Educational Partner’s Program. It provides access to support to educational institution. The eLearning website features can be grouped into student learning features and instructional features.

**Student Learning Features:**

The group of features consist of discussion board, chat room, group box, email archive, help, message centre, my workplace and news.

**Discussion Board**

This feature allows for structure conversation, where students can post a response to the discussion topic or post responses to others posts. Instructors can enable or disable students from participation.

**Chat Room Tool**
The Chat Room feature facilitates synchronous, unstructured chat amongst students. This feature is for real-time, unstructured conversations with users.

**Drop Box Tool**

It enables students to deposit documents in their private folder to be viewed by the instructor. This feature allows for creating folders and subfolders.

**Email Archive Tool**

This feature provides an email address generated via worksite. Email archive stores all messages. Instructors can create alias email address for the worksite users.

**Help Tool**

It provides an online help to the users through a search function and links to the topic.

**Message Centre**

This feature provides communication one-to-one or group. Through private messaging students can communicate one-to-one.

**My Workspace**

This feature enables users to have their own workspace with resources and features.

**News Tool**

The News Tool permits users access news, blogs, events and customisation of the news.

**Instructional Features:**

These features consist of assignment, gradebook, announcement, home page, modules, schedule, syllabus, synaptic, and test and quizzes tool.
Assignments

This feature allows instructors to create and distribute assignments to the students and assignments can be graded using scores, percentage, letter grade and pass/fail. It enables instructors to provide feedback for resubmission, and upon release of the graded assignments, students can view comments and their grade.

Gradebook

This tool enables instructors to assign grades as scores, letter grade or pass/fail, and distribute them online and post them automatically in the gradebook via assignment feature.

Announcements Tool

It provides information to the registered students about course events like posts, deadlines and special assignments. This feature allows multiple file attachments, URLs, drafts etc.

Home

This feature facilitates a portal for every course and project worksite, which can be customised by the students or instructors.

Modules

Modules allow building lesson for the instructors to publish learning sequences of various formats.

Schedule Tool

Schedule feature allows instructors and worksite authors to organise the calendar by day, week, month and year. Multiple attachments can be associated with the items on the schedule.

Syllabus Tool
This feature provides two ways of providing access to syllabus – 1) providing link to the already existing syllabus; 2) allowing instructors to enter the material in the syllabus tool. The syllabus tool also provides access control for the public or specific members.

Synoptic Tools

The synoptic tools present display of various features like announcement, discussion and chat, and provide a quick glance of the recent activity.

Tests and Quizzes

This tool allows instructors or site owners to provide access to students to take quizzes, survey and exams in multiple choice and true/false format. The quizzes can be randomized using a question bank. Test and quizzes feature allows for uploading of audio files as questions as well. It is not a core module.

Teknical Virtual campus

(Key Source: http://www.teknical.com/)

Teknical Virtual Campus was founded in 1997 in the UK. The features consist of student learning and instructional features.

Student Learning Features

Student learning features consist of discussion board, file exchange, online journal/notes, real-time chat, bookmark, help, calendar, work offline/synchronise, groupwork and student community features.

Discussion Board

This feature allows discussions to be posted to be posted as text with the option of attaching documents and can be viewed by thread.
File Exchange

The file exchange feature permits students to upload their work as well as share their work in a shared folder.

Online Journal/Notes

This feature allows students to post their personal notes.

Real-time Chat

Real-time chat supports chat room function along with private messaging.

Bookmark

It allows students to keep record of websites, files etc.

Help

It provides access to an online manual for assistance to the users about features of the website system.

Calendar

Calendar feature allows students to view their schedule related to the course including deadlines, assignments and due dates. It also enables students to post private events.

Work offline/Synchronise

It allows students to access last page after re-logging in.

Groupwork
This feature allows the instructors to assign students in groups with access to their own folder for depositing files, participating in group discussions and chat rooms, and share the calendar.

