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LEARNING STYLES, AGE, AND EXPERIENCE

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Denise L. Hoisington

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**USE OF TECHNOLOGY BY NURSING STUDENTS:
LEARNING STYLES, AGE, AND EXPERIENCE**

By

Denise L. Hoisington

A DISSERTATION

**Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of**

DOCTOR OF PHILOSOPHY

Department of Educational Administration

2000

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ABSTRACT

USE OF TECHNOLOGY BY NURSING STUDENTS: LEARNING STYLES, AGE, AND EXPERIENCE

By

Denise L. Hoisington

The researcher's primary purpose in this study was to determine whether there is a relationship between the learning styles, computer/Internet experience, and age of selected nursing students, and those students' comfort in using the Internet/WWW in a traditional course in Nursing Pharmacology. The researcher also sought to determine what the students perceived as factors that frustrated them or made them uncomfortable when they completed course assignments on the Internet/WWW. An additional purpose was to determine whether any suggestions could be made for teaching and learning.

The study involved a convenience sample of 41 students enrolled in a program leading to an associate degree in nursing. Students were in the first semester in the nursing program and enrolled in a one-credit course in pharmacology. The study was qualitative and quantitative; it was considered correlational, descriptive, and exploratory.

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A comfort scale developed by the researcher was used to measure students' comfort using the Internet and computers. The Canfield Learning Style Inventory and Gregorc Style Delineation were used to measure learning styles. No statistically significant relationship was found between students' results on the comfort instrument and their learning styles. A statistically significant relationship was found ($\alpha = .05$) between students' comfort and their experience using the Internet and computers. No statistically significant relationship was found between students' comfort and their age.

The qualitative data indicated that students perceived comfort in terms of the extra time it took to access the Internet, deal with technological problems, and learn to use the computer software and browsers. Additional qualitative data indicated that students gave only marginal responses over the Internet. Implications for further research, and for teaching and learning on the Internet, were discussed.

ACKNOWLEDGMENTS

I wish to thank those who provided support and encouragement through the long days of completing this project. I particularly want to thank my doctoral committee—Drs. Marvin Grandstaff (chair), John Dirkx, Ann Austin, and Walter Hapkiewicz—for their contributions.

I also want to thank Dr. Sally Johnson for help with grammar, Dr. Fred Swartz and Amy in Testing Services for assistance in data analysis and instrument development, Dr. Mike Cooper for support in data analysis, Mary Roehrig for assistance in instrument analysis, and all the faculty in the Department of Nursing who provided support and encouragement. Special thanks to all the students who agreed to participate in the study and those who helped critique the Internet assignments and the Comfort Instrument.

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CHAPTER I

THE PROBLEM

Introduction and Background of the Problem

The World Wide Web (WWW) and the Internet have increased enormously in popularity over the past five years. With this popular technology have come new ways to perform financial transactions, conduct research, find information, market products, find clients or customers to purchase services and products, and communicate with others. The WWW has become a household word to the youngest of children, many of whose parents have yet to master the computer. For these people, new Internet hardware systems have been developed that connect to the family television without the need for a computer. As this technological phenomenon grows, the Justice Department and Internet software developers have become embroiled in a legal battle to prevent a lucrative monopoly over this fledgling technology.

Along with the benefits of the Internet have come public concerns for limiting children's access to potentially harmful Web sites. Others have voiced the need for government regulation of the Internet to prohibit the transmission and publication of various types of material, such as child pornography. As a result, the Internet and Internet providers are caught between social concerns

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and the constitutional amendment guaranteeing freedom of speech. This is an important issue, especially when one considers that the WWW is exactly that, worldwide, and thus leads to the question of whether anyone can try to legislate and control this medium that crosses oceans and international boundaries. This medium does not have just one source or even limited sources of producers, suppliers, publishers, and consumers (Halpern, 1994). Anyone with a modem and access to the Internet can publish information on the Internet, making control difficult.

Proliferation of the WWW has made it mandatory that graduates of institutions of higher education not only be proficient in the use of computers and computer software, but also be able to navigate the often-confusing Web. Users of the WWW must learn the new terminology of surfing the Web (Williams, 1996): uniform resource locators (URLs), navigation bars, hyperlinks, hypertext markup language (HTML), browsers, servers, and file transfer protocol (FTP). (See Table 1 for definitions of Internet/WWW terminology.) College and university students are called on to use the Internet to find information to complete their course work, to create and publish Web pages, to communicate with professors and peers, and to register for classes. Some even take entire courses over the Internet outside of traditional classroom settings with instructors in attendance.

Higher education institutions have met this new wave of technology with varying degrees of acceptance (Atkins & Rehn, 1996; Halpern, 1994; Simonson, Hays, & Hall, 1996; Williams, 1996). Most colleges and universities have

Table 1: Definitions of Internet/WWW terminology.

Electronic mail (e-mail)—Service for sending messages over a computer network.

File transfer protocol (FTP)—The Internet service that transfers files from one computer to another over standard telephone lines.

Home page—The starting point for a Web site. It is the page that is retrieved and displayed by default when a user visits the Web site.

Hypertext markup language (HTML)—The standard language for describing the contents and appearance of pages on the WWW.

Hypertext transport protocol (HTTP)—The Internet protocol that allows WWW browsers to retrieve information from servers.

Hyperlink—A pointer from text or from an image map to a page or other type of file on the WWW. On Web pages, hyperlinks are the primary way to navigate between pages and among Web sites.

Internet—The global computer network, composed of thousands of wide area networks (WANs) and local area networks (LANs), that uses transmission control protocol (TCP)/Internet protocol (IP) to provide worldwide communication to homes, schools, businesses, and governments. The WWW runs on the Internet.

Internet protocol (IP)—Internet software that divides data into packets for transmission over the Internet. Computers must run IP to communicate across the Internet.

Transmission control protocol (TCP)—Internet networking software that controls the transmission of packets of data over the Internet. Computers must run TCP to communicate with Web servers.

Uniform Resource Locator (URL)—A string that supplies the Internet address of a Web site or resource on the WWW, along with the protocol by which the site or resource is accessed. The most common URL type is http://, which gives the Internet address of a Web page.

Web Browser—A client application that fetches and displays Web pages and other WWW resources for the user.

World Wide Web (WWW). The graphical Internet hypertext service that uses the HTTP protocol to retrieve Web pages and other resources from Web servers. Pages on the WWW usually contain hyperlinks to other pages, documents, and files.

Note. From Getting Started With Microsoft FrontPage 98 (pp. 279-306), 1997, Redmond, WA: Microsoft.

computer access to the Internet and the WWW. Anyone with a computer and access to the Web can reach these institutions' home pages from personal computers, connect to library services, locate descriptions of programs and degrees, and read the institutions' philosophy and mission statements. Students can access their own records and syllabi for courses, e-mail instructors, participate in chat and discussion groups, and even file papers electronically (Terry, 1996). However, use of the Internet in academics varies within departments and programs across the campus for several reasons. Resources for computers, release time for development of Web pages and assignments, maintenance and frequent updating of hardware and software, faculty and staff training (Terry, 1996), and acceptance of this different way of teaching and learning all have led to the disparity among units when it comes to adoption and use of the Internet across and within academic departments.

One reason for the hesitance of some academicians to adopt the Internet for their course work, besides the time and resources needed to develop Web sites, is the complexity of developing Web pages (Williams, 1996). In the past, Web pages have had to be developed using HTML (Terry, 1996), which entails learning an entirely new computer language and spending time typing in computer language to produce interesting and appealing Web sites. However, new software is emerging that allows people to construct Web pages using familiar computer environments and techniques to circumvent many of the confusing and cumbersome HTML functions, thereby allowing quicker development of Web sites without a knowledge of HTML. The increasing ease

of Web-page development will enhance the use of the WWW as a medium for course development and for offering entire degrees via the Internet, as colleges and universities compete for a potentially new student market.

In conclusion, the WWW and Internet are revolutionizing the way colleges and universities reach students, provide services, and enhance teaching and learning. However, this technology presents many challenges for students and faculty who are not experienced in using this medium and are unaware of its effects on teaching and learning. As with any new technology, many questions about instruction via the Web and Internet will be raised and answered over time and through trial and error. Thus, research is essential to determine the best ways to teach and learn via the WWW.

Statement of the Problem

The proliferation and popularity of the Internet and WWW are raising questions about how this technology can be used to aid in teaching the diverse types of students enrolled in colleges and universities. Students come to higher education institutions with a wide array of knowledge and experience in using not only computers but also the Internet. Some students come from resource-rich secondary school systems in which computers and access to the Internet are available and are used in many courses. Others come from schools where computer access was limited or even unavailable. Although numerous students have computers at home, just as many cannot afford home personal computers (PCs). Also, many students who do have home PCs might not have affordable

access from home to the Internet (Terry, 1996), such as those living in rural areas, where long-distance telephone charges for Internet access can limit their time online. In some of these areas, public facilities to access the WWW are also limited, if available at all.

The use of the Internet in traditional college courses has other implications, as well. Some students come to higher education directly from secondary schools, whereas others enter after having been out of school for many years. Still others return to school after having successful careers, to update their skills or to venture into a new career. For many of these students, traditional classroom lectures dominated their secondary and postsecondary educational experiences. To take courses on the WWW or just to complete Web-based assignments can be overwhelming, not only to these students but also to faculty who may not understand the implications the Internet has for teaching and learning.

The Internet has thus become a new way to teach and to learn (Terry, 1996). Yet, little advice and few resources are available for faculty to learn how to develop programs and courses to be offered on the WWW. A search of the literature yielded little guidance in how to use the WWW to aid in teaching and learning, what types of learning occur, and whether the Internet provides the same quality of programs and learning as traditional classrooms and course work. Minimal research has been conducted on what should be done to provide quality Internet courses and assignments, and what types of students learn best

by using the WWW and the Internet. Again, the literature provides little or no guidance in these areas.

Ample literature is available on learning through the use of computers, computer-assisted instruction (CAI), use of hypermedia, and other modalities. Yet, information on how use of the Internet and the WWW relates to learning and teaching is lacking. Eggers and McGonigle (1996) found that use of Internet communication (both synchronous and asynchronous) with students did not elicit the quality or quantity of student responses that was deemed appropriate. They stated that the quality of electronic communication can be a problem. Thus, Eggers and McGonigle advised that instructors should be aware of the importance of synchronous and asynchronous communication and suggested setting up electronic office hours.

The question has been raised whether there is a difference in quality between Internet and traditional classroom settings. Communication using the Web might lack quality because it is such a new medium through which to present courses and course work, and many people are unfamiliar with the technology. Yet, courses are now being taught exclusively on the WWW, and traditional courses include assignments that necessitate using the Web for course completion.

Fischer, Fischer, and Hayes (1996) and Thurston and Sebastian (1996) viewed the Internet as a viable option in distance education, which can link learners in rural areas to major colleges and universities. They stated that e-mail, list-serves, discussion groups, and access to instant information all provide

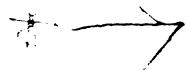
a forum far superior to the traditional classroom. An Internet-based course/classroom management system has been established at the State University of New York (Graziadei, Gallagher, Brown, & Sasiadek, 1997). It is designed to assist faculty in developing courses on the Web and providing a better synchronous and asynchronous learning environment.

Even if the WWW is not included in their course work, students need to understand how to use the Web as a rich source of information. They need to be able not only to find information but also to distinguish between good information and that which is of questionable value (Fischer et al., 1996; Kazor & Jacobson, 1996). Also, students and faculty still are feeling their way with the use of computers and software programs (Partridge, 1993) and determining their place in teaching and learning. Now, the Internet has been added to the growing technology, and students and faculty are unsure how to use this medium to maximize its potential in teaching and learning (Williams, 1996).

A literature review did bring to light some articles about how to use HTML to develop Web pages, what types of fonts to use, and other aspects of preparing a Web site. Monographs were found describing what various universities have done to provide Internet courses and faculty development in their use. Studies were found on the use of computers in instruction. However, only a few articles were found on using the WWW or its relationship to teaching and learning. When authors did address topics of teaching and learning, they concentrated on how to help students find information on the WWW, students' need to use critical thinking to find information on the Web, and differences in

students' use of the Internet in comparison to other learning techniques

(Williams, 1996).



Nowhere is the use of the Internet more important than in healthcare programs in higher education, more specifically, in the nursing profession.

Technology is changing so fast in healthcare, and nurses must keep current on new drugs, innovative medical devices, and healthcare issues. The Internet is an important way to access such information in a timely manner. It enables individuals to network with other nurses through list-serves, chat rooms, and e-mail (Farquhar et al., 1996). Yet, the new technology is not used by many nurses, partly because little use is made of the Internet in nursing education.

Mill et al. (1997) found that, in some institutions, nursing faculty and students felt comfortable using computers. They used computers to play games, do word processing, and conduct database searches. However, in their study of one university, only 25% of students and 40% of faculty thought they used the Internet effectively. In the same survey, 100% of students and faculty said they would like to have an opportunity to learn more about the Internet.

The information and technology explosion may be leaving many nurses behind, and if nurses are unable to use the Internet effectively, they will remain behind. Mill, Piper, and Tucker (1997) stated that few nurses use medical devices and computers effectively in acute-care settings. Healthcare providers cannot afford to employ nurses who are unable to function in ever-changing healthcare settings. Functioning effectively includes use of computers and the Internet because informatics is becoming ever more important in nurses' work.

Mill et al. (1997) discussed this situation, stating that nurses who can effectively use just computers realize an average of 15% more in earnings than those who cannot use computers.

Nursing programs in higher education have student populations similar to those of other disciplines. Like other disciplines in higher education, nursing education depends on the use of information found in textbooks and journals, which quickly becomes outdated. The Internet is a source of almost infinite information and communication and can remain more up to date and timely than published materials. Therefore, students must have access to and be given opportunities to learn to use this technology, in order to complete course assignments while they are in school and to remain current in their fields after graduation.

Purpose of the Study

The researcher's primary purpose in this study was to determine whether there is a relationship between the learning styles, computer/Internet experience, and age of selected nursing students, and those students' comfort in using the Internet/WWW in a traditional course in Nursing Pharmacology. The researcher also sought to determine what the students perceived as factors that frustrated them or made them uncomfortable when they completed course assignments on the Internet/WWW. An additional purpose was to determine whether any suggestions could be made for teaching and learning.

To accomplish this purpose, the researcher collected data from a convenience sample of 41 students enrolled in a program leading to an associate degree in nursing at a midwestern university.

Research Questions

The following questions were posed to guide the collection of data for the quantitative portion of this study:

1. Is there a relationship between the learning styles (independent variable) of nursing students enrolled in a traditionally taught course in Nursing Pharmacology and those students' comfort in using the Internet/WWW (dependent variable)?
2. Is there a relationship between nursing students' personal experience in using computers and the Internet (independent variable) and those students' comfort in using the Internet/WWW (dependent variable)?
3. Is there a relationship between nursing students' age (independent variable) and those students' comfort in using the Internet/WWW (dependent variable)?

Creswell (1994) stated that research questions also should be used to guide the collection of data in qualitative studies. Thus, two exploratory questions were posed for the qualitative portion of the study:

4. What do students perceive as factors that were frustrating or made them uncomfortable when they completed course assignments on the Internet/WWW?
5. Can suggestions be made for teaching and learning?

Hypotheses

Null hypotheses were formulated to test the data gathered to answer the first three research questions. They are as follows:

Ho 1: There is no relationship between nursing students' learning styles and their comfort in using the Internet/WWW.

Ho 2: There is no relationship between nursing students' personal experience in using computers and the Internet and their comfort in using the Internet/WWW.

Ho 3: There is no relationship between nursing students' age and their comfort in using the Internet/WWW.

Definition of Terms

The following terms are defined in the context in which they are used in this dissertation:

Adaptation: "A process of responding positively to environmental changes in such a way as to decrease responses necessary to cope with the stimuli and increase sensitivity to respond to other stimuli" (Johnson-Lutjens, 1991, p. 34).

Asynchronous communication: Communication that takes place when two or more people are online at the same time and responding to one another instantaneously. Examples are teleconferences and chat rooms.

Comfort: Self-reported feelings of students as to their experience using the Internet/Web for course assignments, as measured by the Comfort Instrument.

Comfort Instrument: Researcher-developed instrument using bipolar terms developed to elicit degree of comfort responses from subjects.

Coping: "Routine, accustomed patterns of behavior to deal with daily situations, as well as the production of new ways of behaving when drastic changes defy the familiar responses" (Johnson-Lutjens, 1991, p. 36).

Coping mechanisms: "Innate or acquired ways of responding to the changing environment. Innate coping mechanisms are genetically determined or common to a species. Acquired coping mechanisms are developed through processes such as learning" (Johnson-Lutjens, 1991, p. 36).

Discussion group: A site on the Web where Pharmacology 151 students posted their responses to questions or comments from the instructor. After the message or comment was posted, it was left for other students to read.

Learning style: "The affective component of educational experience, which motivates a student to choose, attend to and perform well in a course or training exercise" (Canfield, 1992, p. 1).

Learning style preference: "The way individuals concentrate on, absorb, and retain new or difficult information or skills" (Dunn, 1983, p. 496). Learning style is a "combination of environmental, emotional, sociological, psychosocial and psychological elements that permit individuals to receive, store, and use knowledge or abilities" (pp. 496–497).

Nursing student: A student who was enrolled in Pharmacology 151, was involved in obtaining an associate degree in nursing, and had no previous educational background in nursing. Nursing students in this study were at least sophomores and were involved in both classroom and clinical settings in hospitals as part of their educational program.

Pharmacology Web page: A Web site developed by the researcher and placed on a local server. The site contained all materials and assignments needed to complete the course. It contained hyperlinks to pharmacological sites that students might find useful, as well as directions to complete Web assignments developed for the course. The site could be accessed from anywhere with the proper computer software and access to the Internet.

Synchronous communication: Communication that involves one person leaving a message or other communication for another individual. The second person receives the message at a later time when accessing the information. Types of synchronous communication on the WWW include sending e-mail, posting a message, and responding to a question or comment in a discussion group.

Threaded messages: Messages or comments that are saved and can be viewed again after another message or comment has been sent. An example is e-mail messages to which the receiver responds, leaving the original message attached. Another example is posting messages to a discussion group, whereby a person can read all messages that have already been posted and then leave a new message that will be added to the list of messages for subsequent visitors to read. Messages or comments can be threaded so that the newest comment is placed at the top of the list or saved under the last one that was sent or posted. In discussion groups, threaded messages allow others to see and respond to all posted comments.

Web assignments: Four assignments that were a part of Pharmacology 151. Each assignment included performance of one activity on the Web. The Web assignments were part of the course.

Overview

Chapter I contained an introduction to the study and the background of the problem, as well as a statement of the problem. The purpose of the study was set forth, and the research questions and hypotheses were stated. Definitions of key terms were provided. Chapter II is a review of literature and research on learning styles and other topics pertinent to the study. The methodology used in conducting the study is discussed in Chapter III, and the findings are presented in Chapter IV. Chapter V contains conclusions drawn from the findings, limitations, and recommendations for practice and for further research.

CHAPTER II

REVIEW OF LITERATURE

Introduction

Literature on learning styles abounds. Exploration of the literature on learning styles revealed a number of theories about and measures of learning styles. Also, much research has been conducted pertaining to learning styles of students across all age groups and disciplines. This chapter begins with definitions of learning styles and continues with an in-depth review of learning style theory and a discussion of learning style inventories. Research on learning styles in general and the learning styles of nursing students in particular also is reviewed. Next is a discussion of the literature on learning styles and learning with computers and the WWW.

The review of research on learning styles ends with the researcher developing assumptions and a conceptual framework for use in connecting the literature review on learning styles to learning on the Internet. The conceptual framework and assumptions are intended to give the reader a better understanding of how the purpose was formed and the hypotheses generated, why the instruments were chosen, and the researcher's expectation of data analysis.

Definitions of Learning Style

In the literature, writers have used the terms *learning style*, *cognitive style*, and *learning strategies*. Hence, it is important to consider how these various terms relate to each other, not only to understand what the term *learning style* means, but also to understand why there are so many different theories and inventories purporting to describe and measure individual learning styles. In this section, an attempt is made to define the term *learning style* by comparing it to the concepts of *cognitive style* and *learning strategies*.

One reason for the multiplicity of terms is that learning style theorists have been unable to arrive at a common definition of *learning style*. This is partly because of a lack of knowledge of how the brain processes information, and partly because it is difficult to assess characteristics used in measuring learning style. Other reasons are that students learn in many ways, individuals encounter multiple learning situations, and different theorists and researchers consider various learning phenomena to be most important in the process of learning. Further, most of the research on cognitive style has been done on children, and it is not clear how generalizable the results are to adults.

Merriam and Caffarella (1991) stated that cognitive styles are consistent ways persons perceive, remember, think, and problem solve. They defined cognitive style as the way people interpret their environments. They believed that people tend to be either global or specific in their approach to problem solving. Global problem-solvers look at problems in terms of the overall aspect

of which the problems are a part. Specific problem-solvers like facts and figures and consider individual pieces of the problem.

Merriam and Caffarella (1991) stated that learning style and cognitive style refer to different things, even though some authors use the terms interchangeably. They cited numerous writers who have attempted to define the two terms and concluded that the difference between the terms *cognitive style* and *learning style* lies in the learning situation itself. Cognitive style is used to describe how individuals generally “perceive, organize, and process information,” whereas learning style is used to “emphasize both the learner and the learning environment” (p. 177). Therefore, cognitive style refers to the way the individual has learned to process stimuli he or she encounters, and learning style is how the learner uses the environment to obtain information for processing. Learning strategies are the tactics (reading, lecture, movies, hands-on) the learner uses to take in the information from the environment and then to process (cognitive style) that information into some form of usable information for further learning.

Robinson (1979) defined learning style as “distinctive behaviors which serve as indicators of how a person learns from and adapts to his environment. It also gives clues as to how a person’s mind operates” (p. 49). In contrast, Underwood (1987) defined learning style as “an attribute, characteristic or quality within an individual that interacts with instructional circumstances in such a way as to produce differential learning achievement” (p. 7). She identified four ways to evaluate learning styles: (a) determining variations in modes of

perceiving, remembering, and thinking; (b) identifying avenues by which people "apprehend, store, transform and utilize information"; (c) identifying conditions under which students are likely to learn; and (d) determining "the amount of structure" persons need in order to achieve (p. 7).

According to Tennant (1991), cognitive style and learning style "are related terms which refer to an individual's characteristic and consistent approach to organizing and processing information" (p. 89). Tennant described learning style as an egalitarian concept because, instead of being thought of as good or bad, learners are simply considered different. The prevailing principle of the egalitarian concept is that all learners learn differently. Therefore, no way of learning is viewed as a good or a bad way to learn.

Gregorc (1994) used the word *style* to describe learning approaches and defined style as being "based on Mediation Ability Channels through which [one] receives and expresses information most efficiently and effectively. The power, capacity, and dexterity to utilize these channels are collectively termed mediation abilities. The outward appearance of an individual's mediation abilities is what is popularly termed *style*" (p. 5). Thus, Gregorc defined style as the behaviors exhibited by individuals in using channels after they encounter stimuli. Channels refer to the specific way individuals take in information and route it for processing. Style is therefore the behavior others observe of the individual when he or she is in a learning situation.

Pintrich and Johnson (1990) distinguished between learning styles and learning strategies. Learning styles, they said, are "based on the assumption

that individuals can be described by certain psychological characteristics, traits or styles that influence the way they perceive, organize, and react to different environmental stimuli" (p. 84). Learning styles are stable across time and different situations, are difficult to change, and are not under conscious control of the learner. In comparison, learning strategies are those techniques that people use regardless of their learning styles, even though people with similar learning styles use similar learning strategies.

Unlike learning styles, learning strategies can be learned and changed (Pintrich & Johnson, 1990). Learning strategy theory "emphasizes (a) the changing nature of strategies and motivation due to situational demands and (b) the assumption that the use of different learning strategies can be controlled by the learner" (p. 85). Many times, however, students have knowledge of only a few learning strategies and use them in inappropriate ways.

Students can learn new strategies when they are presented. Pintrich and Johnson (1990) stated that students engage in learning through a variety of situations, such as attending lectures and discussions, taking notes, writing papers, taking multiple-choice examinations, writing essays, and reading. The learning strategies that are used in taking comprehensive essay examinations are not appropriate to use when taking factual-recall or multiple-choice exams. Thus, students need a wide range of learning strategies to succeed in the varied situations they encounter.

From the foregoing discussion, one can see that the terms *cognitive style*, *learning style*, and *learning strategy* are difficult to separate because they all

pertain to how the dynamic process of learning takes place. The process starts with the person's first encountering many forms of stimuli and then progresses to mentally processing and sorting the information. The person then makes sense of the information by incorporating it with what he or she already knows, and then recalling the information in order to apply it in new situations or to provide answers on evaluation tools such as exams. The above-mentioned terms are an attempt to define the concept of learning, a concept that has yet to be defined and thoroughly understood.

No consensus has been reached as to what learning is, how it takes place, or how to measure it in diverse learners and in the numerous learning situations that people encounter, not only in organized higher education settings but also in work and daily life situations. Therefore, it is useful to view learning style theories and inventories within a conceptual framework in order to understand the multiple perspectives that have been used in defining, explaining, and measuring learning styles.

Theoretical Framework for Understanding Learning Style Theories

Because of the number and diversity of learning style theories described in the literature, it is useful to examine the various theories and theorists in terms of a conceptual framework that allows one to view the concept of learning styles based on the particular aspect of learning style theory they purport to measure. Curry's framework, as used by Claxton and Murrell (1987, p. 7), was used as a model to arrange and understand the various learning style theories. Following

this explanation, selected learning style theorists are discussed, along with their measures of learning style.

When discussing learning styles, Claxton and Murrell (1987) used Curry's typology, which has four levels for classifying different learning style theories. The authors used the metaphor of an onion to conceptualize the different models, or theories, of learning style. They wrote,

At the core of the onion is style in the sense of basic characteristics of personality. Information processing models, describing how persons tend to take in and process information, are the second layer. Social-interaction models, dealing with how students tend to interact and behave in the classroom, make up the third; and learning environment and instructional preferences constitute the fourth. (p. 7)

Personality models are at the core of the metaphorical onion. Claxton and Murrell identified personality models as the field dependence and independence work of Witkin and the Myers-Briggs Type Indicator (MBTI) based on Jungian theory. Also included are the theories of reflection versus impulsivity, the Omnibus Personality Inventory, and the Holland typology of personality, which attempts to describe learning in light of individual environmental preferences in the workplace.

The second layer, surrounding the core of the onion, is the **information-processing** level. This level includes the work of Pask, who described learning strategies as holistic (global) or serialist (sequential). A second information-processing theory is Kolb's experiential learning, which focuses on individual development. A third information-processing model was developed by Gregorc and is similar to that of Kolb. Gregorc described information processing by

1.

2.

3.

learners as being a combination of random or sequential and abstract or concrete.

The next layer out from the core is the **social-interaction level** (Claxton & Murrell, 1987). This level includes the Grasha and Reichmann theory, which describes learners in terms of their response styles. Students are described as independent, dependent avoidant, participant, competitive, and collaborative. The Mann theory views students in terms of clusters, based on their responses in the classroom. A third model, by Fuhrmann and Jacobs, describes three styles of student responses: dependent, collaborative, and independent. The model classifies students as learning oriented or grade oriented. The Eison model identifies learning style in terms of students' attitudes pertaining to grading and learning.

The outer layer of the learning-style onion contains Hill and Canfield's **instructional-preference models**, which are used to evaluate the teaching methods students prefer. Canfield's theory is based on Maslow's hierarchy of needs and research on achievement motivation. His Learning Style Inventory (LSI) encompasses four areas: conditions of learning, content preferences, instruction-mode preference, and grade expectations of students.

The above-described typology and framework provided by Claxton and Murrell (1987) was used to organize learning style theories in this study, in an attempt to understand the various theories and the aspect of learning style each was devised to explain and measure. Using this framework, a review of the

literature on learning style theories was undertaken to explain how the theories vary.

Selected Theorists and Their Theories

There exist a wide variety of theories and approaches to understanding learning styles. Tennant (1991) asserted that learning style theories "should not be seen as mutually exclusive, rather they support the reasonable expectation that people differ in their learning styles in a number of ways" (p. 89). Messick (as cited in Tennant, 1991) identified 19 types of learning styles, and Smith identified 17 learning style inventories aimed at diagnosing individual learning styles.

Tennant (1991) and Merriam and Caffarella (1991) stated that most inventories identify learning styles on bipolar scales using such terms as field dependent versus independent, reflective or impulsive, serialist or holistic, and diverger versus converger. Tennant discussed the controversy surrounding the belief of some learning theorists that learning potential involves a single dimension such as intelligence quotient (IQ) and the notion that learning style can be measured by or adequately described with bipolar scales. However, a single dimension and a bipolar scale cannot take into account the complexity of the learning process, multiple learning situations, and the diversity of learners.

The debate surrounding the diversity of learners and learning situations has focused on the fact that, because there are so many situations and learners, an incomplete picture of learning styles is obtained when they are measured on

such limited scales. Most of the LSIs use paper-and-pencil questionnaires, which limit the information gathered. Qualitative information, which would be a richer source of data on individual learning styles, is not gathered with the inventories reviewed for this study. LSIs, however, can be used with large groups of students, and the ensuing data analyses are quicker and more cost effective than analyses of interview responses and other qualitative data. This is an important consideration when limited time and resources are available to diagnose the learning styles of large groups of students, such as those in college classrooms.

Thompson and Crutchlow (1993) stated that much confusion about learning styles has resulted from the small samples used in most studies. Most research efforts have been very limited and focused, have used one survey, have employed limited research designs, and have not followed the same students over time in order to understand how learning styles may or may not change.

Each learning style, according to Fry and Kolb (as cited in Tennant, 1991), is incomplete by itself. Further, each learning style has its own weaknesses and strengths. Thus, if a person is locked into one learning style, he or she is an incomplete learner. In contrast, the complete learner is able to distinguish each learning style, know the boundaries of each one, and recognize how to use each style effectively. Fry and Kolb “proceeded to link the notion of the *complete* learner with a model of human development whereby a long period of accentuating one’s dominant learning style is followed by a capacity for

integration. . . . It is not a model which is worked out in detail and there is no evidence offered in its support" (Tennant, 1991, p. 102). Tennant criticized the term *complete learner* used by Kolb and Fry as being a "utopian conception of psychological development" (p. 102).

To better understand the differences in learning style theories and what they mean, it is important to consider a sampling of those theories. By doing so, educators who use learning styles may gain a better understanding of what each theory emphasizes and is intended to measure. The learning style theories presented here are only a sample and are presented in accordance with the framework of Claxton and Murrell described above, starting at the center, or core, of the onion. A review of these theories and their inventories provides the context for each of the related studies and allows a better understanding of the implications and conclusions from those studies.

Of the four levels of models included in Claxton and Murrell's (1984) framework, the third level, the one just beneath the outer layer, is social-interaction theories. In the literature on nursing students, no studies were found that specifically fit this level, so the models discussed in that section are not evident in the ensuing review of research articles. However, two models are reviewed under the social-interaction level that illustrate what theorists in that category have sought to understand when attempting to explain learning styles.

A fifth level was added for the purposes of this study. It contains the Productivity Environmental Preference Survey (PEPS) developed by Price, Dunn, and Dunn (1991), a model of learning styles that does not seem to fit into

any of the other four levels of Claxton and Murrell's (1984) typology of learning styles. The PEPS appears to be more global and incorporates aspects of the other four levels in various degrees. Therefore, it is included and discussed as a separate level of the metaphorical onion.

Personality Models of Learning Style

Field dependence/independence. Witkin discussed learning styles in terms of field dependence and field independence (Tennant, 1991; Witkin & Goodenough, 1981). From studying how people make decisions, Witkin came to believe that some people's perceptual judgments are based on the context of the situation. He related this to the cognitive function of decision making, but found evidence that field-independent learners perform better than field dependents on cognitive tasks. Witkin's classification of people as field independent and dependent has been broadened from just a narrow view of perception to an understanding of how people in each of these categories view the world.

Field dependents are bounded by a social framework and reflect this preference for social interaction in the activities they engage in and the work area they select. Tennant (1991) described field dependents as follows:

Field dependents rely on a social frame of reference to formulate their beliefs, attitudes and feelings, and self-concept; . . . they make few self-references in their speech; . . . they adapt their rate of speech to the rate of the person to whom they are communicating; . . . they are more sensitive to social cues; . . . they like to be with people; . . . they are better liked; . . . they prefer to be physically closer to others, and so forth. (p. 92)

The following is a description of how field-dependent students learn and how such teachers teach:

Field dependent learners rely on externally provided structure, therefore need assistance with unorganized material; tend to focus on salient cues only, but their strategy can be altered with instruction; are better at learning and remembering social material; and external reinforcement should be more salient. Teachers who are field dependent prefer discussion method and situations which allow interactions with students; avoid negative feedback and evaluation; and prefer rapport, participation, a warm and personal environment. Field dependents prefer interpersonal domains which require social skills such as elementary school teaching, social sciences, rehabilitation counseling, welfare; favor specializations with a people emphasis, e.g., clinical psychology, psychiatric nursing, social studies teacher; are more undecided about occupational choice and less committed to their choice, and shift their college majors away from impersonal and cognitive domains. (Tennant, 1991, pp. 93-94)

In contrast, field independents are more autonomous and have been taught throughout life to be independent. Therefore, they view the world from a viewpoint of "self," referring less to self in the context of others and using "I" when talking about the self. Field independents are less apt to feel comfortable when involved in close work with others and function better in activities in which they are allowed to function at the pace and course they set themselves. This is not to say that field independents cannot work with others and are antisocial; rather, they prefer and have a higher level of comfort when they are able to work independently and think as one. They have difficulty putting the world in a social context; therefore, their actions are better suited to functions that allow them to think and work outside the confining context that society can bring. In this way, they can focus on their internal motivation.

Field-independent learners learn more under conditions of intrinsic or internal motivation, are more likely to structure ambiguous material, tend to sample the entire array of cues (hypothesis-testing approach), and need

assistance in focusing on social material. They prefer analytic and impersonal domains in such areas as physical and biological sciences, mathematics, engineering, and technical and mechanical activities. Such learners favor specializations that are impersonal and require cognitive skills, such as experimental psychology, surgical nursing, natural science, and teaching, which are concerned with occupational planning; have more specialized vocational interests; and shift their college majors away from personal and social domains. Field-independent teachers prefer lectures, discovery methods, and situations that are more impersonal and cognitive; emphasize the need to correct errors and provide negative evaluations where appropriate; and show strength in organizing and guiding student learning.

The Myers-Briggs typology. The second personality model of learning style is the Myers-Briggs typology. This typology is based on the general personality model and is not related to cognitive functioning used by college students in normal classroom settings (Pintrich & Johnson, 1990). In the Jungian-derived Myers-Briggs typology, students are categorized along four dimensions. These dimensions are based on whether people use **sensing or intuition** to perceive the world, and whether they employ **thinking or feeling** to make judgments and decisions. People prefer one alternative from each of the two categories. Along with preferences for **sensing or intuition** and **thinking or feeling**, people have a propensity, or preference, for either **introversion or extroversion**, and to be either **judging or perceptive**. These “preferences for

interacting with information and other people are related to how students learn in all courses all the time" (Pintrich & Johnson, 1990, p. 84).

The Myers-Briggs Type Indicator (MBTI) measures variations in individuals by means of dichotomous scales that assess (a) Extroversion versus Introversion (E-I), (b) Sensing versus Intuition (S-N), (c) Thinking versus Feeling (T-F), and (d) Judging versus Perception (J-P). Research using the MBTI has indicated that students tend to use consistent strategies to take in information and make decisions regardless of the situation or material presented, based on the four dichotomous scales.

Claxton and Murrell (1987) provided the following description of the four scales of the MBTI. The E-I scale measures individuals' tendency to be extroverted (E), focusing on other people, actions, and ideas, or to be introverted (I), focusing more on inner ideas and concepts. The S-N scale assesses whether people act based on what they directly sense (S) from the concrete environment or make inferences to give meaning to what is experienced (N).

T-F, the third scale on the MBTI, is used to explain how people make individual judgments. These judgments may be made either through logical, decision-making steps (T), or through decisions people make based on their priorities and values (F). The final scale, J-P, measures whether people judge situations and react proactively based on planned actions (J) or react more spontaneously to events without planning or controlling what is happening (P).

Implications of the Myers-Briggs theory have been researched and demonstrated in teaching-learning situations. Matching teaching and learning

types on the four scales brings about better results than occur when teachers' and learners' types do not correspond to each other. The MBTI also has been used to demonstrate that people learn better when course content, modes of learning, and so on, are matched with their learning types, as determined by the MBTI. Claxton and Murrell (1987) explained this by saying that

intuitive types consistently score higher on aptitude measures based on reading and writing . . . because they convert symbols into meaning, thus grasping concepts and ideas faster from written words and developing greater skills in reading. Sensing types have less natural interest in reading, take more time to read for details, and are less motivated to learn to read unless they can see a practical use for reading. (p. 15)

McCaulley (1990) stated that the MBTI is useful not only with regard to individuals but also to the relationships between individuals involved in groups.

In conclusion, researchers on field-independent and field-dependent learners and the MBTI has attempted to describe individuals and how they think; each theory is an attempt to classify students according to their unchanging personalities. Claxton and Murrell (1987) also stated that these theories measure personality attributes that are not changeable and are stable across situations and time. In light of this, it is necessary to look at whether the learner and teacher are matched or mismatched because matching of the teacher-student dyad is important for student learning. If there is a mismatch, student learning and achievement will be hampered because it is difficult for both teacher and learner to change to meet the needs of the other. This situation has implications for faculty and student development offices, which will need to plan courses and provide resources aimed at helping both faculty and students

understand the teacher-learner situation. Instructors and students need help in learning how to work at optimal levels, whether matched or mismatched, how to identify when there is a mismatch, and skill in decreasing the effects of a mismatch.

Information-Processing Models

Information-processing models focus on how people process information when they receive it. These models explain how students use past experiences and knowledge to select information from the environment and incorporate it into what they already know. The following examples comprise the second level of Curry's learning-style "onion."

Experiential learning. Kolb and Fry related their theory of learning style to the experiential learning model. In this model (Kolb, 1984), the learner has a concrete experience, makes observations and reflections based on the experience, and then forms abstract concepts and generalizations from that experience. The cycle is completed when the person tests the implications of the concepts in new situations. When the cycle is completed, the learner is ready for another concrete experience based on a new frame of reference developed from the last experiential process.

Kolb and Fry developed an LSI to measure a "person's relative position on the **concrete experience** vs. the **abstract conceptualization** dimension, and **active experimentation** vs. the **reflective observation** dimension" (Tennant, 1991, p. 103). The LSI lists a number of words, which respondents

put in rank order according to preference. Researchers have linked LSI results to such things as vocational choices, professional socialization, choice of undergraduate majors, and preference for various teaching methods. This theory is very prescriptive and has implications for career counseling of students.

The terminology of this model is complex, so a more in-depth explanation of the model, using direct quotations, is given here. The four learning styles characterized by Kolb and Fry (as cited in Tennant, 1991) are as follows:

1. Converger = *Abstract Conceptualization + Active Experimentation:*

These are the characteristics of many engineers. Convergers are strong in the practical application of ideas, perform well when there is a single correct answer such as on IQ tests, can focus hypothetical-deductive reasoning on specific problems, are unemotional, prefer to deal with things rather than people, and have narrow interests and choose to specialize in the physical sciences.

2. Diverger = *Concrete Experience + Reflective Observation:*

These are characteristics of people with humanities and liberal arts backgrounds. Divergers are strong in imaginative ability, are good at generating ideas and seeing things from different perspectives, are interested in people, have broad cultural interests, and specialize in the arts.

3. Assimilator = *Abstract Conceptualization + Reflective Observation:*

Assimilators often work in research and planning departments. They have a strong ability to create theoretical models, excel in inductive reasoning, are concerned with abstract concepts rather than people, are not too concerned with the practical use of theories, and are attracted to basic sciences and mathematics.

4. Accommodator = *Concrete Experience + Active Experimentation:*

Accommodators are often found in action-oriented jobs such as marketing and sales. Their greatest strength is in doing things, are risk takers, perform well when required to quickly adapt to immediate circumstances, solve problems intuitively, and rely on others for information. (p. 103)

Cornwell and Manfredo (1994) found Kolb's model to be valid, giving credence to the need to match learning styles with learning experiences to determine how students will master new skills. Geiger, Boyle, and Pinto (1992) stated that the construct validity of the instrument still needs to be reviewed and studied.

Style Delineator–Gregorc. This model also uses a bipolar scale ranging from the abstract to the concrete (Gregorc, 1994; Robinson, 1979). Gregorc juxtaposed this with an additional random-to-sequential scale similar to that of Kolb. The first learning style described by Gregorc is the Concrete Sequential (CS) learner. In this style, learning takes place based on hands-on concrete experience that is ordered and logically sequenced with extensive direction. CS teachers use a variety of teaching methods that are well organized and instructor directed. Abstract Random (AR) learners capture the teacher's verbal messages as well as nonverbal messages as a single concept in an unstructured, free learning environment. AR teachers use varied teaching methods but prefer peer learning and peer interaction.