**Student Community Building**

It allows students from different courses to participate in shared environment using chat space, notice boards, and share material privately within the group.

**Instructional Features:**

These features comprise of course management, helpdesk, online grading, student tracking and automated testing and scoring,

**Course Management**

This feature enables instructors to release assessment and announcement based on requirements of the course with specific start and end dates. Instructors can facilitate self-learning modules.

**Helpdesk**

Helpdesk feature provides access to assistance related to features of the website system.

**Online Grading Tool**

This does not have functionality to mark all assignments automatically.

**Student Tracking**

It allows tracking of students in terms of the number of attempts and time spent per assignment.

**Automated Testing and Scoring**
This feature allows the instructors to automatically score multiple choice questions and true/false questions. Automated testing feature also enables importing of questions from test banks and randomisation of questions and answers.
Appendix – C
(Questionnaire – Part 1 and II)
Welcome to the survey on **Understanding relationships between Learning Styles and eLearning Website Feature Sets**. This survey is part of my Doctor of Business Administration degree research work at the School of Management, University of Surrey, UK. Your responses are highly appreciated. There are three Parts to this survey- Part I of the survey relates to the Background Information, Part II relates to the eLearning Website Feature Sets and Part III to the Learning Styles.

**Part I**

**Background information questionnaire**

**Directions:** This survey contains 11 statements that you will answer as appropriate. There are no right or wrong answers. This part of the survey should take you only 2 to 4 minutes to complete. Your responses will be kept confidential. Fill in the circle beside the choice that is the best response to the statement.
1. Please enter your First Name and Last Name:

Characters Remaining: 25

2. Gender

- Male
- Female

3. Academic status

- Undergraduate
- Graduate

4. Write your program of studying the box (example, BS Chemistry)

Characters Remaining: 25

5. Age

- 18-20
- 21-24
- 25-30
- 31-35
- 36 and above

6. Type of eLearning class experience

- Online
- Blended/Hybrid
7. Number of eLearning classes taken

- Between 1 and 5
- Between 6 and 10
- 10 plus

8. In addition to Blackboard, have you used other eLearning Website platform(s). If your response is "No", skip question # 9.

- Yes
- No

9. Number of classes on other eLearning Website platform(s) than Blackboard

- Between 1 and 5
- Between 6 and 10
- 10 plus

10. I live

- On-Campus
- Off-Campus

11. This semester, I am working

- Full time
- Part time

Clear answers on page
Part II

eLearning Website Feature Set preference questionnaire

Directions: This part of the survey contains 9 statements that you will rate on a scale of 1 to 7.

1- (Not desirable at all) - 2 - 3 - 4 (Neutral) - 5 - 6 - 7 (Extremely desirable)
and a statement where you will distribute 100 points over three feature sets.

Also, you can provide any additional comments relating to features.

There are no right or wrong answers. The part of the survey should take you only 2-4 minutes to complete. Be sure to mark all 9 statements. Your responses will be kept confidential.

Please indicate to which extent you would find the following features in an eLearning Website system desirable:

<< Back

Next >>
Features regarding communication with the lecturer:
1- (Not desirable at all) - 2 - 3 - 4 (Neutral) - 5 - 6 - 7 (Extremely desirable)

12. Announcements
(Announcement feature is used to display class assignments, exam schedules, due dates etc.)

<table>
<thead>
<tr>
<th>Not desirable at all</th>
<th>Extremely desirable</th>
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<td>6</td>
<td>0</td>
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<td>7</td>
<td>0</td>
</tr>
</tbody>
</table>

13. Any additional comments

Characters Remaining: 100

http://research.uw.edu/clients/Univ/MaryWashington...Status=preview&Lang=&test=&SSL=&Type=&Mode=&Dir=NXT (1 of 7) 9/8/2007 1:53:15 AM
14. File exchange
(File exchange tools allow learners to upload files from their local computers and share these files with instructors or other students in an online course. File Exchange tools enable downloading files and upload or posting files over the Web from within the course.)