Abstract Sequential (AS) learners do well at conceptualizing what they learn and rely on reading and listening skills. AS teachers use reading as well as written and oral assignments in which students can convey how they conceptualize their ideas and thoughts. Concrete Random (CR) learners excel in problem solving, exploration, and experimentation based on independent, individual, or small-group activity in which they can take detours from

assignments. CR teachers provide learning experiences that give students only the basic intention and let them develop and solve the problem.

Learning style models at the information processing level, such as those of Kolb and Gregorc, attempt to explain how individuals process information and highlight the role that development plays in learning styles. They emphasized the role that active learning plays in learning. Implications of these models include offering courses based on the learners' development and using learners' experiences as a way of relating new information to student learning. This level also emphasizes the relatively stable way in which people process information, an approach that may be difficult, if not impossible, to change. Implications for the use of the Kolb and Gregorc models are found in the opportunity for counselors and instructors to test students so they can be placed in courses and career tracks that complement their learning styles. This implies that faculty should also be aware of their own learning styles. By knowing their own styles, faculty will be better able to develop course lectures and modes of instruction that provide a variety of avenues to accommodate different types of learning, as well as their own style.

According to these theories, learning should include concrete, hands-on experiences that students use as a base for learning. This initial learning is then used when it is incorporated into future learning. As learning takes place, it is melded into past learning and provides a new, broader base for additional future learning. This is considered a continuous cycle that includes not only classroom

experiences and learning, but also application of learning in situations encountered in everyday life.

Unlike personality models, information-processing models involve an evolution of learning or knowledge. Personality models describe how learners best take in information and process that information. Information-processing models, on the other hand, describe learning as dynamic, a transformation of information from basic skills and knowledge to an increasing, more sophisticated knowledge—knowledge that is not static but changes when new learning takes place.

Social-Interaction Models

The two models used as examples at the social-interaction level are those based on the works of Grasha and Reichman and of Eison. These models evaluate how students relate to others in the classroom and their individual attitudes about course work and grades. These models are found in the layer next to the outer layer of the metaphorical onion.

Grasha and Reichman's Student Learning Style Scale. Grasha and Reichmann (as cited in Claxton & Murrell, 1987) developed the Grasha-Reichmann Student Learning Style Scale (GRSLSS), which identifies six categories of student response styles. The six categories are described in the following paragraphs:

1. **Independent** students work individually and are confident about their own abilities. They learn what they need to know through their own abilities and self-reliance.

2. **Dependent** students learn only what they need to know to pass the course and to get by. They rely heavily on teachers to lead them. They need direction in learning and demand that the learning process be laid out so that they can move from point A to B to C, eventually learning the material and passing the course.

3. **Collaborative** students learn with and through others. They enjoy the interaction involved in working with others. Learning is important, but social contact adds motivation and enjoyment to the learning process.

4. **Competitive** students strive to receive rewards, and the ultimate reward is to be the best in the class. It is not that learning is unimportant, but learning is secondary to the need to be the best.

5. **Participant** students enjoy the course work and want to learn and retain high self-responsibility.

6. **Avoidant** students not only participate little, but they avoid doing any more than absolutely necessary to pass the course or perform at the minimum level.

Grasha and Reichmann's learning style model has been used to structure courses for each of the different categories of students. For example, Dependent students can use all teaching strategies, but they remain centered on the teacher to lead their learning. These students rely completely on the

teacher, not only to lead them but also to provide learning situations in a highly structured manner. Independent students, on the other hand, enjoy developing their own learning or unstructured learning. Competitive students do well leading peer groups, whereas collaborative students prefer lectures and small-group activities. Participant students like opportunities to apply what they learn and situations that allow them to analyze what they learn. Avoidant students see no real value or benefit in any situation involving the classroom; they do not care for any classroom activity or content.

The GRSLSS, then, defines learning style as the way students like to interact, or not interact, with the teacher, content, and others in the learning situation. According to the GRSLSS, learning is maximized when students are allowed to be in situations that reflect their social-emotional needs. Hence learning situations should reflect and fulfill the multiple needs of diverse students.

The GRSLSS has demonstrated differences between traditional- and nontraditional-age college students. The nontraditional-age groups were more competitive, wanted less responsibility for learning, wanted teacher control, and had lower levels of interest in course work.

Eison's LOGO II. The second social-interaction model was developed by Eison (as cited in Claxton & Murrell, 1987), who studied student attitudes that manifest themselves as observed behaviors toward grades and learning. LOGO II is the instrument Eison used to measure students' attitudes in these situations. He identified students according to Learning Orientation (LO) and Grade

Orientation (GO), hence the name LOGO II. Eison did not use these two orientations alone, but used a combination of the behaviors to describe four scenarios reflecting varying degrees of LO and GO: (a) high LO and high GO—students are highly motivated to learn and achieve good grades; (b) high LO and low GO—these students' primary concern is to learn. Grades do not have great significance or motivation in their learning; (c) low LO and high GO—students seek grades irrespective of what they learn; and (d) low LO and low GO—students pursue neither grades nor learning through attending college, but rather seek other things such as job avoidance or social contact with peers.

Like the GRSLSS, LOGO II has been used in studies comparing traditional- and nontraditional-age (adult) college students (Claxton & Murrell, 1987). Nontraditional groups scored higher on LOGO II, indicating they had a higher preference for learning than did traditional-age students and that the two groups need different evaluation criteria. Older, nontraditional students did not care how grades were determined but enjoyed learning assignments that were not evaluated for grading purposes. Traditional-aged students' concerns revolved around quizzes, exams, and other graded assignments that were used to measure their achievement or learning. These students also requested extra-credit assignments to raise their grades, thus indicating that letter or number grades were very important to them. Implications of this study suggest that, when working with traditional-age college students, courses should be organized based on clear objectives, course work should be based less on individual

student responsibility, and there should be more graded assignments. Work assignments should capitalize on the competitive nature of this group.

Social-interaction models of learning style emphasize the social nature of learning and how students interact with peers and teachers and view grades and content. According to Claxton and Murrell (1987), the two models presented here have been useful in demonstrating the differences between traditional- and nontraditional-age college students by assessing the motivation of students—grades or personal improvement—and determining what aspects of the social situation motivate, or do not serve to motivate, students in learning situations.

Compared to personality models and information-processing models, the main aim of social-interaction models is to discover what makes students perform in the classroom. Personality models and information-processing models look at how information is acquired and what is the best way for individual students to acquire that information. In information-processing models, there is also a focus on how that information is taken in, what is done with it, and how it relates to future learning. In contrast, social-interaction models describe what motivates students to excel or not to excel in the classroom. These models are aimed more at discovering **why** students learn, not how they acquire, process, and use information.

Instructional-Preference Models

Proceeding to the outer layer of the metaphorical onion, one comes to the fourth level or instructional-preference models, exemplified by the work of Canfield. Instructional-preference models appear to incorporate characteristics of the social-interaction model with the type of content presented in the classroom, instructional methods, and how students deal with the complexities of the total learning situation in the classroom environment.

Canfield's Learning Style Inventory. Canfield's Learning Style Inventory (LSI) (as cited in Claxton & Murrell, 1987) is based on Maslow's hierarchy of needs and the achievement motivation theory developed by McClelland. This inventory includes four scales: conditions of learning, content preferences, learning mode preference, and expectations of students as to grade achievement, which may or may not be a motivating factor determining how students achieve.

The first scale, **conditions of learning**, describes how learners deal with, and interact in, different learning situations. This scale includes *affiliation*—how students interact with and handle others in the particular situation in which they find themselves. *Structure* measures learners' need for organization and detail in the learning situation. *Achievement* is a measurement of how well students set goals, and whether they work better independently or depend on others for their learning. *Eminence* concerns how students deal with authority and competition in the classroom.

The second scale measures students' **content preferences** in the learning situation. Canfield classified course content into *numerics* (numbers), *qualitative* (language), *inanimate* (working in areas of building or repairing), and *people* (interviewing and sales).

The third scale assesses **preferred modes** of learning and includes *listening, reading, iconic, and direct experience*.

The fourth scale measures grades and the effect that students' **expectations** of grades have on learning. Expectation of a grade is viewed as a motivational factor that influences how students perform in a course. Grades can be highly motivating to some students who work hard to achieve expected grades. Others, for whom grades are not a highly motivating factor, place less emphasis on grade expectations. Thus, students who expect low grades may realize a self-fulfilling prophecy and achieve low grades irrelevant to their actual learning.

Together, the four scales on the LSI are used to assess how students learn. Canfield used this inventory to test college students. There is evidence from use of Canfield's LSI in research that students enrolled in courses whose content, conditions of learning, and modes of learning are similar to their own will feel more comfortable and exhibit higher achievement in those courses. This conclusion is true of each learning style model in the other three levels of the metaphorical onion, even though each focuses, defines, and measures learning styles in different terms. However, Canfield's instructional-preference model seems to have a heightened focus on the importance of the instructor and

instructional methods used in the classroom, as well as the need for on-going evaluation and improvement of courses and programs.

Instructional-preference models, such as that of Canfield, pertain specifically to the classroom and instructional methods. The implications are greater than just diagnosing learning styles in order to provide instruction that meets students' individual needs. If individual students' needs are identified and faculty are sensitized to these needs, faculty can better refer students for assistance and develop classroom strategies that enhance students' chances of success. By identifying individual learning styles using models in the fourth level, administrators and faculty alike can develop a consciousness of the importance of individual differences and can work to develop programs and courses to meet more students' needs. To do this, administrators and faculty would participate in continual evaluation and improvement of programs and classroom instruction.

Unlike the models in the other three levels of learning styles, the instructional-preference models divert the focus from the student as being solely responsible for learning and recognize the role the classroom environment, instructional methods, and instructor play in student learning and achievement. These models shift the focus from student-centered information processing, social interactions, and motivation to a complex network of different students, multiple motivations and interactions, and diverse content, learning activities, instructional styles, and classroom environments. This emphasizes the need for

faculty to seek and implement new instructional strategies to meet the needs of students with varying learning styles.

An important aspect not present in models at the other three levels is that Canfield's model places some responsibility for student learning and achievement on instructors by recognizing the complex issues involved in learning styles. Instructors are moved to refer students to other resources, such as individual tutoring or assistance in identifying their learning styles, so the students can seek situations that maximize their strengths and work on their weaknesses.

A Combined Model

A fifth level of learning style model is included here, constituting the outermost layer of the symbolic onion. This model is similar to level four, which recognizes the complexity of learners and learning situations. However, it emphasizes the learning that takes place in everyday life. It is not focused solely on the structured learning situations often found in the classroom, but rather on learning as it also occurs in the day-to-day activities of individuals in work and life situations. It therefore takes the emphasis from learning in an educational setting, recognizing that learning takes place every day in many situations and environments. It is not that the other models exclude learning that takes place outside of the classroom, but they do not emphasize the more global learning that individuals experience. In this combined model, the word

preference is used to denote that people favor certain learning factors, which does not preclude their having just one learning style.

Productivity Environmental Preference Survey. Price et al. (1991)

developed the Productivity Environmental Preference Survey (PEPS). The underlying theory behind the PEPS is that individuals' preferences for learning situations apply not only to the classroom, but also to work situations. Like Canfield's instrument, the PEPS is comprehensive and attempts to measure numerous items involved in working and learning. The theory and instrument include many of the areas assessed in the models described above. Instead of having just one or two scales that measure particular aspects of learning style phenomena, the PEPS incorporates many scales to measure several aspects or stimuli that students encounter in the learning situation. It does not use a strictly bipolar scale.

Dunn (1983) stated that diagnosing learning styles involves considering five stimuli: environmental, emotional, sociological, physical, and psychological. Environmental stimuli contain the elements of sound, light, temperature, and physical design. Emotional elements include motivation, persistence, responsibility, and structure. Stimuli classified as sociological involve peers, the self, pairings, teams, adults, and various others. Physical stimuli are the components of time, mobility, perceptions, and intake. The final stimulus is psychological, which includes the elements of cerebral dominance, analytic versus global, and impulsive versus reflective.

The above-mentioned 21 elements of learning style identified by Price et al. (1982) aid individuals in determining their learning styles. No person is affected by all 21 elements, but most people strongly agree to or disagree with between 6 and 14 of them. If a single element is important to a person, the response to that element will be a strong like or a strong dislike. If someone finds an element unimportant, he or she will not respond knowledgeably when questioned about that element. By determining which preferences regarding each of these elements are strong, students and teachers can determine learning preferences and provide educational opportunities that promote achievement. This highlights the importance of others, as well as the individual student, in learning and achievement.

Price et al. (1982) developed the PEPS based on the elements they thought were important to learning. The 22-item survey identifies how adults prefer to “function, learn, concentrate and perform in their occupational or educational activities” (p. 3). After students complete the survey, analysis of the responses reveals personal characteristics that represent how they prefer to learn and work. This survey also takes into account that there is a difference in how adults prefer to learn; this is a component of the other models discussed, but it is emphasized in the PEPS.

Conclusion

In summary, the learning style theorists discussed above all emphasized different aspects of learning and what is important in the learning process.

Witkin described learning style in terms of field dependence and field independence, whereas Kolb and Fry highlighted the experiential learning model as the basis for their learning style (Tennant, 1991). Price et al. (1982) developed the PEPS, which goes beyond cognitive functioning alone and identifies environmental factors that the authors thought were involved in learning. The Myers-Briggs typology is based on personality types. Each model reflects some aspect of the learning process and some characteristics of learners that are thought to be measurable, are worthwhile to know, and play an important role in learning. By knowing these characteristics, students and faculty can manipulate the environment to improve learning, thereby increasing student achievement.

However, from the theories discussed above, it can be seen that the concept of learning style is complicated and is based on what a particular individual believes it to be. It is suggested, therefore, that no one learning style instrument or theory should be used when attempting to measure learning style. It is also suggested that students be provided opportunities to identify the ways they prefer to learn so they can better understand the situations in which they learn best and concentrate on strengthening their ability to learn in the situations they like the least.

Learning style theorists disagree as to whether learning styles are stable over time, or whether certain aspects of learning style can be changed or learned and unlearned. Some students seem to be able to adapt their learning styles in situations in which their preferred style of learning is not useful. For

example, a student prefers to learn alone but is constantly put in collaborative learning situations. Does or can that student still learn effectively? Through time and exposure to collaborative learning, the student might adopt this strategy and perform well, but still feel most comfortable learning through solitary endeavors. Can or will the student replace his or her previous preference for solitary learning with collaborative learning? These questions indicate that further clarification is needed about learning style as it relates to the classroom.

Application of Learning Style Theory to the Classroom

Application of learning style theory to the classroom has led to varied conclusions regarding the utility of employing a knowledge of learning styles in an attempt to enhance student achievement and satisfaction in the classroom. Claxton and Murrell (1987) stated that knowledge of learning styles should be used not only by students, but also by faculty and administrators to emphasize the learning process and the importance learning has in the institution. By being sensitized to learning styles and the different learning style theories, administrators and faculty will become more aware of the diversity of learning styles and their influence on student learning and achievement. This awareness will lead to continual evaluation and improvement of instructional settings in order to meet learners' needs.

The theories discussed above underscore the need to match learner and teacher characteristics in order to provide the best learning environment possible for the student. They highlight the learning styles of students so that

students themselves consciously consider how they think; this enables them constantly to evaluate situations and make adjustments to aid in learning. Students may not be able to change the way they learn, but by knowing how they think and process information, students will be aware of their strengths and weaknesses and seek out help if necessary.

The theories also highlight the need of administrators and faculty to find ways, through research, to improve the learning process so that students are given the best chance to achieve and excel in the classroom. However, because there is no common definition of learning or learning style, the many theories and measurement tools, the multiple learning situations and students, and the conflicting results of research on learning style have made it difficult to determine what instructional methods are best used in the classroom.

According to learning style theorists, institutions should provide learning opportunities based on students' different learning styles. By knowing students' learning styles, administrators and faculty can better adapt scarce resources and curricula to meet those students' needs. When students and instructors are aware of individual learning preferences, those strengths can be used to provide the environment most conducive to academic achievement (Claxton & Murrell, 1987).

Pintrich and Johnson (1990) stated that "lack of knowledge about appropriate learning strategies—and lack of motivation to use them—plague many college students and hinder their learning" (p. 83). The best learning environments are those that promote optimal learning and teaching situations for

both faculty and students (Merriam & Caffarella, 1991). Knowledge of the learning styles of students and teaching styles of faculty will produce an environment that is more conducive to students' employing the learning strategies they find most effective.

According to Welborn (1986), learning style alone may not be the final solution to enhancing academic achievement. "The learner's final success in the educational setting may be dependent upon the appropriateness of the learning strategy utilized by the teacher" (p. 14). Teaching style has a strong influence on student achievement. Instruction that supports students' learning styles is the most effective. Therefore, instructors must be provided with resources to expand their variety of teaching styles to accommodate students' learning preferences. Today this can be observed in the increasing focus on faculty development services in many institutions and the emphasis on teaching and learning.

Dunn (1983) stated that individuals' learning needs vary, regardless of IQ or achievement. Learning needs depend on "a combination of environmental, emotional, sociological, physical and psychological elements that permit individuals to receive, store, and use knowledge or abilities" (Dunn, 1988, pp. 496-497). When students are taught using resources and strategies that focus on their learning needs, their achievement is enhanced (Dunn & Bruno, 1985). Price et al. (1982) stated that, by identifying their own preferences for learning, both students and teachers can create learning environments that are conducive to academic achievement.

Teachers provide instruction to students based on their own personal learning styles. Students are more successful when their learning styles match those of the teacher. When teachers' and students' learning styles are dissimilar, students will need to work harder so as not to miss some of the material presented in the classroom. For this reason, teachers should vary their teaching methods to match the wide array of student learning styles. However, Claxton and Murrell (1987) stated that, because there are numerous combinations of students and learning situations, it is not realistic to think that instructors could possibly adapt their teaching and classroom techniques to fit the learning styles of all students in a classroom.

Dunn and Bruno (1985) stated that achievement is significantly increased when the instructor's teaching style complements the student's learning style. When students identify their own learning preferences and are able to use the identified strengths, they can seek out experiences that increase their learning. According to Dunn (1983), "Students' preferences, when matched and mismatched with complementary environments, consistently revealed better test performances in the congruent conditions and there can be no doubt that students with strong learning style preferences should be taught in ways that complement them" (p. 11).

In contrast, Claxton and Murrell (1987) claimed that a mismatch between teaching and learning styles also can serve a useful purpose in the classroom. When teaching and learning styles are mismatched, students should be taught how to use different strategies to overcome the problems they encounter in such

a situation. Faculty and administrators should develop programs and instruction that help students develop new approaches to use when there is a mismatched teaching-learning situation. In this way, students can learn to overcome problems and have new strategies to compensate for a mismatch. These new strategies strengthen student learning, not only enhancing achievement in the immediate situation but giving additional tactics for students to use in future learning situations.

Thompson and Crutchlow (1993) countered the thought that students' learning styles should be matched to the instructor's teaching style by claiming that students need a degree of stress to optimize learning—a cognitive dissonance or disequilibrium. If the student-teacher dyad is matched, then the stress level may be reduced to such a degree that learning may not be optimized. Therefore, trying to achieve a perfect match in the teacher-student dyad may not be the best action to take. Some degree of mismatch is needed, but there is no indication of the level at which a mismatch becomes a hindrance to learning.

Thompson and Crutchlow (1993) discussed the match and mismatch between student and instructor in different terms. Students may experience different outcomes, not necessarily related to learning styles per se, when there is a mismatch in instruction and learning styles. For example, if a student and instructor match in terms of learning-teaching style, the student may feel a satisfaction that manifests itself in a positive attitude and motivation that enhances learning. This attitude may have nothing to do with learning style, but

still can increase student achievement and learning. The authors also questioned whether students use different styles of learning depending on the submissiveness of the instructor, and whether learning styles become more sophisticated through years of study with many different types of instructors. This sophistication could possibly be the result of an increased flexibility in students' learning styles, which allows students to adapt and adjust better to different teaching and learning situations. Thompson and Crutchlow concluded that students must be taught to be flexible to accommodate the many teaching-learning situations they will encounter.

Merriam and Caffarella (1991) stated that numerous LSIs are available, each of which measures different things. Any particular inventory is influenced by how the researcher who developed it conceptualized and defined the term *learning style*. What is important, however, is that both faculty and students should use LSIs. By being aware of their own learning styles, faculty and students alike may use their strengths and minimize their weaknesses in the learning situation. LSIs are important because they are an avenue for students to evaluate themselves as learners. This, in turn, allows them to capitalize on their learning environments or situations.

In concluding this discussion of different learning style theories and types of measures, it is important to recognize that many faculty and administrators are confused about and fail to take into account students' learning styles. If used correctly, these tools can assist in evaluating teaching practices with the express intention of improving instruction. Some of the confusion about learning styles

exists because there is not just one definition of learning, and as a result it is difficult to measure such a concept. The broad range of inventories and the multitude of students and learning situations make it difficult to measure students' learning styles with just one scale.

Faculty must be aware of the complexity of the issue and the multiple implications of each learning style model. Many faculty resist using such inventories because no one inventory can or does measure all the attributes present in the classroom. By understanding the background of LSIs, faculty and administrators can make more informed decisions about which, if any, of the inventories meet their individual program and classroom needs. Faculty and administrators may even recognize a need to do their own research to develop theories and evaluation tools that more adequately reflect what they need to know when diagnosing learning styles of students in their classrooms.

Next the focus turns to research concerning nursing students, college students in general, and college students' use of technology, especially computers and the Internet/ WWW. This is by no means a comprehensive review of all studies on learning styles of nursing and other college students, but a sampling that is intended to demonstrate the difficulty of drawing conclusions because of the inconsistent results and the different instruments used. This review is intended to give an overall background on how research on learning style theory has been used in higher education. It also highlights recent studies that provide insight into learning styles and what they mean to classroom instruction.

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Research on Learning Styles of Nursing Students

This review of research on learning styles of nursing students reflects the same confusion found in the literature on learning style theories and inventories. Multiple tools have been used to measure learning styles, depending on what particular researchers thought was an important aspect of the classroom or learner. The Myers-Briggs, Kolb, and Canfield LSIs seem to be the instruments used predominantly. However, even studies using the same measurement instrument have had conflicting findings and conclusions. Nevertheless, the ensuing review provides insight into what educators in nursing programs believe is important and should be measured as a part of learning. It also provides an idea of how nursing students might react to inclusion of assignments using the Internet/WWW in their courses.

King (1986) studied differences between generic nursing students and registered nurse (RN) students. Each group aspired to different goals. For the RNs, participation in school was a means to the ultimate goal—career advancement. Generic nursing students perceived their education as a means to an end—to become an RN. The differences in life and learning experiences had given the RNs greater knowledge about how they learned best. King also distinguished between generic nursing and RN students in terms of adult responsibilities and “various dimensions of adult development” (p. 370), using three of Levinson’s stages of adult development: early adult transition, age-30 transition, and midlife transition. These stages were described as follows:

Early Adult Transition—Separating oneself from the pre-adult world and beginning to form an adult identity, activities such as questioning one's place in the world, and creating an initial adult identity. Students in this stage focused on the personal issue of "growth and adjustment." Individuals in this phase are making and testing preliminary choices for adult living.

Age 30 Transition—This phase is transitional. Individuals have already made their choices about love, marriage, family, lifestyles, etc. Many people focus more on careers and less on their families. The focus was on becoming "their own person." Questioning and redefining may come in the form of life crises such as divorce or death of a significant other.

Mid-Life Transition—In this phase the individual realizes that illusionary dreams of the past are becoming a reality. Neglected parts of the individual are seeking expression. (King, 1986, pp. 338-340)

King found that the differences between generic and RN nursing students were not meaningful when comparing life stages of those students, using Kolb's LSI. Both groups clustered around Kolb's Diverger and Accommodator. King concluded that, because RNs are further into their life cycle, any differences between students were due to adult development rather than to differences in learning styles. She stated that the learning styles of the two groups were similar in some ways because particular professions attract certain types of learners. This contradicts the belief that learning is purely individualized and distinct, as learning style theory suggests.

Highfield (1988) also used Kolb's LSI to compare learning styles of baccalaureate students in their first year of study and in their last year of college, and of first- and fourth-year nursing students. The main learning style of these student groups was that of Assimilator, which emphasizes a preference for abstract watching and thinking. This finding is contrary to that of some

studies in which it was found that nurses tended to be either Accommodators or Divergers, who deal best with "concrete feeling-oriented situations" (p. 31). Assimilators are less active in learning and seek assistance to put knowledge into practice. Highfield attributed the higher percentage of Assimilators in the two groups to the fact that baccalaureate programs "reward and promote their students' reflective watching and thinking" (p. 32). The author concluded that students possibly use more than one learning style, which would explain the differences between the two groups.

Beeman (1988) cited the need to define the learning needs of individual basic and baccalaureate nursing students in order to maintain innovative programs. "Faculty support and commitment to the unique learning needs of adults can spell success or failure for a basic baccalaureate program that admits RNs" (p. 370). Beeman recognized the individual needs of students in areas of professionalization and socialization and advised that educational programs need to accommodate students in all aspects of these areas.

McCabe (1983) studied the learning styles of nursing students and identified the need to build on student strengths. To do this, both students and teacher must know their own teaching and learning preferences. By identifying preferred learning styles of students, instructors can alter their teaching style to meet students' needs and hence facilitate achievement.

Meeting the needs of RN students was the focus of a study in which satisfaction of RN students was evaluated in a clinical setting (Ryan, 1985). Ryan evaluated an attempt to "package" individual student needs in order to

obtain the best clinical experience possible for the students. Results of this clinical packaging showed high RN satisfaction, as indicated by clinical and teacher evaluations. Ryan recognized the need of faculty to be ready to try new ideas such as this, based on the needs of individual students.

Ostmoe, Van Hoozer, Scheffel, and Crowell (1984) examined the learning-strategy preferences of baccalaureate students. These students preferred learning strategies that were directed, organized, and did not involve student participation. Students in their last nursing course expressed less preference for nontraditional nursing practices, whereas beginning students preferred a wider scope of learning strategies. In the beginning group, not one learning strategy was "never preferred" (p. 29).

In 1985, Lassen described senior-level nursing students as being capable of selecting learning situations that were congruent with their individual learning styles. The author stated that nursing curricula should provide for "sequential learning, perhaps self-paced, whereby each student may be free to sample a variety of learning techniques to achieve the stated course objectives" (p. 27). Using an LSI, Lassen concluded that students learn by a variety of methods, depending on the circumstances of each learning experience.

Merritt (1983) used both the Kolb and Canfield learning style models to study adult learners. She hypothesized that generic, adult nursing students would prefer directed learning over self-, goal-directed learning. The opposite was hypothesized for RN, nontraditional students. Merritt's findings did not support these hypotheses, nor did the preferences of baccalaureate nursing

students in this study support the findings from previous research. Merritt concluded that learning differences between adult RN and adult generic baccalaureate nursing students could not be determined from her study. However, based on the study findings, Merritt proposed six differences between adult RN and adult generic students.

The first proposition was that RN students were more likely than generic students to dislike traditional learning environments and methods. Second, nontraditional and traditional learners preferred structured environments with content presented in a logical and clearly defined manner. The third proposition concerned the need for both passive and active learning activities combined with direct contact with course content. Next, Merritt discussed both traditional and nontraditional students' lack of preference for goal setting, saying that neither group aspired to competitive situations with instructor control. Last, nontraditional learners did not "prefer instruction that uses reading modes, but compared to traditional adult learners, [were] more positively inclined toward the reading mode" (p. 372). From these propositions, Merritt concluded that there is a need for different teaching-learning methods for "younger-aged versus older, experienced adult learner groups" (p. 373).

Thurber (1988) found more similarities than differences when comparing RN students in two types of baccalaureate-completion programs. The author discussed the need to adapt baccalaureate programs to meet students' learning needs. Citing the fact that bachelor of science (BS) programs are mere images of basic RN programs, Thurber cited the need for BS programs to be more

flexible and adapted to student needs in order to survive, and to provide nurses to lead the profession in the future. Nursing educators need to assess the needs of RN students more accurately and develop programs that are individualized and focused on meeting those needs. Meeting the needs of RNs will enhance their satisfaction and achievement.

Cranston and McCort (1985) distinguished between cognitive style and learning style, saying that cognitive style is concerned with the way a person "receive[s] information or gain[s] meaning from one's environment" (p. 136). Learning style, on the other hand, focuses on an "individual's attitude toward peers, instructors, teaching methods and learning" (p. 136). Studying students in an associate degree program, Cranston and McCort found no significant differences in achievement between the cognitive style group and the learning style group when appraising performance. The researchers concluded that both cognitive style learning style should be determined to better assess the learning "processes" of students.

In 1995, Rakoczy and Money used Kolb's measure of learning styles in a three-year longitudinal study of a diploma-nursing program. They found that the nursing students in the study were concrete learners and needed concrete learning experiences about which they could then think and incorporate feelings. The students in all three years were Assimilators, similar to the results found by Highfield (1988) but unlike the Accommodators and Divergers found by King (1986), who liked "doing and watching." This style changed very little over the three years. Rakoczy and Money concluded that "teachers should implement

teaching strategies that promote inductive reasoning and organize disparate observation into an integrated explanation" (p. 73).

The preceding discussion highlighted some of the research that has been done on nursing students. It also demonstrated the conflicting findings from research on learning styles, perhaps resulting from the use of different inventories and diverse comparisons to learning styles. This underscores an important fact to remember when attempting to understand learning styles: that the learning styles of each group of students will differ, depending on the classroom situation. Differences exist within and among groups of students, making it impossible to prescribe particular instructional strategies and making it necessary to measure the learning style of each group of students entering an instructor's classroom and the type of learning situation in that classroom.

If the learning styles of nursing students do vary, how will these students react to inclusion of assignments using the Internet/WWW in traditional programs and courses in nursing? Will their learning styles match this type of instruction? These two questions have implications for teaching and learning on the Internet because nursing students have not only different learning styles, but also diverse backgrounds in the use of computers and the Internet. Some are more comfortable than others in such learning situations, possibly due to comfort gained from previous use of the technology.

Research on Learning Styles of Students in Disciplines Other Than Nursing

The review of research on learning styles continues with a discussion of studies on the general population of higher education students. Again, rather than being a comprehensive review of studies that have been completed, the focus is on efforts that have gone beyond simply defining the learning styles of a specific groups of students at a particular time. Longitudinal studies were found, concerning how learning styles might change over time. This review also highlights weaknesses in learning style research; for example, gender, race, and culture do not seem to have been taken into account in developing LSIs. This raises the question whether measures of learning style, like those of IQ, are biased with regard to gender, race, and culture.

Farr (1971) studied 72 college students and found it was advantageous for them to learn and be tested in their preferred modality. Farr stated that individuals can predict the way in which they will be able to achieve superior academic performance. It is therefore imperative that educators sanction alternative learning modalities, allowing students to learn in their preferred mode. This study is not unlike many others that have been done on college students; however, Farr did generalize "college students" and did not seem to consider other factors such as racial and cultural diversity.

In a study of 100 college students, Domino (1970) found that students who were taught in ways in which they believed they learned better scored higher on tests, factual knowledge, attitude, and efficiency than those taught in a

manner dissonant with their beliefs. Cafferty (1980) found similar results when comparing student-teacher pairs. The better the match between the student's and teacher's style, the better the student's grade point average. Conversely, when there was a mismatch between the student's and teacher's style, the greater the mismatch was, the worse the student outcome.

In a rare qualitative study, Vermunt (1966) found that the students in his sample exhibited a great variety of learning styles. However, he concluded that

the learning functions that are not carried out by the students are often perceived by them to be not their responsibility, but as the tasks of instruction. Mental models of learning and learning orientations influence the way students interpret, appraise and use instructional measures. The effect of external regulation devices, such as questions, assignments, learning objectives and the like, is dependent on the interpretations and appraisals students give to them. (p. 45)

Learning styles, then, are dependent on students' internal and external mental models. If students view a learning task as internal, they will take responsibility for it. However, if students view the assignment or learning as external, they will expect it to occur as a part of the teacher's instruction. Thus, students must be taught to internalize more learning activities so that when instruction does not include some external learning activities, students will take responsibility and perform those activities because they have been internalized (Vermunt, 1996).

Vermunt (1996) said this means that instructional methods should include those aspects the students view as external to their own learning. According to Vermunt, students do not like the teaching of rote facts; therefore, he said, instructors should teach for meaning. However, this can be done only when the

teacher knows the learning styles of his or her students. Based on the learners' needs, then, instruction can be devised that contains activities the learners consider external. Learners should be taught how to incorporate more external learning activities so that those activities become internal. Vermunt was not clear about how this occurs, whether more internal activities are included as students progress in higher education, or how instructional activities should be changed as students progress from a more external mental model to a more internal one. Here, Vermunt challenged the long-held belief that individuals' learning styles are fairly static and unchangeable. If learning style is actually dynamic, this may have important implications for student development and referral for study skills.

In a rare longitudinal study, Pino, Geiger, and Boyle (1994) challenged the prevalent belief that learning styles are static. Using a longitudinal design, the researchers tracked students' learning styles as they progressed through their years in higher education. They cited numerous studies in which it was found that, not only did learning styles differ among students and between disciplines, but also that students' learning styles changed from the freshman to senior year in college. This implies that students mature over the four-year period, necessitating diverse teaching styles, depending on students' class level. However, the researchers found conflicting results.

Pinto et al. (1994) concluded that some aspects of learning style may be fairly stable, whereas others will change. One reason the authors offered for this inconsistent outcome is that students in this age group (18 to 24 years) have not

fully developed their learning style preferences by the time they reach college. Learning styles, then, metamorphose, but to what extent and how is not known. This finding has implications for teaching students, not only in diverse disciplines, but also in different years in college. For example, if freshmen and sophomores are given much active experimentation (Kolb), they may not be ready or able to engage in such activities because they have not matured enough to work at the "what if" level.

In similar studies cited by Pinto et al. (1994), college students increased their abilities in abstract experimentation as well as abstract reasoning as they progressed through their college years. The amount of change that took place was not specified, and more research is needed in this area. The effect of discipline-specific knowledge on the amount of change in student learning styles through the years in higher education also is unclear. In conclusion, the researchers cautioned that it is difficult to apply generalizations to all students in all disciplines because students in diverse disciplines often exhibit varying learning styles.

In their study of agricultural students, Torres and Canno (1995) found that learning style is an important variable in teaching students to think critically. They found that 9% of the variance in students' critical thinking was attributable to their learning styles. The authors went on to state that even though 9% does not seem like a lot, it actually is a significant amount of variance. It is significant because there are multiple variables that affect critical thinking, and for just one factor to account for 9% of the variance is very meaningful. Therefore, if

educators want to instill in students the ability to think critically, they must have a knowledge of learning styles. This includes identifying teachers' and learners' styles, and incorporating teaching and learning methods that optimize those styles.

Matthews (1994) investigated learning styles in various disciplines in higher education and considered gender and cultural influences on those styles, influences that have not been widely discussed in the literature. Matthews stated that those assessing learning styles must examine the influence of race and gender on those styles in order to provide equality in instruction and to counsel students for placement in particular disciplines. Using the Canfield measure of learning styles, she found that, in mathematics, women tended to be more independent in their learning styles. In business, both men and women were conceptual in style, and in the social sciences and education, women tended to be more conceptual and independent. Men and women in science or humanities differed little in learning styles as compared to those in other disciplines. Matthews's findings suggest that there is a difference in learning styles between men and women. An implication of this finding is that educators in disciplines that attract primarily men need to change their teaching techniques to attract more women to those programs. The same is true for programs that historically have attracted women. To attract men, teaching styles in those programs will need to be changed.

When Matthews looked at racial differences within disciplines, she found that African Americans and Caucasians in mathematics, science, business, and

social science differed significantly in their learning styles. In mathematics and science, African Americans had more conceptual styles, whereas Caucasians favored applied styles. No significant differences were found between the races in humanities or education. An implication of these findings is that African Americans might have problems in disciplines that have been composed mainly of Caucasians.

Matthews's study demonstrates the need to include gender and racial aspects in learning style inquiries. Such inclusion will aid in understanding how learning styles of diverse groups differ and to provide instruction based on those styles.

Two years later, in a four-phase study of 2,000 college students, Matthews (1996) looked at differences in students' learning styles using Canfield's measure. She found that, in general,

First-year students at colleges and universities preferred social and conceptual styles of learning to other styles. This finding varied with subgroups, however. Young women favored the conceptual styles more than did young men on the applied to conceptual continuum. On the other hand, young men preferred the social styles more than did young women on the social to independent continuum. Blacks chose conceptual to independent styles more frequently than did Whites. . . . Students with applied styles performed higher in school and scored higher on the standardized test (SAT) than did students with other styles. (p. xv)

Matthews (1996) also investigated college retention and learning styles. She found no relationship between white men's learning styles and retention, but she discovered that white females with an independent learning style more frequently stayed in college. Black females categorized as social/applied on the

Canfield LSI and black males with independent and independent/applied styles remained in college less frequently than did those with other learning styles.

Matthews (1996) also found that there was an association between social and family factors and students' learning styles. In general, more conceptual learners tended to be from large families. The father's educational level, but not the mother's, also appeared to be associated with learning styles. Specifically, students whose fathers did not have a college education tended toward more conceptual than applied learning styles. Conversely, those whose fathers had a college education were more applied than conceptual in their style of learning. Matthews concluded that the findings from her study indicated that there are many factors associated with student learning styles and that faculty and administrators must consider all facets of students when attempting to instruct them.

Technology, the Internet/WWW, and Learning Styles

The focus of this section is studies of learning styles and the use of technology (computers, computer-aided instruction—CAI) and the Internet in teaching and learning. Computers and CAI are included in the discussion because students need to use computers when accessing the Internet. If they are not comfortable using computers or do not have learning styles that are suited to using computers or surfing the Internet in different instructional settings, their learning may be hampered. These students may need extra assistance, introductory courses in using computers and the Internet/WWW, and

more patience and time when using computers and the Internet as learning techniques.

Davidson, Savenye, and Orr (1992) used the Gregorc theory as a measure of learning styles in their research on student learning styles and instruction in a course in computer programming. Students who were found to have an Abstract Random (AR) learning style had difficulty with the linear and logical programming and computer logic needed to work with computers during a project designed to teach BASIC programming. Those classified as Abstract Sequential (AS) learners had higher scores than the AR learners. The researchers said this was probably because AS learners were able to understand the linear aspect of programming and computer logic. They concluded, "Both types of learning styles were influenced by their preferences for one group, to their detriment. That is, those students who had high preferences for loosely structured tasks and courses did not fare as well in performance as did those learners who liked structure" (p. 356). Davidson et al. recommended that more time be spent on AR students, giving them instruction in computer logic and linear programming before beginning course work. They emphasized the need to adapt instruction, teaching styles, and course work to assist students with various learning styles in any classroom.

Logan (1990) studied the online behavior of people who used MEDLINE for online searching. Kolb's LSI, the Remote Associates Test (RAT), and the Symbolic Reasoning Test (SRT) were used in the study. The sample included students involved in a graduate program in Library and Information Studies who

had minimal exposure to online searching techniques. The largest group of learners comprised Divergers, whom Kolb (as cited in Logan, 1990) described as being "creative thinkers, and having as their greatest strength imaginative ability" (p. 505). Accommodators made up 22% of the sample, Assimilators 24%, and Convergers only 9%. Although the findings were inconclusive overall, they did indicate that each type of learner performed online searches in a different fashion. "Assimilators as a group spent more time online, issued more commands, keyed more descriptors, completed more cycles and printed more references than any other group. Accommodators, on the other hand, had the lowest mean scores on all measures except descriptors" (p. 507). Assimilators had higher scores on reflective observation and abstract conceptualization, whereas Accommodators were high in concrete experiences and active experimentation.

Logan (1990) did not draw any conclusions about what these findings meant, but they could have implications for students searching both databases and the WWW, which is also very scattered and nonlinear, does not appear in logical order, and requires active experimentation. Learning on the Internet is unlike computer programming, which is linear and logical. Assimilators may have skills that are better suited to such abstract activities, thus making online searching of databases and the WWW more suited to their learning styles.

Clariana (1997) studied three cohorts from 13 to 21 years of age. Using Kolb's LSI, the researcher found that when CAI was used over time, students' learning styles did change. There was a shift from abstract conceptualization

and active experimentation to concrete experience and more abstract experimentation. The change in learning style when students are exposed to CAI over time may be to a style counter to what is needed in traditional classrooms. But again, there is evidence that students need skills or styles different from those required in traditional learning situations when they employ this new technology.

Using Gregorc's model of learning styles, Ester (1994) found in a study of CAI that abstract learners achieved better in lecture situations, whereas concrete learners preferred to use computers and simulations. This finding was similar to Davidson et al.'s observations of students in computer programming and logic. However, Davidson et al. found a distinction, not so much between concrete and abstract learners in computer programming and logic, but between the sequential and random nature of assignments. In contrast, in Ester's study on CAI, a difference was found between concrete and abstract learners. This demonstrates that, not only do students' learning styles make a difference, but also what is being studied. Different students will perform differently in various learning situations (i.e., computer programming versus CAI).