15. Any additional comments

16. Email
(Email tools enable messages be read and sent exclusively inside the course or alternatively the tools enable links to external email addresses of those in the course so that contacting course members is facilitated. Internal email may include an address book and some address books are searchable.)
17. Any additional comments

Features regarding collaboration with other students:
1- (Not desirable at all) - 2 - 3 - 4 (Neutral) - 5 - 6 - 7 (Extremely desirable)

18. Group discussion board
(Group discussion boards are online tools that capture the exchange of messages over time, sometimes over a period of days, weeks, or even months. Threaded discussion forums are organized into categories so that the exchange of messages and responses are grouped together and are easy to find.)

Not desirable at all

1 2 3

Extremely desirable

4 5 6 7

19. Any additional comments

Characters Remaining: 50
20. Real-time chat
(Real-time chat is a conversation between people over the Internet that involves exchanging messages back and forth at virtually the same time.)

Not desirable at all

1 2 3 4 5 6 7

Extremely desirable

21. Any additional comments

Characters Remaining: 50

22. Online Journal/notes
(Online Notes/Journal enable students to make notes in a personal or private journal. Students can share personal journal entries with their instructor or other students but cannot share private journal entries.)

Not desirable at all

1 2 3 4 5 6 7

Extremely desirable

23. Any additional comments

Characters Remaining: 50
Features regarding your studying productivity:
1- (Not desirable at all) - 2 - 3 - 4 (Neutral) - 5 - 6 - 7 (Extremely desirable)

24. Calendar
(Calendar tool enable students to document their plans for a course and the associated assignments in a course.)

Not desirable at all

1 2 3 4 5 6 7

Extremely desirable

25. Any additional comments

Characters Remaining: 50

26. Bookmarks
(Bookmarks allow students to easily return to important pages within their course or outside their course on the web. In some cases bookmarks are for an individual students' private use, and in others can be shared with an instructor or amongst an entire class. Some systems also allow bookmarks to be annotated.)

Not desirable at all

1 2 3 4 5 6 7

Extremely desirable
28. Self-assessment
(Self-assessment tools allow students to take practice or review tests online. These assessments do not count toward a grade. Self assessments encourage students to take responsibility for their own learning and to monitor their learning progress. Self assessments can also facilitate student motivation if students receive feedback on the self-assessments and if there is a direct connection between the self assessments and the measurement instruments the instructor uses to determine final course grades.)

29. Any additional comments

30. What percent would you assign to each of the three feature sets in terms of your preference?
Please make sure your total points do not exceed 100.

Features regarding communication with the lecturer

Features regarding collaboration with other students

Features regarding your studying productivity

Total
Thank you

Part III

Honey and Mumford’s Learning style questionnaire

Directions: Upon clicking Continue at the right bottom, Part III of the survey will redirect you to the Honey and Mumford’s Learning style questionnaire which contains 40 statements that you will answer as Agree or Disagree. There are no right or wrong answers. You will be required to Register for completing the survey. Please use the Authorization Code provided to you via email. This part of the survey should take you only 5-7 minutes to complete. Be sure to mark every question. Your responses will be kept confidential.

Thank you for completing Part I and II. To complete Part III of the survey, please click Continue. If there are any questions regarding this survey, please feel free to contact Mukesh Srivastava at msrivast@umw.edu.
Appendix – D
(Learning Styles (40-item) Questionnaire)
Learning Styles (40-item) Questionnaire

This 40-item questionnaire will help you discover your learning style preferences. We all develop learning 'habits' that make us happier to learn in some ways and less happy to learn in other, less familiar, ways. Most people are only vaguely aware of their learning preferences. This questionnaire will clarify your preferred ways of learning so that you are in a better position to select experiences that suit your style and/or to broaden your scope by strengthening under-utilised styles.