Further, Ester (1994) found that concrete learners did just as well in lecture as in CAI. On the other hand, abstract learners performed well only in lecture situations. The implication was that if students could identify concrete learners, who did well on CAI, they could then concentrate on assisting abstract learners in using CAI.

Discussed thus far have been studies that focused on learning style and use of computers or the WWW, employing the similar theories of Kolb and Gregorc. In Kaczor and Jacobson's (1996) survey of Internet users, some questions arose that have implications for conducting research on learning styles and use of the Internet. Kaczor and Jacobson found that, when students learned on the Internet, they did so in a solitary environment, unlike a traditional classroom setting. Does this solitary aspect of working with the Internet make it difficult for students who prefer more cooperative and collaborative learning environments to use this medium for learning? This aspect of learning on the Internet and WWW would reflect instructional and classroom factors such as those measured with Canfield's LSI and Price et al.'s PEPS.

Kaczor and Jacobson (1996) also concluded that, when instructors include Internet assignments in course work, other aspects of student learning must be taken into account. Some students may need instruction before being given Internet assignments, to learn not only how to navigate around the Web, access the Web, or use Web browsers, but also how to discriminate between good and bad information that is found on the Web, according to their individual learning strategies.

From this review of studies on the use of technology and the Internet, it is evident that students with varying learning styles do have different experiences using such technology. Therefore, when instruction and learning are provided on the Internet, students' learning styles must be taken into account. Using these technologies has both random and sequential aspects, abstract and

concrete qualities, and the aspect of learning alone versus learning with others, which may be contrary to traditional classroom settings. Learning styles that are effective in traditional classrooms might not be effective in using the Internet, computers, and computer applications.

Conclusion

Studies have indicated a significant increase in academic achievement when students' individual learning traits are matched with complementary teaching styles, resources, and environments. Likewise, research in nursing education has shown that curricula and teaching techniques should complement individual students' learning styles. Thus, when working with generic and RN nursing students, nursing educators should identify differences in students' motivation and learning preferences so as to provide curricula and teaching techniques that complement the many learning preferences of their students.

Consensus does not exist with regard to the stability of learning styles. Recent studies have indicated that some aspects of learning styles may indeed change as students progress through higher education (Pinto et al., 1994). However, because there are so many different teaching styles and learning environments, students cannot change their learning styles to correspond to every situation that might arise. Claxton and Murrell (1987) did not agree that learning styles can be changed, but they claimed that, by being aware of their own learning styles, students can maximize their strengths and work on their weaknesses.

Each learning style theory discussed in this review focused on a different aspect of learning style. The lack of a single theory of learning style makes it difficult to compare results from various studies. Only a few studies, such as longitudinal efforts, controlled for cohort differences to determine whether students' learning style did in fact change as they advanced through nursing programs. Most of the studies, however, were one-time cross-sectional studies of groups of students of various ages, with a variety of backgrounds and experiences.

The literature on learning styles has provided little information on how students' learning styles relate to their evaluation of learning, and whether students with particular learning styles prefer to use technology such as the Internet. This appears to be a serious gap in the literature on learning styles, not only of the general population but also of nursing students.

Hypothesis Generation, Conceptual Framework, and Assumptions

Based on the review of literature, information on learning styles, learning style instruments, and experience of the researcher, the purpose and subsequent hypotheses for this study were generated. Assumptions that guided hypothesis generation were based on the ambiguity and abstractness of using the Internet, experience working with students for 13 years, the conflicting results of learning style research, the many levels and complexities of learning styles and their inventory measures, and the technical nature of using the Internet and computers. Therefore, the researcher developed assumptions that

guided the study. First, the researcher developed assumptions about learning styles guided by the review of literature and personal experience. For this study, it is believed that learning styles do exist.

It is also believed that learning is multidimensional, as are learners, and cannot be measured or assessed by any one of the existing learning style inventories alone. So any study should include measures on more than one level of the learning style onion (Claxton & Murrell, 1987). Use of the Internet is considered a learning/instructional method as those discussed in the instructional-preference and combined models of Canfield (1994) and Price et al. (1991). However, the use of the Internet was also documented in the review of literature as containing both concrete and abstract aspects, aspects measured at the information-processing level in the learning style inventories of Gregorc (1994) and Kolb (1984). In addition, the issue of random/sequential lends itself to the Gregorc model, which measures both Random versus Sequential and Concrete versus Abstract aspects of learning styles.

The review of literature did indicate that the abstract nature of the Internet posed problems to some students who did searches on the Internet or used CAI (Davidson et al., 1992). Use of computers also posed problems for students in computer courses where there was course work that was more sequential, and problems for others if the work was more random in nature (Ester, 1994). Therefore, the researcher assumed that this same abstractness and ambiguity would differ among students, depending on their learning styles when using the Internet as part of a traditionally taught course. For example, students who are

Concrete and Sequential (Gregorc, 1994) could find the abstract and random nature of the Internet difficult to understand and have feelings of getting lost in a maze of Web sites and multiple Web pages. Therefore, the Gregorc Style Delineator and the Canfield LSI were used to measure the construct of learning styles for the study.

Another assumption guiding the research is that learning has an aspect that can cause negative feelings when new instructional techniques are introduced that are not in the learner's preferred way of learning. This has been documented by several researchers who cited the need to closely match learning and instructional methods to the learning styles of students (Claxton & Murrell, 1987; Price et al., 1991; Tennant, 1991; Thompson & Crutchlow, 1993). This was noted by the researcher when students had a problem using computers while using computer-assisted testing (CAT). Some students felt angered. They thought they would do better on a test if it was given on paper because they were better able to flip back and forth to compare similar or related questions. They were comfortable doing a pencil-and-paper test. The presentation of the same type of test on a computer decreased their comfort level. This appeared to interfere with their taking the test, causing enough stress to bring out very emotional reactions. Whether it was real or imagined, students thought they did worse on a test because it was on the computer, and this caused negative feelings and emotions.

Literature on stress and anxiety (Roy, 1984; Selye, 1974) would explain the feeling students have when performing something new, like taking a test on

the computer or using the Internet for course completion. When confronted with new and unfamiliar stimuli, people tend to develop some types of feelings that vary in intensity. The stimuli must, however, reach a certain point before a person experiences uneasiness or feelings that are uncomfortable.

Up to a certain point, the stimulus might not interfere with the person's actions and thoughts because the individual has innate coping mechanisms or has acquired new coping mechanisms through past experiences (Roy, 1984). A certain level of anxiety is needed for people to perform well. However, when that stimulus becomes too frequent, becomes too intense, or comes with multiple stimuli, overload might occur. Intense feelings might arise, making it difficult to concentrate, function physically, or even perform simple tasks. Learning may be hampered or even avoided because the person tries to decrease the feeling through avoidance or even dropping out of the situation.

In studying students using CAI in math courses, O'Neil (1970) found that as stress increased, performance decreased. Similarly, Spielberger (1970) found that anxiety was a predictor of performance when students used computer-assisted learning (CAL). Tatsuoka (1978) studied students in the military and found that stress of learning led to less favorable achievement in computer-based technical training.

The above-mentioned findings could explain why, in situations where there is a discrepancy between their preferred learning style and the mode of instruction, students would feel frustrated, angry, and uncomfortable. The degree of the discrepancy and individual coping skills would determine how the

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student is likely to cope with and adapt to the new stimuli (Roy, 1984). Other stressing stimuli occurring simultaneously, such as other course work, family problems, and so on, might contribute to a student's inability to cope with the discrepancy between the preferred way to take a test and the new way involving a computer. Based on this, the researcher assumed that the mismatch of learning strategies and the learning style of students can, and will when the discrepancy (stimulus) is too large or too frequent, develop negative feelings that can hamper learning and even lead to physical and emotional problems (Dabney, 1995; Presno, 1998).

These negative feelings may be minimal or consuming to the student, depending on how he or she has learned to cope and the degree of mismatch between the student's learning style and the test on the computer. Therefore, there should be some form of correlation between students' learning style and their comfort using the Internet or computers. The greater the mismatch of learning styles and use of the Internet/computer, the greater the discomfort should become.

The ability of students to adapt to or cope with mismatches in their learning styles and different types of learning/instructional techniques leads to another assumption made in this study. Kolb's Experiential Theory states that, by being exposed to new material such as the new learning techniques and strategies involved in using the Internet and CAI, students will eventually internalize their new strategies. The once-new skill of CAT will become a part of their learning strategies, the discrepancy (stimulus) in their learning style that

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caused the stress will no longer exist, and coping skills will have been acquired to deal with the stimulus effectively through repeated use. Hubbard (1998) found a need for ongoing training to decrease anxiety among persons using the Internet in course work. Eventually, ongoing training or experience will decrease stimulus response and will not elicit a negative response because it is now familiar, internalized, and even performed without conscious thought by the person (Kolb, 1984).

The researcher assumed that students can, over time, adjust to new learning situations. So a person who exhibits the concrete-sequential learning style of Gregorc might not feel the discrepancy between the random/abstract Internet because of the role that past experience has played when using the Internet at home, at school, or at work. Even though students would rather have the concrete book, with well-ordered assignments and instructor guidance, past experience has given them the knowledge and resources they need to cope with or adapt to the new stimulus. Using the Internet or CAI now does not cause a stimulus great enough for them to feel any great discomfort or negative feelings even though the Internet does not fit well within their preferred learning style. This would explain the debate among theorists as to the stability of learning styles over time. The negative feelings caused by discrepancy between the use of the Internet/computers in course instruction and learning styles should diminish with repeated exposure. Therefore, this researcher sought to measure the relationship between students' feelings (comfort) about using the technology and the amount of experience they had using computers and the Internet.

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Experience performing skills causes internalization of the skills (Kolb, 1984). As people age they acquire new coping skills through their experiences to deal with new stimuli. It is also possible that older students have abilities to adapt to new situations, including learning situations, that younger, less mature students have not yet acquired (Clariana, 1997; King, 1986; Pinto et al., 1994). Conversely, older students might not feel as comfortable using the Internet and computers because of the length of time away from the classroom. Their experiences in school might not have included the use of such technologies; thus, they have not had the chance to adapt this technology to their learning styles as younger students have. Edelson (1998) found that adult learners experienced discontinuity of time, space, and action when using the Internet. Anxiety was observed in this discontinuity and in the frustration in dealing with Internet providers and equipment limitations.

Cross (1981) also described different motivations and skills of adults that most younger students have not yet developed. Cross (1981), Merriam and Caffarella (1991), and King (1986) also highlighted differences between adults and younger students in the area of adult development, life stages, and maturity. So it is of interest whether there is a relationship between the age of the student and comfort using the Internet and computers. In this study, students were viewed not only by age, but categorized as traditional (24 years and younger) and nontraditional (25 years and older). Do these differences in motivation, life stages, and coping mechanisms help in the use of the Internet in the classroom?

In conclusion, the researcher developed these assumptions based on personal experience, learning style theory, and a review of the literature. These assumptions helped determine the direction of the study, instruments used to measure the concepts, hypotheses, and data-analysis methods. The study design, methods, and procedures are further delineated in Chapter III for the reader to gain a better understanding of what was done. Chapter IV contains an explanation of how the data were analyzed, as well as the results of hypothesis testing and the qualitative data analysis.

CHAPTER III

DESIGN AND METHODOLOGY

Introduction

The researcher's primary purpose in this study was to determine whether there is a relationship between the learning styles, computer/Internet experience, and age of selected nursing students, and those students' comfort in using the Internet/WWW in a traditional course in Nursing Pharmacology. The researcher also sought to determine what the students perceived as factors that frustrated them or made them uncomfortable when they completed course assignments on the Internet/WWW. An additional purpose was to determine whether any suggestions could be made for teaching and learning.

This chapter begins with an explanation of the research design, followed by a restatement of the research questions and hypotheses. Next, the methodology used in carrying out the study is described. Characteristics of the convenience sample are discussed. The instrumentation and procedures used in the study are described, as are the Web assignments completed by the subjects.

Research Design

A quantitative and qualitative design was used in carrying out the study. Information about subject selection, demographics, instruments used, procedures, and Web assignments is presented in this chapter to better elucidate the research design and methods of the study.

Results of the data analyses are presented in Chapter IV. Quantitative methods were used for testing the first three hypotheses; these methods included parametric and nonparametric correlation and regression. Data analysis included the use of correlations between the total score on the Comfort Instrument and the Canfield LSI and the Gregorc Style Delineator. Hypotheses 2 and 3 were tested using correlations. Student age, experience in using computers, and experience in using the Internet were also correlated with the total score on the Comfort Instrument. Demographic data are presented in the form of descriptive statistics (frequencies, means, medians, and standard deviations).

The answers to an open-ended question found in the Web assignments form were evaluated as a means of determining what students thought was uncomfortable for them and to provide a more specific and personal evaluation of how students felt using the Internet for course work. A description of each of the quantitative statistical methods is provided in the data-analysis section below each hypothesis.

Research Questions and Hypotheses

The following questions were posed to guide the collection of data for the quantitative portion of this study:

1. Is there a relationship between the learning styles (independent variable) of nursing students enrolled in a traditionally taught course in Nursing Pharmacology and those students' comfort in using the Internet/WWW (dependent variable)?
2. Is there a relationship between nursing students' personal experience in using computers and the Internet (independent variable) and those students' comfort in using the Internet/WWW (dependent variable)?
3. Is there a relationship between nursing students' age (independent variable) and those students' comfort in using the Internet/WWW (dependent variable)?

In addition, two exploratory questions were posed for the qualitative portion of the study:

4. What do students perceive as factors that were frustrating or made them uncomfortable when they completed course assignments on the Internet/WWW?
5. Can suggestions be made for teaching and learning?

Null hypotheses were formulated to test the data gathered to answer the first three research questions. They are as follows:

Ho 1: There is no relationship between nursing students' learning styles and their comfort in using the Internet/WWW.

Ho 2: There is no relationship between nursing students' personal experience in using computers and the Internet and their comfort in using the Internet/WWW.

Ho 3: There is no relationship between nursing students' age and their comfort in using the Internet/WWW.

The preceding hypotheses are written with no expected direction of results. However, given the study assumptions detailed in Chapter II, the review of literature, and the personal experience of the researcher, certain expectations of direction can be surmised.

With regard to Hypothesis 1, the researcher expected to find that, for the four Gregorc mediation channels, those students who were more concrete and sequential would report less comfort when using the Internet, which can be random and abstract. From the Canfield LSI it might be expected that those students who enjoyed more social learning activities, preferred instructor-involved learning and instructor-directed activities, preferred working with people, were more dependent, and preferred more concrete activities would have less comfort when working with computers and the Internet.

In Hypothesis 2, the researcher surmised that students with less experience using the Internet and computers would report a lower comfort level than those with more experience using the Internet and computers. Even though their learning styles might not match those of using computers and the Internet for learning, the repeated exposure had given those with more experience the abilities needed to work with the technology, as well as the resources to adapt the technology to their learning styles.

For Hypothesis 3, there was no expectation of direction. Older students who are acclimated to more traditional learning settings might experience less comfort using the technology. However, with many of the older students holding jobs, this might not be the case. They might have become very used to using the technology through their work and families because the technology is so prevalent. Here again, the older students might also have matured, and developed more diverse learning styles over time. The use of the Internet and computers might not produce any less comfort than that experienced by younger (traditional) students who have been acquainted with this type of learning in high school.

Subjects

Subject Selection

There was no random selection or assignment of subjects. Rather, a convenience sample was used, comprising 41 nursing students enrolled in an associate degree program in nursing at a four-year university in the Midwest. Forty-three students started the course, but two dropped out early into the semester, one because of personal and family obligations and the other due to a change in major. The group was enrolled in the first of two courses in pharmacology (drugs and their actions in the body). Pharmacology 151 is a one-credit course that is offered during the first semester of the nursing program. It is one of the first nursing courses that students take.

Students could not enter the nursing program until they had completed all prenursing courses with a grade of C or above. Some of the subjects had completed all of the prerequisites and been on a waiting list for the nursing program for two to three years. In addition to the pharmacology class, the subjects were taking one or two other nursing courses at the time of the study.

The subjects in this study took Pharmacology 151 during the summer semester. They completed the course in four weeks (two hours per day, two days per week). The researcher taught the course as part of her teaching load and had taught the course for several years.

To better describe the subjects, demographic data were gathered through the Web assignments students completed (described under Procedures). Some of these data also were used in testing the hypotheses and answering the research questions.

The subjects were primarily Caucasian females. The average age of the class was 24.4 years, almost 9 years younger than the average age of 33. This makes the group uncharacteristic of nursing students at this university. National trends are also higher than this and approximate 33 years, on average. This fact must be taken into account when analyzing the data because the group appears to be different from students in other nursing programs. Any findings must be viewed in light of these data on the sample.

Demographic data regarding age of sample members and their experience using computers and the Internet are shown in Table 2. Frequencies and percentages of males and females, as well as traditional and nontraditional students, in the

sample are shown in Table 3. Additional descriptive information may be found in Appendix A.

Table 2: Subjects' age and experience using the Internet and computers.

	<u>N</u>	Mean	Median	<u>SD</u>
Age	41	24.42	22.00	5.50
Years' experience using computer	41	5.05	5.00	1.75
Hours per week on Internet	41	2.83	2.00	3.60
Years using the Internet	41	3.76	4.00	1.60

Table 3: Distribution of subjects by gender and traditional/nontraditional age.

	<u>N</u>	Percent
Female	38	92.7
Male	3	7.3
Traditional	27	65.8
Nontraditional	14	34.2

Protection of Subjects' Rights

Permission to conduct the study was obtained from the Michigan State University Committee on Research Involving Human Subjects (UCRIHS—see Appendix B) and from the host university. To ensure confidentiality, the names of participating students and the university are not identified in this study. Although students' names were required on the Web assignments and the instruments so that the results could be correlated, their names were not used in

the data analysis. At that time, respondents were assigned numbers to protect their anonymity.

Instrumentation

Three instruments were used to collect data on the subjects in this study. They are the Canfield LSI, the Gregorc Style Delineator, and the Comfort Instrument developed by the researcher.

The Canfield Learning Style Inventory

The Canfield LSI was used to measure learning styles of the nursing students in this study, in conjunction with the Gregorc Style Delineator. Canfield (1992) described the LSI as "a self-report questionnaire that allows students to describe what features of their educational experiences they most prefer" (p. 1). Canfield defined learning style as

the affective component of educational experience, which motivates a student to choose, attend to and perform well in a course or training exercise. The LSI is a rationally derived and highly structured instrument that breaks the motivational component into four major categories (Condition for Learning, Area of Interest, Mode of Learning and Expectation for Course Grade). (p. 1)

(A brief description of the LSI scales is included in Appendix C.) Of the LSI scales, the Peer, Organization, Independence, People, and Direct Experience scales were used in this study to detect possible differences among students using the Internet in course assignments. Form A of the LSI was used; it is the higher education version, having a seventh-grade reading level.

The LSI takes approximately 30 minutes to administer, following a brief explanation of the instrument (see Appendix C). Students rated sets of descriptors and marked their answers on a bubble scoring form. The completed forms were then sent to Canfield for evaluation. Norms are given for the LSI, and scores are reported as percentiles and T-scores (mean = 50, SD = 10).

Similar to the Gregorc Style Delineator, the Canfield LSI ranks student responses on a scale from 1 to 4. Students rank their perceptions from most preferred (1) to least preferred (4). (Due to this similarity, the instruments were not given together, so as to avoid confusion in completing the instruments.) There are 30 sets of rankings. Respondents complete the ranking and mark their answers on a bubble form provided, in a column next to each set of ranked items. Unlike the Gregorc instrument, the Canfield LSI uses sets of phrases and sentences to be rank ordered by importance. It even uses short scenarios and asks students to rank how they would feel, act, or learn in certain situations. Subjects also rank tasks they like to do best, how they like to learn best, skills they think teachers should have, their grade expectations, and feelings concerning evaluations, among other things.

The completed Canfield LSI instruments were sent to WPS for analysis (see Appendix C). The completed instruments and report forms for all students were returned to the researcher. The instrument itself cannot be included here because of a usage agreement with the author; however, a sample report form is provided for referral in Appendix C. In the same appendix is an example of the directions given to the students and a sample question. Scores on each of the

21 scales of the Canfield LSI are reported for each student. A horizontal graph is presented beside each T-score/percentile for each of the scales. The graphs demonstrate a student's score relative to the other 20 scales (see Appendix C).

An overall typology is presented to the student, showing how each of the T-scores on the 21 scales is used to figure the student's summary score. The subsequent overall learner typology for each student is provided in the individual reports. A grid containing all of the possible typologies is provided to the student. The student's typology is identified on the grid based on calculations for each of the 21 scales. There are nine typologies, each of which is explained in Appendix C, following the sample report. These are given to students for assistance in understanding their own learning styles. A grid containing all of the responses the student gave is also contained in the report. Appendix C contains the address from which readers may obtain the instrument and documentation for further evaluation.

Reliabilities and validities for the LSI are included in the administration booklet. (See Appendix C for Form A Split-Half Scale Reliabilities [range from .95 to .99] and Form A Item Analysis [range from .87 to .98]). Reliabilities were reported by Brainerd and Ommen (as cited in Canfield, 1992, p. 36) on a sample of 1,397 students.

Canfield (1992) reported validity in the area of student achievement in use of computers, stating that a study by Davis "provides evidence of concurrent and discriminant validity" (p. 38). He stated that "over the last decade, however, a number of researchers have reported evidence of (a) the power of the LSI to

discriminate meaningful group differences in learning style preferences, and (b) the value of matching instructional methods to characteristics of individual student preferences" (p. 38). Canfield also reported that there is solid evidence that "the preferences discriminated by scales and sets of scales do relate to the academic and career choices of those tested" (p. 38).

The Gregorc Style Delineator

The Gregorc Style Delineator was used in conjunction with Canfield's LSI to determine whether there were differences among subjects in random versus sequential learning, which was evident in the literature when subjects were working with computer programming and database searching. The Gregorc Style Delineator

is based on a Mediation Ability Theory, which states that the human mind has channels through which it receives and expresses information most efficiently and effectively. The power, capacity, and dexterity to utilize these channels are collectively termed mediation abilities. The outward appearance of an individual's mediation abilities is what is popularly termed "style." (Gregorc, 1994, p. 5)

Perception and ordering are the two types of mediation identified by the delineator.

Perception is the means by which information is "grasped"; this type is composed of abstractness and concreteness:

Abstractness—This quality enables you to grasp, conceive and mentally visualize data through the faculty of reason and to emotionally and intuitively register and deal with inner and subjective thoughts, ideas, concepts, feelings, drives, desires, and spiritual experiences. This quality permits you to apprehend and perceive that which is invisible and formless to your physical senses of sight, smell, touch, taste, and hearing.

Concreteness—This quality enables you to grasp and mentally register data through the direct use and application of the physical senses. This quality permits you to apprehend that which is visible in the concrete, physical world through your physical senses of sight, smell, touch, taste and hearing. (p. 5)

Ordering is the way in which you “authoritatively arrange, systematize, reference, and dispose of information” (p. 5). This emerges as two qualities: sequence and randomness:

Sequence—This quality disposes your mind to grasp and organize information in a linear, step-by-step, methodical, predetermined order. Information is assembled by gathering and linking elements of data and piecing them together in a chain-like fashion. This quality enables you to naturally sequence, arrange, and categorize discrete pieces of information. It further encourages you to express yourself in a precise, progressive, and logically systematic manner.

Randomness—This quality disposes your mind to grasp and organize information in a nonlinear, galloping, leaping, and multifarious manner. Large chunks of data can be imprinted on your mind in a fraction of a second. Information is also held in abeyance and, at any given time, each piece or chunk has equal opportunity of receiving your attention. Such information, when brought into order, may not adhere to any prior or previously agreed upon arrangement. This quality enables you to deal with numerous, diverse, and independent elements of information and activities. Multiplex patterns of data can be processed simultaneously and holistically. This quality encourages you to express yourself in an active, multifaceted and unconventional manner. (pp. 5-6)

From these two types of mediation abilities come four distinct transaction ability channels: Concrete/Sequential (CS), Abstract/Sequential (AS), Abstract/Random (AR), and Concrete/Random (CR). Therefore, the Gregorc Style Delineator reveals the perception and ordering abilities people use to transact in and adapt to their everyday environments. People have the ability to use one, two, three, or even all four channels. However, most are predisposed

to use only one or two. The proclivity to use certain channels is natural and determines how people view and perceive the world.

The Style Delineator allows students to self-score the instrument by providing row totals and then column totals for the 10 ranked sets. A replication of the instrument, scoring, and interpretation guidelines are provided in Appendix D (Canfield, 1994) for a better understanding of the instrument. The address to obtain the full instrument and other materials is also included.

Each row of the instrument is totaled in four columns next to the 10 sets of words. Next, the four columns are totaled at the bottom. The four column totals represent the respondent's scores for the four mediation channels. A high score (27 to 40) on any one or more of the four channels indicates that "the qualities [Mediation Ability] are a powerful means of transaction" for the person for that channel (p. 14). An intermediate score (16 to 26) means that the person has "a moderate Mediation Ability and capacity to transact in the channel indicated" (p. 14). A low score (10 to 15) for any channel indicates that that channel is the least powerful in terms of mediation qualities.

To interpret the scores, a grid is provided to students, describing the qualities exhibited by each of the four channels used in the Gregorc Style Delineator. The grid allows students to better understand their preferred mediation channel(s). The grid also provides a comparison of the four channels (CS, AS, AR, CR) in the categories of reality of the world, ordering ability, view of time, thinking processes, validation processes, focus of attention, creativity,

and so on. The grid is provided in Appendix D for further evaluation by the reader.

Gregorc (1982) reported the reliability of his Style Delineator in terms of internal consistency using standardized alphas. Stability was established using a test-retest correlation coefficient. One hundred ten adults took the Style Delineator twice. Alphas for the two administrations were .92 and .92 for the CS scale, .89 and .92 for the AS scale, .93 and .92 for the AR scale, and .91 and .91 for the CR scale. Correlation coefficients between the first and second tests were .85 for the CS scale, .87 for the AS scale, .88 for the AS scale, and .87 for the CR scale.

Gregorc (1982) assessed construct validity by interviewing 100 individuals, who indicated that virtually all descriptions were accurate. He assessed predictive validity by computing correlations. Correlations between Style Delineator scores and ratings of attributes were .68 and .70 for the CS scale, .68 and .76 for the AS scale, .61 and .60 for the AR scale, and .55 and .68 for the CR scale.

The Comfort Instrument and Demographic Items

The researcher developed the Comfort Instrument to assess students' comfort in using the Internet. The instrument was modeled after one used by Cairry (1998) in a doctoral study. Cairry did not provide information as to the reliability of the instrument, but said that its validity was ensured through an in-

depth literature review on the subject and administration to seniors in a bachelor of nursing program.

The Comfort Instrument (Appendix E) used in this study was modified from the one used in Cairry's research and was based on literature pertaining to the use and development of affective instruments (Gable & Wolf, 1993) and the use of bipolar terms to obtain construct validity. While developing the Comfort Instrument, the researcher addressed content validity by having an expert review the items and assist in instrument development (M. Roehrig, personal communication, 1997). Roehrig has had extensive teaching experience and has been actively involved in development and administration of psychosocial instruments. She is also a mental health nurse, has taught nursing for more than 20 years, holds private counseling evaluation sessions, and has taught statistics and research for many years, in addition to being trained as a psychologist.

The Comfort Instrument was given to 56 student volunteers who were graduating from the associate degree program in nursing at the university at which the study was conducted. The instrument was given in both Likert and semantic forms for evaluation purposes and to assess comprehension of the bipolar terms and the instrument form.

These students were asked to comment on any ambiguity of terms and to indicate which scale (Likert or semantic) they preferred for describing their perceptions of comfort. The students also were asked to evaluate the bipolar scales and to make suggestions as to adding to or deleting any of the scales

relating to their perceptions. This administration of the instrument was also used in assessing reliability. The instrument was also given for evaluation to faculty members in the Department of Nursing, as well as to a statistician to review for content and construct validity.

Reliability was evaluated using the responses of the above-mentioned student volunteers. Reliability coefficients are shown in Table 4. The reliability analysis of the Comfort Instrument indicated that the combined scales had a Cronbach alpha of .9079. An alpha greater than .60 usually is considered to indicate internal consistency (Mitchell & Malloy, 1999). Each bipolar scale was broken down to find the best reliability of the instrument, using varied combinations of the bipolar terms. If the Unsure/Confident bipolar scale was deleted from the instrument, the next highest alpha was .92. Similar reliability results were found when analyzing the Likert scale.

Inter-item correlations on the Comfort Instrument indicated that all correlations were significant at the .05 level (see Table 5). Nineteen Pearson correlation coefficients were significant at the .01 level (2-tailed), and the remaining two correlations were significant at the .05 level (2-tailed).

Student volunteers who favored the semantic scale said it gave them more options to rate the terms. They thought the Likert scale was too confining and gave them less latitude in expressing and rating their perceptions. Those who did not like the semantic scale thought it was less concrete than the Likert scale, and they said they had trouble rating their perceptions on the analog scale. They preferred the Likert scale because it was definite and concrete

Table 4: Correlations of items in the Comfort Instrument.

Scale Item	Scale Item						
	Difficult/ Easy	Tense/ Relaxed	Stressful/ Unstressful	Anxious/ Calm	Unsure/ Confident	Unpleasant/ Pleasant	Comfortable/ Uncomfortable
Difficult/Easy Pearson corr. Sig. (2-tailed) N							
Tense/Relaxed Pearson corr. Sig. (2-tailed) N	.716** .000 56						
Stressful/Unstressful Pearson corr. Sig. (2-tailed) N	.690** .000 56	.810** .000 56					
Anxious/Calm Pearson corr. Sig. (2-tailed) N	.606** .000 56	.602** .000 56	.809** .000 56				
Unsure/Confident Pearson corr. Sig. (2-tailed) N	.297* .037 56	.394** .003 56	.303* .023 56	.394** .003 56			

Table 4: Continued.

Scale Item	Scale Item						
	Difficult/ Easy	Tense/ Relaxed	Stressful/ Unstressful	Anxious/ Calm	Unsure/ Confident	Unpleasant/ Pleasant	Comfortable/ Uncomfortable
Unpleasant/Pleasant Pearson corr. Sig. (2-tailed) N	.625** .000 56	.613** .000 56	.744** .000 56	.687** .000 56	.397** .002 56		
Uncomfortable/Comfortable Pearson corr. Sig. (2-tailed) N	.563** .000 56	.519** .000 56	.620** .000 56	.720** .000 56	.601** .000 56	.635** .000 56	

**Significant at the .02 level (2-tailed).

*Significant at the .05 level (2-tailed).

(*Strongly Agree to Strongly Disagree*). Similar pros and cons have been expressed in the literature on the use of Likert and semantic scales (Nieswiadomy, 1998; Polit & Hungler, 1995). The two forms of the Comfort Instrument also were discussed with a statistician, who thought the semantic scale allowed more options for data analysis. Based on these assessments, the semantic-scale form of the instrument was used in the actual study.

Table 5: Reliability coefficients of the Comfort Instrument: Scale alphas.

Item	Scale Mean If Item Deleted	Scale Variance If Item Deleted	Corrected Item-Total Correlation	Alpha If Item Deleted
Difficult-Easy	26.1607	69.6282	.7152	.8953
Tense-Relaxed	26.0893	67.4282	.75074	.8905
Stressful-Unstressful	26.1786	63.3994	.8320	.8814
Anxious-Calm	25.6964	67.5244	.7977	.8867
Unsure-Confident	26.5279	73.9970	.4641	.9220
Unpleasant-Pleasant	25.7500	64.9182	.7677	.8892
Uncomfortable-Comfortable	25.8571	67.3974	.7569	.8906

Number of cases = 56 Number of items = 7 Alpha = .9079

The final version of the Comfort Instrument contained seven bipolar terms (Table 5), which students rated on a scale from 1 to 7. Thus, the total score for the seven bipolar scales could range from 7 to 49. This total comfort score for each subject was compared with the student's scores on the Canfield LSI and the Gregorc Style Delineator.

In the Web assignments (see Procedures section), students were asked to respond to several statements regarding demographic characteristics. Students were also asked to respond to several statements using a semantic-type scale ranging from *Strongly Agree* (1) to *Strongly Disagree* (7). These statements elicited a range of answers to gain data about subjects' comfort when using computers and the Internet (see Appendix F). Students completed these assignments on the Internet. Some of the responses to these statements were correlated to students' responses on the Comfort Instrument.

Procedures

Pilot Testing of Web Assignments and Syllabus

Because of the complexity and technical nature of Web-site development, the researcher asked 33 students who had previously taken the course to complete the Web assignments and review the Web syllabus. These students were asked to provide feedback and make suggestions for further refinement of the multiple Web pages and to make sure the URLs and other technical aspects functioned properly. Although no real problems were mentioned as a result of this pilot test, the students did offer suggestions for making the Web pages more appealing and easier to read (colors, fonts, page size, and so on).

Informed Consent

The researcher gave the students a short explanation of the research and asked them to indicate their willingness to participate by signing a consent form (Appendix B). The researcher assured them that their grades would not be

affected by whether they did or did not participate. However, the Web assignments were a part of the course to get students to use the Web syllabus and gain knowledge of Internet sites on pharmacology that they would use in the course and in future professional activity. If students did not complete the LSIs, the researcher assumed they did not want to participate in the study. For those students, information from the Web assignments was not used in the study, but it was used in evaluating the course and determining whether Web assignments would be used in succeeding semesters.

Data Collection

To pass the course, subjects were required to complete four activities using the Web. The activities were included in a Web syllabus created by the researcher, which was based on the course syllabus also developed by the researcher. The syllabus was published on the Web in January 1998 through two different servers, with access through a URL address. The assignments were accessed through the Web syllabus, using the Web Assignments hyperlink and a URL address set up specifically for the assignments. A replica of the Web assignments is provided in Appendix F, along with directions for completing the assignments.

The first assignment was given the first day of class. The home page of the syllabus contained information about how to use and navigate through the syllabus on the Web; it also contained the first exercise. The home page provided instructions on how to access a page titled NURS 151 (the course

syllabus) and then how to e-mail the instructor using the hyperlink. Students were instructed to inform the instructor via e-mail that they had successfully accessed the Web. This was to be done before the second class to ensure that students could gain access to the Internet and that any problems they encountered could be solved before starting the course.

During the second class, students' assignment was to access the Web, go to the Web Assignments page, and again e-mail the instructor. In this assignment, students were asked to answer a question about their comfort with and feelings concerning use of the Web. The question was open-ended and designed to elicit students' initial reactions (positive or negative) about using the Web. This assignment was to be completed by the third class period.

The assignment for the next activity, called Web Assignment 2 (Appendix F), was given in the third class session. In this assignment, students were to access a Web site on pharmacology (Food and Drug Administration—FDA). Four Web sites were given—locations that dealt with pharmacology and contained information that would be useful in the course and in their future work. They could look at all four sites, but it was mandatory that they go to the first site. All four sites had hyperlinks and could be accessed by just clicking on the text in the syllabus under the assignment.

Subjects were to look at the FDA site. They then were instructed to return to Web Assignment 2 and click on the text Discussion Group, which would hyperlink them to a discussion group where there again was a question they had to answer. They were asked to describe what the FDA site had to offer and how

they could use it as a student and nurse. Students also were instructed to view responses to this question by others who had already completed the assignment. Subjects were able to read their own comments after posting them. The researcher saved and printed all answers for data-analysis purposes. Students were alerted that their comments would be viewed by anyone entering the discussion group. They were to complete the assignment by the next class. The directions and Discussion Group assignment are provided in Appendix F.

The third Web assignment, given during the fourth class, was to be completed by the next class session. This assignment entailed students' using a 4-point Likert-type scale (*Strongly Agree to Strongly Disagree*) to respond to questions concerning their comfort using the Web syllabus and the Web assignments. Information was also obtained on subjects' experience in using computers and the Internet, their educational background, whether they thought the assignments were useful, and their future use of the Internet. The students answered the questions using drop-down boxes, text boxes, and other elements frequently used to obtain information on the Web. A replica of the form is provided in Appendix F.

Students were given printed directions only on how to access the Web syllabus. The rest of the directions were given in each assignment on the Web. They could access the syllabus through any laboratory at the university or from home. They had to find their own access to the Internet. A 25-station computer laboratory was located next door to the room where the class was held; it was open until 10 p.m. every day except Sunday.

The Comfort Instrument, a paper-and-pencil survey, was administered during the next class session. The instrument was not put on the Internet because the researcher wanted to control the environment, ensuring that students understood the instructions and answered the questions.

The Canfield LSI and the Gregorc Style Delineator were administered during the seventh and eighth class sessions. Instructions were read according to criteria defined in each instrument.

The researcher told the students that the Web assignments they were to complete had not been added to the regular course assignments, but rather replaced other assignments that had been omitted. Students were assured that they were not incurring any more work because of the Web assignments. Those assignments were designed to meet the same course requirements as the ones that had been omitted.

CHAPTER IV

RESULTS OF THE DATA ANALYSIS

Introduction

The results of the data analyses are reported in this chapter. Findings regarding descriptive statistics are presented first, followed by the results of hypothesis testing. Then the qualitative findings are discussed. Descriptive statistics were used to analyze responses to the Canfield and Gregorc instruments. Frequencies, means, and standard deviations were determined for each of the 21 Canfield scales and for the four channels on the Gregorc instrument. Data are presented throughout Chapter IV. Each of the seven bipolar semantic scales of the Comfort Instrument was analyzed for frequency, mean, and standard deviations; results are presented along with those for the other two instruments.

Hypotheses were tested using both parametric and nonparametric statistical techniques. Data were analyzed with the assistance and guidance of two statisticians, who used Statistical Package for the Social Sciences (SPSS) software to analyze the data for the three hypotheses. All data were taken from the Canfield and Gregorc instruments, the Comfort Instrument, demographic items, and the Web Form and put into an Excel spreadsheet for use in SPSS. All data were double-checked for accuracy after transfer. A logbook was also

used to maintain data and other material taken from the instruments. Alpha was set at .05 for all tests for each of the three quantitative hypotheses. For clarification, the three instruments (or sample items) are included in the appendices, along with information on how data for the Canfield and Gregorc instruments are presented and on interpretation of the scores on each instrument.

Descriptive-Statistics Findings

Scores on all four of the four mediation channels on the Gregorc instrument were very close when viewing the group as a whole. Only the CS (concrete sequential) channel was considered high (range = 27 to 40), with a mean of 27. The other three channels were all considered intermediate (16 to 26); their means ranged from 22.49 to 26.78. The closeness of these ranges may indicate that, as a whole, this group was able to use all four mediation channels equally, demonstrating a wide range of learning styles. They were able to adapt easily to new learning situations because they had a wide range of mediation channels. (See Table 6.)

Table 6: Total for all students on each of the four channels of the Gregorc Style Delineator.

Channel	<u>N</u>	Mean	Median	<u>SD</u>
Concrete sequential (CS)	41	27.54	28.00	5.18
Abstract sequential (AS)	41	22.49	22.00	4.31
Abstract random (AR)	41	26.78	26.00	5.02
Concrete random (CR)	41	23.66	23.00	4.96

Analysis of the Canfield LSI provided 21 group means. The range is 1 to 100 for each scale. A score of 50 is considered average, and those above 90 are considered very high. Of the group means, the highest was Detail (59.10), which was only slightly above average. The lowest mean was 43.98 for the Goal Setting scale. Nine means were between 50 and 60, and the rest of the 21 means were between 40 and 49. (See Table 7.)

Table 7: Total scores for all students, by scale, on the Canfield LSI.

Scale	<u>N</u>	Mean	Median	<u>SD</u>
Preferred Condition for Learning				
Peer	41	50.49	51.00	10.03
Organization	41	57.76	54.00	10.62
Goal setting	41	43.98	42.00	9.83
Competition	41	50.24	50.00	9.87
Instructor	41	47.61	46.00	9.49
Detail	41	59.10	60.00	10.18
Independence	41	42.02	40.00	8.43
Authority	41	52.93	54.00	9.88
Preferred Area of Interest				
Numeric	41	53.29	53.00	10.02
Qualitative	41	46.24	46.00	9.21
Inanimate	41	48.41	48.00	9.60
People	41	51.24	53.00	8.77
Preferred Mode of Learning				
Listening	41	49.85	50.00	8.74
Reading	41	47.66	48.00	7.94
Iconic	41	47.83	48.00	8.09
Direct experience	41	55.00	54.00	10.63
Expectation for Course Grade				
A-Total expectation	41	58.34	62.00	11.23
B-Total expectation	41	47.22	45.00	7.85
C-Total expectation	41	44.80	40.00	9.42
D-Total expectation	41	45.51	46.00	8.03
Total expectation	41	55.10	57.00	9.12

As with the Gregorc instrument, the absence of any high scales on the Canfield instrument and the clustering of means between 40 and 60 demonstrates that the group as a whole tended to use all of the 21 scales, without any scales having a significant impact over the others. Again this might suggest that, as a group, the students used a variety of all four of the LSI modes equally. They did not prefer any mode more than the others.

Descriptive statistics for the Comfort Instrument demonstrated very high means on all seven of the bipolar scales. Six of the seven scales had a mean of 6.0. Only one had a mean of 6.5 (possible range = 7 to 49). This suggests that the group as a whole was very comfortable. The mean for all seven of the scales was 41.5. (See Table 8.)