There is no time limit for the completion of this questionnaire. It will probably take you 5 to 10 minutes. The accuracy of the results depends on how honest you are. There are no right or wrong answers. If you agree more than you disagree with a statement select "Agree". If you disagree more than you agree with a statement select "Disagree". Be sure to mark every item.

Take the Questionnaire

1. I quite like taking risks.
   Agree ☑
   Disagree ☐

2. Before taking part in a discussion or meeting, I like to read the appropriate papers and prepare carefully.
   Agree ☑
   Disagree ☐

3. I like to be absolutely correct about things.
   Agree ☑
   Disagree ☐

4. I like practical, tried and tested techniques.
   Agree ☑
   Disagree ☐

5. I often do things just because I feel like it, rather than thinking about them first.
   Agree ☐
   Disagree ☑

6. I make decisions only after weighing up the pros and cons of different possibilities.
7. I prefer to solve problems using a systematic approach that reduces guesswork and uncertainty.

Agree □
Disagree □

8. What matters most to me is whether something works in practice.

Agree □
Disagree □

9. I actively look for new things to do.

Agree □
Disagree □

10. I prefer to establish the facts and think things through before reaching a conclusion.

Agree □
Disagree □

11. I like to check things out for myself rather than take them for granted.

Agree □
Disagree □

12. When I hear about a new idea or technique, I immediately start working out how to apply it to my situation/problems.

Agree □
Disagree □

13. I like the challenge of trying out different ways of doing things.

Agree □
Disagree □
14. I prefer to have as many bits of information about a subject as possible. The more I have to sift through the better.

Agree [ ]
Disagree [ ]

15. I am quite keen on sticking to fixed routines, following procedures and keeping to timetables.

Agree [ ]
Disagree [ ]

16. In discussions, I like to get straight to the point.

Agree [ ]
Disagree [ ]

17. I prefer to jump in and do things as they come along rather than plan things out beforehand.

Agree [ ]
Disagree [ ]

18. I prefer to base decisions on hard evidence rather than on hunches or intuition.

Agree [ ]
Disagree [ ]

19. I like to fit things into some sort of pattern, framework or model.

Agree [ ]
Disagree [ ]

20. I tend to judge people's ideas on their practical merits.

Agree [ ]
Disagree [ ]

21. In discussions, I usually come up with lots of spontaneous ideas.
22. I prefer to look at a problem from as many different angles as I can before starting to solve it.

Agree □
Disagree □

23. I prefer to evaluate the soundness of my ideas before sharing them.

Agree □
Disagree □

24. In meetings and discussions, I put forward ideas that I know are down-to-earth and realistic.

Agree □
Disagree □

25. Usually I talk more than I listen.

Agree □
Disagree □

26. If I have to write a report or a formal letter, I prefer to have several rough drafts before settling on the final version.

Agree □
Disagree □

27. I am rather fussy about how I do things – a bit of a perfectionist.

Agree □
Disagree □

28. I find that I can often work out more practical ways of doing things.

Agree □
Disagree □

29. I find rules and procedures take the fun out of things.
Agree □
Disagree □

30. I like to consider many options before I make up my mind.

Agree □
Disagree □

31. I believe that careful, logical thinking is the key to success.

Agree □
Disagree □

32. I prefer ideas with an obvious relevance to my life and work.

Agree □
Disagree □

33. I am usually the ‘life and soul’ of the party.

Agree □
Disagree □

34. I like to think through the consequences before taking action.

Agree □
Disagree □

35. I like to understand the assumptions, principles and rationale upon which things are based.

Agree □
Disagree □

36. In my opinion, it doesn’t matter how you do something, as long as it works.

Agree □
Disagree □

37. I enjoy the excitement of a crisis situation.
38. I usually do more listening than talking.

39. I like meetings and discussions to be structured and orderly.

40. I do whatever I need to, to get the job done.
Appendix – E
(Hierarchical Cluster Analysis)
**HIERARCHICAL CLUSTER ANALYSIS**

Dendrogram using Ward Method

Rescaled Distance Cluster Combine

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