Table 8: Descriptive statistics for the Comfort Instrument.

Bipolar Scale	<u>N</u>	Mean	Median	<u>SD</u>
Difficult-Easy	41	5.70	6.0	1.47
Tense-Relaxed	41	5.53	6.0	1.71
Stressful-Unstressful	41	5.25	6.0	1.81
Anxious-Calm	41	5.43	6.0	1.71
Unsure-Confident	41	5.48	6.5	1.91
Unpleasant-Pleasant	41	5.50	6.0	1.66
Uncomfortable-Comfortable	41	5.60	6.0	1.77
Total comfort score of 1-7	41	38.48	41.5	10.48

Results of Hypothesis Testing

Hypothesis 1

There is no relationship between nursing students' learning styles and their comfort in using the Internet/WWW.

Data analysis. The first test used in analyzing the data for Hypothesis 1 was the Pearson product-moment correlation coefficient. Scores on the 21 scales of the Canfield LSI (in the form of percentages) for each subject were correlated with the total score obtained by each subject on the Comfort Instrument (possible range = 7 to 49). The resulting 21 correlation coefficients were all considered low ($r = .3$ or less). Some were negative, but none showed either a positive or a negative correlational strength of greater than .3 (see Table 9). No statistically significant findings were obtained.

The Canfield LSI also gives an overall learner typology (see Appendix C) based on students' scores. Nine typologies are possible. Each of the nine overall typologies was coded using numbers arbitrarily assigned from 1 to 9; no ranking of the typologies was possible. This categorical numbering was then correlated with the Comfort Instrument using a nonparametric Spearman correlation, which is used when data are categorical in nature. Almost no correlation was found. The resulting $r = .007$ was demonstrated after analysis. Again, there was no statistically significant finding at $\alpha = .05$.

Table 9: Correlations between 21 Canfield LSI scales and total scores on the Comfort Instrument.

Scale	Total Comfort Score
Preferred Condition for Learning	
Peer	.089
Organization	.269
Goal setting	-.205
Competition	-.204
Instructor	.099
Detail	-.139
Independence	-.083
Authority	-.056
Preferred Area of Interest	
Numeric	-.053
Qualitative	-.103
Inanimate	-.020
People	.112
Preferred Mode of Learning	
Listening	-.087
Reading	-.068
Iconic	-.047
Direct experience	.191
Expectation for Course Grade	
A—Total expectation	-.162
B—Total expectation	.184
C—Total expectation	-.199
D—Total expectation	-.209
Total expectation	.007
By learner typology	.009

Pearson product-moment correlation was used again to correlate the total of the Comfort Instrument with the four channels of the Gregorc Style Delineator (AS, CR, AR, CS). Again, very low correlations were found between the total on the Comfort Instrument and the four mediation channels. The highest correlation found was -.285 for the Abstract/Random (AR) channel (see Table 10). Again,

no statistically significant findings emerged. The subject group appeared to be fairly comfortable in using the Web assignments for course work.

Table 10: Correlations between the four channels of the Gregorc Style Delineator and the total score on the Comfort Instrument.

Scale	Total Comfort Score
Gregorc CS	.110
Gregorc AS	-.285
Gregorc AR	.077
Gregorc CR	.015

Multiple regression techniques were used to determine whether any combination of the Canfield LSI or Gregorc Style Delineator scores had significance when viewed with the total scores on the Comfort Instrument. Multiple regression is used when there are multiple levels of the independent variable with one dependent variable. The independent variables were inserted into the computer in a standard form, meaning there was no deliberate insertion of variables based on importance or ranking.

First the four Canfield scales making up Mode of Learning (direct experience, iconic, numeric, and qualitative) were inserted as the independent variables; total Comfort Instrument score was the dependent variable. From Table 11 it can be seen that the results showed an adjusted R-square value of -.046. ANOVA results from the same test indicated an F-value of .419 and a significance level of .740. The results again were not statistically significant.

Table 11: Regression between the dependent variable, total Comfort score, and the independent variables, Canfield LSI preferred mode of learning.

Model Summary

Model	<u>R</u>	<u>R</u> -Square	Adjusted <u>R</u> -Square	Std. Error of Estimate
1	.181 ^a	.033	-.046	12.2340

^aPredictors (constant): Preferred mode of learning.

ANOVA^a

Model	Sum of Squares	<u>df</u>	Mean Square	<u>F</u>	Sig.
1 Regression	188.332	3	62.77	.419	.740 ^b
Residual	5537.863	37	149.627		
Total	5726.195	40			

^aPredictors (constant): Preferred modes of learning.

^bDependent variable: Total score on Comfort Instrument.

Note: See individual correlations between all scales of the Canfield LSI and the Gregorc scales and the total score on the Comfort Instrument.

The same technique was used, only with the four channels of the Gregorc Style Delineator (AS, CS, AR, AS) for the independent variables or predictors and the total score on the Comfort Instrument as the dependent variable. Again, from Table 12, it can be observed that no statistically significant results were found at $\alpha = .05$.

Finding no significant results from the Comfort Instrument, the researcher and statistician decided to use Item 20 on the Web Form (see Web assignments in Appendix F). The 7-point semantic scale was used, asking students to rate their frustration when using the Web. The students rated their frustration from

low or none (1) to high frustration (7). Again, no statistically significant findings were found at $\alpha = .05$ when using the four channels from the Gregorc instrument and the Web Assignment Form: Frustration (see Table 13).

Table 12: Regression between the four Gregorc channels (AS, CS, CR, AR) and the total score on the Comfort Instrument.

Model Summary

Model	R	R-Square	Adjusted R-Square	Std. Error of Estimate
1	.233 ^a	.0543	-.051	12.2658

^aPredictors (constant): CS, AS, CR, AR.

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	310.165	4	77.541	.515	.725 ^b
Residual	5416.030	36	150.445		
Total	5726.195	40			

^aPredictors (constant): CS, CR, AS, AR.

^bDependent variable: Total score on Comfort Instrument.

Note: See individual correlations between all scales of the Canfield LSI and the Gregorc scales and the total score on the Comfort Instrument.

In conclusion, all correlations and regression tests performed on the data to test Null Hypothesis 1 indicated no statistically significant results at $\alpha = .05$. Therefore, the null hypothesis cannot be rejected and must be retained.

Table 13: Regression between the four Gregorc channels (AS, CS, CR, AR) and the Web Assignment Form: Frustration.

Model Summary

Model	R	R-Square	Adjusted R-Square	Std. Error of Estimate
1	.277 ^a	.077	-.026	2.1886

^aPredictors (constant): CS, AS, CR, AR.

ANOVA^a

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	14.339	4	3.585	.748	.566 ^b
Residual	172.441	36	4.790		
Total	186.780	40			

^aPredictors (constant): CS, CR, AS, AR.

^bDependent variable: Web Assignment Form: Frustration.

Note: See individual correlations between all scales of the Canfield LSI and the Gregorc scales and the total score on the Comfort Instrument.

Discussion. The lack of a statistically significant relationship between students' comfort using the Internet/WWW and their learning styles may have been due to the small sample, which contained high variability. A larger sample might produce different results. Students using the Internet/Web in a classroom might also have different learning styles from those found in the Canfield LSI or the Gregorc Style Delineator. The Comfort Scale should be used again and more reliability and validity tests performed to enhance the instrument. That might also change the results in future studies.

The lack of statistically significant findings contradicted the results obtained by Davidson et al. (1992), Ester (1994), and Kaczor and Jacobson (1996) using the Gregorc Style Delineator. Those studies, as well as the present one, need to be replicated in order to obtain more concrete evidence that learning style theory does indeed measure the learning that takes place when students use the Internet and computers. So far, the few studies that have been done on the Internet have been sketchy and have provided minimal guidance, at best, for teaching and learning using computers and the Internet. Only when more definitive studies are conducted can learning styles be used to assist faculty who are teaching and students who are learning in these types of situations. This includes using LSIs that represent the many different levels of learning styles discussed earlier in this dissertation.

This study was based on Internet assignments that can be considered introductory in nature. Relatively stable, traditional learning techniques were used for most of the course. Had the Internet been used for a greater portion of the course, or even the entire course, it is possible that different findings regarding the relationship between comfort in using the Internet and learning style might have emerged. Greater use of the Internet might have caused students with certain learning styles to become more uncomfortable as the Internet became a more integral part of the learning experience.

Hypothesis 2

There is no relationship between nursing students' personal experience in using computers and the Internet and their comfort in using the Internet/WWW.

Data analysis. Nonparametric correlations were used to test Null Hypothesis 2, when correlating years of experience using the Internet and computers. Spearman correlation was used because response to years of experience for both questions was given an arbitrary number for each possible response on the Web Assignment Form (see Appendix F). The options given were 0 years (1), less than 6 months (2), 6 months to 1 year (3), 1-2 years (4), and so on, and can be found on the Web Assignment Form.

From Table 14 it can be seen that, when correlating the total score on the Comfort Instrument with years of experience using a computer, the r value was .454. This is a moderate correlation; however, it was statistically significant at .05 (2-tailed). It was even found to be significant at $\alpha = .01$ (2-tailed).

Table 14: Correlation of total score on the Comfort Instrument and experience using computers and the Internet.

		Experience Using Computer	Experience on Internet	Total Comfort Score
Pearson Correlation	Exp. on computer	1.0000	.672**	.454**
	Exp. on Internet	.627**	1.0000	.390*
	Total Comfort score	.454**	.390*	1.0000
Signif. (2-tailed)	Exp. on computer		.000	.003
	Exp. on Internet	.000		.012
	Total Comfort score	.003	.012	
<u>N</u>	Exp. on PC	41	41	41
	Exp. on Internet	41	41	41
	Total Comfort score	41	41	41

*Significant at the .05 level (2-tailed).

**Significant at the .01 level (2-tailed).

Statistically significant findings also were found ($r = .390$) when correlating the total score on the Comfort Instrument and years of experience on the Internet, using nonparametric correlation (Spearman). Similar response options were given as for years of experience using a computer and are shown on the Web Assignment Form in Appendix F. The results were statistically significant at $\alpha = .05$ (2-tailed) (see Table 14).

Given the significant findings for years of experience using the Internet and computers, the null hypothesis could be rejected. The researcher's assumptions were validated in this study. Experience did play a role in these students' comfort using computers and the Internet.

Discussion. The significant relationship found between students' scores on the Comfort Instrument and their experience using the Internet and computers has implications for using this technology for teaching and learning in the classroom. If comfort increases with experience in using computers and the Internet, then courses in which students are introduced to these technologies may be needed to ensure that students have the skills and confidence to use them in completing course work and as aids to learning.

Hypothesis 3

There is no relationship between nursing students' age and their comfort in using the Internet/WWW.

Pearson correlations obtained between a student's age and his or her total score on the Comfort Instrument indicated no statistically significant results. Age was then viewed as a categorical variable; the two groups were (a) those

considered traditional-age students (24 years of age and younger) and (b) those considered nontraditional-age students (25 years of age and older). Again, no statistically significant relationship was found between the total scores of students in the two age categories on the Comfort Instrument. Therefore, Null Hypothesis 3 could not be rejected.

Discussion. The lack of statistically significant findings when correlating students' age and their comfort using the Internet indicates that students' previous exposure to computers and the Internet may be enough to make them feel comfortable when using these two learning aids, regardless of their age. Thus, skill in using these technologies may need to be included as a prerequisite to students entering higher education or acquired soon after enrolling in a college or university.

Results of the Qualitative Data Analysis

When students were asked to describe what made them uncomfortable or frustrated with the Web assignments, they gave a variety of answers. Six stated there was absolutely nothing that they would describe as making them uncomfortable or as being frustrating. The other subjects gave short answers to the question, most of which dealt with issues of technology and experience or knowledge. Three themes emerged from students' responses: technology, access, and experience or knowledge. The overriding aspect of time was involved in all the responses.

Qualitative data analysis was done by using a simple grid. Responses that demonstrated some negative feedback were not used. Some students did

not provide any negative feedback and gave only positive responses.

Therefore, these responses were not included and the number of respondents was fewer than the 41 included in the quantitative analyses. Some students gave responses that would apply to more than one theme.

Responses were transcribed, and then the researcher took each response and put it on a grid. Like responses were put on the grid together. The responses then were viewed and rearranged. Finally, three themes emerged, and the researcher soon realized that the three themes were all speaking of time involved in using the Internet for course assignments.

Of the issues termed **technology** (37.5%), the most prevalent aspect was the frustration students felt when servers were down, busy, or somehow inaccessible. These aspects of using computers and the Internet are ones that subjects could not control.

The second issue, **access** (17.5%), had two different aspects. The first was students' inability to quickly get e-mail and Internet access because they had to go through the process of registering through the Information Services department at the university. Students thought this was confusing and time consuming. After getting access, there was a 24-hour wait before signing on to certain aspects of the Internet and e-mail. Those with children and no Internet access from home saw this as just another obstacle keeping them from their studies and their families.

The second aspect of **access** concerned students' having computer access. Students said it was very frustrating finding out where to start and get

access through the university if they had no other e-mail and Internet access. They thought it wasted valuable time having to go a computer lab and/or having to make arrangements (planning) to get to one of the several computer labs on campus or in their communities. This added stress to those who commuted and had no computer access at home or in their communities. All of these concerns appear to have compounded the stress of starting a new program that is very intense, with most students carrying 19 credits in an abbreviated 12-week summer course.

The third theme was students' lack of **knowledge** (45%) about how to use both the computer and the Internet. Those who had little or no experience found it overwhelming to learn how to use the computer to access the Internet and then how to use the browsers to find the information they needed. Some students were overwhelmed by the amount of information they found, as well as by sorting out the information they needed.

Overarching these three themes was the matter of **time**. All of the problems with technology, access, and knowledge or experience gave rise to a need for additional time to complete assignments. For these students, time was at a premium. Completing their assignments on the Internet took time away from these students' families and their "studying."

Some students who found the assignments on the Web overwhelming also said they were glad they had done the assignments. They understood that they would need these skills in later courses, or it was something they had wanted to learn but had not previously had the time or computer access.

Summary

The results of the quantitative and qualitative data analyses, along with a discussion of those results, were presented in this chapter. The results of the quantitative data analyses for two of the three hypotheses were not what the researcher expected, but the data did provide insight into the learning styles of this group of students.

Chapter V concludes the dissertation and provides possible reasons why the results for this group of learners were obtained. Limitations and reflections of the researcher are provided in an attempt to bring some type of understanding as to the results of the study. The researcher's reflections provide for greater understanding of the data and subsequent meaning for this group of learners using the Internet and computers in a traditionally taught course in nursing education.

CHAPTER V

DISCUSSION, LIMITATIONS, RECOMMENDATIONS, REFLECTIONS, AND CONCLUSION

Discussion

Not many studies have been undertaken on the topic of learning styles and the Internet, and only a few of the available LSIs were used in those investigations. Further, previous researchers attempted to measure just a couple levels of the onion metaphor presented by Tennant (1991). The findings of the present study contradicted the results of previous studies in which it was found that learning styles influenced how students dealt with computers and the Internet. However, the limited nature of the studies that have been completed on learning styles makes it difficult to determine how learning styles affect learning on computers and the Internet. Because the studies that have been done have not been replicated, it is difficult to formulate definitive implications for teaching and learning.

This study was considered exploratory; among other things, it was designed to determine whether factors such as age and experience in using computers and the Internet might affect students' comfort in using this technology. In this study, no correlation was found between students' age and their comfort in using the Internet/WWW. However, a significant relationship

was found between students' experience using computers and the Internet and their comfort in using the Internet/WWW, leading to the conclusion that experience may play a significant role in determining students' comfort. This study needs to be replicated with a larger sample to see whether the same findings emerge. If they do, there are implications for teaching and learning. Students who lack skill in using computers and the Internet may need to gain such skill before entering colleges and universities.

The qualitative results from this study had one overriding theme—that of time. Students thought that the extra time needed to access the Internet, learning how to use computers and browser software, and time spent when servers were slow or inoperative, was time wasted. This time was taken away from “studying” and other personal endeavors. For some reason, these students did not perceive the Web assignments as learning assignments and hence as important as their “studying.” It would be interesting to know what these students perceived as learning and why they did not view the assignments as adding to their learning. Quite possibly these students felt more comfortable with the traditional classroom setting and did not consider any deviation from that setting a valuable learning tool. Students might have viewed the Web assignments only as the instructor's research project and not as learning.

Limitations

One limitation of the study was the use of a convenience sample of nursing students at only one university. Thus, the findings are generalizable only to students who are similar to those who participated in this research. Use

of a larger, random sample would make the findings generalizable to a larger population.

The researcher-developed Comfort Instrument needs to be administered to a larger sample of subjects, to better determine its reliability and to further refine the instrument. A larger sample would have decreased variability, thereby possibly yielding statistically significant findings.

Results were dependent on subjects' honesty in completing the instruments and their comprehension of the terms used. Also, the students seemed to have a strong bond with the instructor/researcher, and it is possible that they might have tried to "help" her by not giving negative answers on the Comfort Instrument.

Students' responses to the qualitative question were very limited, even though they were asked to expound on their feelings and provide substantial feedback. This limited the data that were available for analysis.

Recommendations for Further Research and for Teaching and Learning

Using the Internet in the classroom has enormous potential to enhance teaching and learning. Additional studies need to be undertaken to determine how students learn by using this technology. Until then, students and faculty will need to try new techniques and find what works and what does not, through trial and error. It is therefore important that more studies be done to validate the findings of research that has already been completed and to explore new directions to help students and faculty use the Internet effectively.

The Internet/Web has the potential of providing unlimited opportunities and new avenues through which teaching and learning can occur. Further study of the way learning takes place in this relatively new teaching and learning situation is needed so that students are given opportunities that enhance learning and best match their learning styles. Even though, in this study, no relationship was found between students' learning styles and their comfort in using the Internet/WWW, more research needs to be conducted to determine whether students are comfortable using this medium in learning. Research should also be undertaken to determine whether current LSIs measure the types of learning that students employ when using computers and the Internet. New learning style theories and instruments may need to be developed to explain and measure this type of learning.

Not addressed in this study, but prevalent in the literature on teaching and learning, is the teaching style of instructors using the Internet/Web in the classroom. More studies need to be conducted on how best to use the Internet/Web to facilitate student learning. There is also a need for research on how instructional style relates to using the Internet as a part of teaching, and what skills instructors need in order to facilitate learning using the Internet.

Work on learning styles has raised a number of questions. Further research is needed to determine whether there is gender or cultural bias in LSIs. Researchers need to focus on the role of age, race, and gender, to determine whether these characteristics have more implications than previously thought. If it is true that LSIs identify only a portion of what constitutes learning style, then

more studies will need to be conducted using multiple learning style measures. More qualitative and longitudinal designs also should be used, which would provide added insight into learning styles and whether they change over time. Insight could also be gained into whether, over time, students are able to adopt and use other learning styles as they gain broader experience and knowledge in a discipline. These implications also apply to studies focusing on learning styles and use of the Internet/WWW because if students' learning styles do not match the style involved in using the Internet, universities must provide basic skills preparation in this area so that students can effectively use the Internet/WWW as they progress through college and later in their careers.

College and university administrators will need to determine how to better support faculty when incorporating the Internet into the classroom because, as this researcher learned, using such technology is very technical and time consuming. Faculty will have to learn new communication skills, as well as those related to the Internet and computer technology.

College and university administrators should also study their facilities and procedures for computer labs and Internet access in order to make access to and use of these technologies as uncomplicated as possible and available to all students. This issue recently has been addressed at Michigan State University, where freshmen might in the future need to have a laptop computer when they enter the university.

College and university personnel must also address the need for student assessment in the skills needed to use computers and the Internet. Students

coming onto campus without these skills might need an introductory course on these technologies.

When looking at the use of the Internet in teaching and learning, the quality of students' responses on the Internet needs to be evaluated. Also, ways to enhance student communication in course work need to be investigated. As noted in this study, students' response was minimal when they were asked to provide feedback in written form.

Reflections

The results of this study did not meet the expectations of the researcher, as stated at the end of Chapter II. Reasons were given throughout Chapter IV and in the discussion and limitations sections of Chapter V that might explain the results. They are reviewed in this section to try to reach a better understanding of the results and why the study had the results it did.

As stated in the limitations, researcher honesty, content construct of the Comfort Instrument, sampling methods, and limited responses of students on the qualitative question all could have affected the internal validity and affected the study findings leading to the results. However, when looking more deeply at the descriptive statistics gained from the Canfield LSI, the Gregorc Style Delineator, the Comfort Instrument, and group demographics, some interesting data were revealed.

First, the group was typical because, as a group, the mean age was 9 years lower than the average student at the university. This means that younger students comprised the group—one that had more exposure to computers and

possibly less anxiety or discomfort using computers and the Internet because they had greater exposure to the technology in their previous education. The homogeneity of the group might have skewed the results of the study, leading to the lack of correlation between learning style and comfort using the Internet in course work because they were more alike than different. No correlation could be found because of a lack of differences in the group.

This homogeneity also can be seen in the group scores on the two LSIs. The group score on the Canfield scales ranged from 40 to 60 using percentiles. The average for that instrument on each scale was 50. The group mean was clustered 10% above and below what is considered average (50th percentile), demonstrating the homogeneity of the group. This led the researcher to assume that the group had very little variability in general and very little preference for any of the 21 scales over any other scale. The group, when viewed as a whole, used all of the 21 scales, with very little preference for any of the scales when learning. Also no one, two, or group of scales was predominant over others, so the group's learning styles were evenly distributed over the 21 scales, demonstrating no preferred learning style.

The same phenomenon can also be seen in the Gregorc scores on the four mediation channels. The group means were closely clustered from 23.6 to 27.5. Only the mediation channel Concrete Sequential was considered to be high and therefore highly preferred by learners. The CS channel (mean = 2.75) was only minimally higher than the low reference point of 26. A score of 26 or greater means a channel is considered high for learners and was predominantly

used and preferred by learners. But given the group means, it is suggested that the group was more alike than not. By preferring all four channels equally, students had no high mean or preference for any one or two of the mediation channels, which means they could use all four channels equally. If they had no overriding preference and could use all four channels, then any new learning strategy like computers and the Internet would be incorporated into their learning with no more stress or discomfort than any other type of strategy. This would make this group adept at using any learning strategy imposed on them.

Viewing the group as not having any preferred learning style, based on the Gregorc and Canfield instruments, that they did not highly prefer or did not prefer, would provide a reason why the mean (38.4 group mean, range 7 to 49, average of range 21) on the Comfort Instrument was fairly high. The students did not experience a great deal of discomfort or negative feelings because they could use any learning style as measured by the instruments used in the study, regardless of age.

When looking at the results for Hypothesis 2 in light of the preceding discussion, it would seem, then, that just gaining experience using the Internet and computers would be enough for this group to report an increase in comfort level when using the technology in the classroom. This was also borne out when looking at comments made by students on the qualitative question, where the biggest obstacles were the hassles in constraints of time. These were due to the lack of knowledge of how to use the technology, accessing computers and

the Internet, and delays incurred due to technology issues. Edelson (1998) reported similar barriers to using the technology.

Therefore, with the ability to comfortably use all the learning preferences equally, as measured by the LSIs, students should be given ample support and experience in learning to use computers and the Internet (Edelson, 1998; Hubbard, 1998; O'Neil, 1970; Presno, 1998; Spielberger, 1970). This experience and support would be adequate for this group of learners to use the technology comfortably to complete course assignments based on their abilities to use multiple learning styles and no strong preference for or against only one learning style.

When reflecting on the preceding discussion, the researcher also thought about the issues of support for this group. It is possible that the group wanted to make the researcher "look good" in the study because of their identification with the researcher; hence they might have reported more "comfort" because they were being supportive of the researcher's project. This was indeed a two-way street for the issue of support.

It is also conceivable that students' report of comfort when using the Internet was a nonissue for them relative to the wide array of very stressful things they were experiencing that summer. Some of these stresses were having a large number of contact hours, learning to give shots, working with medications, and learning how to perform intimate procedures with real patients in clinical settings. These new experiences could have entailed stresses that

made using the Internet and technology pale in comparison when they rated their comfort on the Comfort Instrument.

As mentioned earlier, the Web assignments completed by students were just a small part of the total course expectations. Most of the course was taught traditionally, and therefore the Web assignments were not a strong enough stimulus to cause a great enough discrepancy between learning styles and instructional methods. Therefore, the stimulus was not great enough to reach the threshold needed for students to have negative feelings and thus report a lack of comfort. Possibly, using more intensive instructional methods based on the Internet might have enhanced the discrepancy between learning styles and use of the Internet and computers, leading to different results regarding student comfort.

In conclusion, even though the results of the study were not what the researcher expected, in light of the descriptive statistics and qualitative research questions, the study did provide some interesting propositions as to the group's learning needs. This, of course, needs to be studied further and leads to more studies to learn about what happens if students do not have a preference for any one learning style. It also adds emphasis to the experiential learning that takes place for students.

Conclusion

This study was completed using a group of nursing students in a medium-sized state university; these students were enrolled in a course in which nursing

pharmacology was taught. The researcher substituted traditional assignments with assignments on the Internet to enhance learning. Based on a review of research studies and literature on learning style theory, the researcher hypothesized that students' comfort using the Internet and computers would differ, based on their learning styles. The discrepancy between students' learning styles and their use of the Internet and computers would cause a stimulus that would be apparent in the students' comfort level.

It is also plausible that the researcher did not find a correlation between learning styles and student comfort because the LSIs used in the study were developed and validity gained using traditional classroom settings. Current LSIs may not include the types of learning styles that are employed when using the Internet and computers.

However, group analysis demonstrated a homogeneous group with little difference in learning styles on two LSIs. In fact, the group did not demonstrate any learning style preferences on either instrument. Significant findings were indicated between comfort and experience in using computers and the Internet. Qualitative analysis indicated that students were more concerned about the lack of knowledge in using the technologies and issues of access when asked about their comfort using the Internet and computers. Plausible reasons have been presented for the findings of the study, including the limitations of sample selection and the construct and content validity of the Comfort Instrument. The study results, however, need to be compared with the results of research on larger, more diverse student populations to determine whether relationships

exist between learning styles and use of the Internet and computers in the classroom.

APPENDICES

APPENDIX A

DESCRIPTIVE STATISTICS FOR THE SAMPLE

Table A1: Breakdown of the sample by age.

Age	Frequency	Percent	Cumulative Percent
18	2	4.9	4.9
19	1	2.4	7.3
20	7	17.1	24.4
21	6	14.6	39.0
22	5	12.2	51.2
23	5	12.2	63.4
24	1	2.4	65.9
25	2	4.9	70.7
26	3	7.3	78.0
29	1	2.4	80.5
30	2	4.9	85.4
32	2	2.4	87.8
35	2	4.9	92.7
36	1	2.4	95.1
38	2	4.9	100.0

Table A2: Subjects' experience using the computer.

Experience	Frequency	Percent	Cumulative Percent
0 years	1	2.4	2.4
Fewer than 6 months	1	2.4	4.9
6 months to 1 years	7	17.1	22.0
1-2 years	9	22.0	43.9
2-3 years	5	12.2	56.1
3-5 years	4	9.8	65.9
5-10 years	14	34.1	100.0
Total	41	100.0	

Table A3: Subjects' experience using the Web/Internet.

Experience	Frequency	Percent	Cumulative Percent
0 years	1	2.4	2.4
Fewer than 6 months	12	29.3	31.7
6 months to 1 years	3	7.3	39.0
1-2 years	14	34.1	73.2
2-3 years	6	14.6	87.8
3-4 years	1	2.4	90.2
4 or more years	4	9.8	100.0
Total	41	100.0	

Table A4: Subjects' educational level/background.

Educational Level	Frequency	Percent	Cumulative Percent
High school	28	68.3	68.3
Associate degree	9	22.0	90.2
Bachelor's degree	4	9.8	100.0
Total	41	100.0	

Table A5: Subjects who had taken previous courses on the Web.

Had Taken Course	Frequency	Percent	Cumulative Percent
Yes	12	29.3	29.3
No	29	70.7	100.0
Total	41	100.0	

Table A6: Subjects who considered themselves computer literate.

Computer Literate?	Frequency	Percent	Cumulative Percent
Strongly agree	12	29.3	29.3
Agree	19	46.3	75.6
Disagree	7	17.1	92.7
Strongly disagree	3	7.3	100.0
Total	41	100.0	

Table A7: Subjects' comfort using the Web.

Comfortable Using the Web?	Frequency	Percent	Cumulative Percent
Strongly agree	17	41.5	41.5
Agree	16	39.0	80.5
Disagree	6	14.6	95.1
Strongly disagree	2	4.9	100.0
Total	41	100.0	

Table A8: Subjects who had a computer at home.

Have Computer	Frequency	Percent	Cumulative Percent
Yes	12	29.3	29.3
No	29	70.7	100.0
Total	41	100.0	

APPENDIX B

**INFORMED CONSENT AND LETTER OF PERMISSION FROM
THE UNIVERSITY COMMITTEE ON RESEARCH INVOLVING
HUMAN SUBJECTS (UCRIHS)**

Informed Consent

The following learning style inventories are being given to you to assist in determining how student learning styles relate to use of the Internet and WWW in a traditional classroom setting such as this, Nursing 151. It is a study by the instructor in completion of requirements for a Ph.D. at MSU. You will receive the results of the instruments and how to use them in understanding your own learning style later in the semester after they are scored.

It is important that you understand that your names will not be used in the study, as only the group scores are to be used. Names are needed only to match your responses to the Web assignments and to return the results to you. Your participation in completion of the instruments will not be graded or impact your grade in any way.

The Web assignments, however, are a part of this course participation and will continue to be a part of this course in order to introduce students to, and use, the Internet/Web as a valuable source of communication and information. Therefore, completion of Web assignments is part of your grade and will be included in the study by completion of the learning style instruments.

For participation you will be given one service credit of the three needed for graduation. The instructor will fill out the forms and return them to you to give to your advisor. You will also receive the results of the learning style instruments with instructions how to use them to assist you in your course work. The instructor will pay for the instruments and scoring of the instruments. This is free, no cost to you, the student, and will give you valuable information about how you learn best and how to help you use your style to enhance your learning.

Thank you for your participation.

Denise L. Hoisington, RN, MSN

**MICHIGAN STATE
UNIVERSITY**

May 11, 1998

TO: Marvin Grandstaff
Educational Administration
427 Erickson Hall

RE: IRB#: 98-296
TITLE: CONFORT USING COMPUTES AND RELATIONSHIP TO
LEARNING STYLES AND AGE: NURSING STUDENTS
REVISION REQUESTED: N/A
CATEGORY: 1-C, 1-A
APPROVAL DATE: 05/04/98

The University Committee on Research Involving Human Subjects' (UCRIHS) review of this project is complete. I am pleased to advise that the rights and welfare of the human subjects appear to be adequately protected and methods to obtain informed consent are appropriate. Therefore, the UCRIHS approved this project and any revisions listed above.

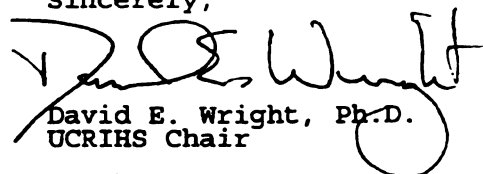
RENEWAL: UCRIHS approval is valid for one calendar year, beginning with the approval date shown above. Investigators planning to continue a project beyond one year must use the green renewal form (enclosed with the original approval letter or when a project is renewed) to seek updated certification. There is a maximum of four such expedited renewals possible. Investigators wishing to continue a project beyond that time need to submit it again for complete review.

REVISIONS: UCRIHS must review any changes in procedures involving human subjects, prior to initiation of the change. If this is done at the time of renewal, please use the green renewal form. To revise an approved protocol at any other time during the year, send your written request to the UCRIHS Chair, requesting revised approval and referencing the project's IRB # and title. Include in your request a description of the change and any revised instruments, consent forms or advertisements that are applicable.

**PROBLEMS/
CHANGES:** Should either of the following arise during the course of the work, investigators must notify UCRIHS promptly: (1) problems (unexpected side effects, complaints, etc.) involving human subjects or (2) changes in the research environment or new information indicating greater risk to the human subjects than existed when the protocol was previously reviewed and approved.

If we can be of any future help, please do not hesitate to contact us at (517)355-2180 or FAX (517)432-1171.

Sincerely,


David E. Wright, Ph.D.
UCRIHS Chair

DEW:bed

cc: Denise L. Hoisington

APPENDIX C

SUPPLEMENTARY INFORMATION ON THE CANFIELD LSI

Table C1: Description of scales on the Canfield LSI.

Conditions for Learning (8 scales)

Preferred situation or content of instruction

Peer	Enjoys teamwork, maintaining good relations with other students, having student friends, etc.
Organization	Desires clearly organized course work, meaningful assignments and a logical sequence of activities
Goal Setting	Wants to set own objectives, use feedback to modify goals or procedures, and make his or her own decisions on objectives
Competition	Desires comparison with others, needs to know how he or she is doing in relation to others
Instructor	Wants to know the instructor personally and have a mutual understanding and liking for him or her
Detail	Likes to know specific information, assignments, requirements, rules, etc.
Independence	Prefers working alone, determining his or her own study plan, and doing things independently
Authority	Desires classroom discipline, maintenance of order, and having informed and knowledgeable instructors

Area of Interest (4 scales):

Preferred subject matter or objects of study

Numeric	Prefers working with numbers and logic, solving mathematical problems, etc.
Qualitative	Likes working with words or language—writing, editing, talking
Inanimate	Enjoys working with things—building, repairing, designing, and operating
People	Prefers working with people—interviewing, counseling, selling, helping

Table C1: Continued.

Mode of Learning (4 scales):

Preferred manner of obtaining new information

Listening	Prefers hearing lectures, tapes, speeches, etc.
Reading	Enjoys examining written information, reading tests, pamphlets, etc.
Iconic	Likes interpreting illustrations, movies, slides, graphs, etc.
Direct Experience	Desires hands-on or performance situations, such as shop, field trips, practice exercises, etc.

Expectation for Course Grade (5 scales):

Level of performance anticipated

A-expectation	Outstanding or superior level
B-expectation	Above average or good level
C-expectation	Average or satisfactory level
D-expectation	Below average or unsatisfactory level
Total expectation	Weighted sum of A-, B-, C-, and D-expectations

Canfield LSI available from:

WPS
12031 Wilshire Blvd.
Los Angeles, CA 90025-1251

Source: Canfield, A. A. (1992). Canfield Learning Styles Inventory (LSI). Los Angeles: Western Psychological Services, p. 2.

Table C2: Item analysis, Canfield LSI, Form A.

Scale	1st Item Versus Sum of Other 5	2nd Item Versus Sum of Other 5	3rd Item Versus Sum of Other 5	4th Item Versus Sum of Other 5	5th Item Versus Sum of Other 5	6th Item Versus Sum of Other 5
Peer	.98	.91	.90	.91	.89	.91
Organization	.88	.88	.87	.88	.88	.89
Goal Setting	.89	.88	.88	.91	.91	.91
Competition	.94	.94	.91	.96	.91	.94
Instructor	.87	.87	.90	.89	.87	.85
Detail	.92	.89	.91	.91	.92	.92
Independence	.93	.92	.91	.90	.92	.94
Authority	.95	.92	.91	.90	.92	.94
Numeric	.93	.93	.94	.95	.93	.94
Qualitative	.94	.95	.93	.95	.94	.95
Inanimate	.92	.92	.92	.93	.91	.94
People	.93	.92	.99	.91	.90	.93

Table C2: Continued.

Scale	1st Item Versus Sum of Other 5	2nd Item Versus Sum of Other 5	3rd Item Versus Sum of Other 5	4th Item Versus Sum of Other 5	5th Item Versus Sum of Other 5	6th Item Versus Sum of Other 5
Listening	.90	.92	.86	.94	.94	.94
Reading	.95	.94	.94	.96	.97	.96
Iconic	.93	.94	.92	.93	.93	.97
Direct Experience	.88	.89	.87	.90	.86	.91
A-expectation	.96	.89	.96	.96	.95	.93
B-expectation	.92	.89	.93	.93	.92	.89
C-expectation	.95	.90	.95	.94	.94	.92
D-expectation	.98	.96	.98	.97	.96	.95

Source: Canfield, A. A. (1992). Canfield Learning Styles Inventory (LSI). Los Angeles: Western Psychological Services, p. 37.

Table C3: Split-half scale reliabilities, Canfield LSI, Form A.

Scale	First Half Versus Second Half	Odd- Versus Even- Numbered Items
Peer	.97	.97
Organization	.96	.97
Goal Setting	.97	.97
Competition	.98	.98
Instructor	.96	.97
Detail	.97	.98
Independence	.97	.98
Authority	.98	.98
Numeric	.98	.98
Qualitative	.98	.99
Inanimate	.98	.98
People	.98	.98
Listening	.98	.97
Reading	.99	.99
Iconic	.98	.98
Direct Experience	.96	.96
A-expectation	.98	.99
B-expectation	.97	.97
C-expectation	.98	.98
D-expectation	.99	.99

Source: Canfield, A. A. (1992). Canfield Learning Styles Inventory (LSI). Los Angeles: Western Psychological Services, p.38.

INSTRUCTIONS

This inventory gives you an opportunity to describe how you learn best. There are no right or wrong answers. You are to read each of the 30 statements and rank the responses according to how well they describe your reactions or feelings. Be sure to write your answers in the spaces to the right of the appropriate question (a, b, c, or d) and to the left of the dark line on the edge of the page. The example below illustrates how the items are presented. Examine it carefully to be sure you understand how you are to mark your answers

EXAMPLE

Rank the following colors in the order in which you generally prefer them.

- | | |
|-----------|-------------------------------|
| a. Yellow | a. <u>4</u> (least preferred) |
| b. Red | b. <u>3</u> (third) |
| c. Blue | c. <u>1</u> (most preferred) |
| d. Green | d. <u>2</u> (second) |

For each statement, there are four responses to be marked. Each response must be rated 1 through 4, with 1 indicating the most-preferred choice and 4 indicating the least-preferred choice. Use a different number of each response. Be sure to put a number in each blank or your answers will be unusable.

If you are sure that you know what to do, begin. If you have a question, ask for assistance before starting.

L

WPS TEST REPORT

Reproduced from: Canfield, A. A. (1992). Canfield learning styles inventory (LSI). Los Angeles: Western Psychological Services (p. 12).

 * Learner Typology *

This is how individual scales (T-scores) are combined to give summary scores:

Organization		Qualitative		Reading		Direct Experience		Inanimate		Iconic		Summary X score
68	+	52	+	66	-	55	-	36	-	46	=	49
-----		-----		-----		-----		-----		-----		-----

Peer		Instructor		Goal Setting		Independence		Summary Y score
36	+	52	-	45	-	56	=	-13
-----		-----		-----		-----		-----

These typology results are from summary scores:

	6	X less than -15	X from -15 to 15	X greater than 15
Y greater than 10		SA Social/Applied	S Social	SC Social/Conceptual
Y from -10 to 10		A Applied	N Neutral Preference	C Conceptual
Y less than -10		IA Independent/Applied	I Independent	IC Independent/Conceptual *** YOU ***

WPS TEST REPORT

Western Psychological Services • 12031 Wilshire Boulevard • Los Angeles, California 90025

Reproduced from: Canfield, A. A. (1992). Canfield learning styles inventory (LSI). Los Angeles: Western Psychological Services (p. 13).

Students tend to be most comfortable and involved with learning when instructional techniques are matched to their own or a nearby group as charted above.

Social—prefers extensive opportunities to interact with peers and instructors; has no strong preference for either applied or conceptual approaches; instruction involving small groups and teamwork will create the closest match.

Independent—prefers to work alone toward individual goals; has no strong preference for either applied or conceptual approaches; instructional techniques such as analysis of case studies or self-selected and self-paced programs will create the closest match.

Applied—prefers to work in activities directly related to real world experience; has no strong preferences for either social or independent approaches; instruction involving practicums, site visits, and team labs will create the closest match.

Conceptual—prefers to work with highly organized language-oriented materials; has no preference for either social or independent approaches; instruction involving lectures and reading will create the closest match.

Social/Applied—prefers to have opportunities to interact with students and instructors in activities closely approximating real-world experiences; instruction involving role playing, group problem solving, and supervised practicums will create the closest match.

Social/Conceptual—prefers to have opportunities to interact with students and instructors using highly organized language-oriented materials; instruction involving a balance of lecture and discussion will create the closest match.

Independent/Applied—prefers to work alone toward individual goals in activities closely approximating real-world experience; instruction involving individual labs or unsupervised technical practicums will create the closest match.

Independent/Conceptual—prefers to work alone toward individual goals with
->> highly organized language-oriented materials; instruction allowing for
YOU - >> independent reading, literature searches, and reviews will create the
- >> closest match.

Neutral preference—tends to have no clear areas of strong preference; may find adequate match in any other type, but may also at times find it difficult to become entirely involved.

WPS TEST REPORT

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Reproduced from: Canfield, A. A. (1992). Canfield learning styles inventory (LSI). Los Angeles: Western Psychological Services (p. 14).

APPENDIX D

ADMINISTRATION AND SCORING OF THE

GREGORC STYLE DELINEATOR

Style Comparison

Following are brief synopses of the style characteristics of the four dominant channels. (p. 38).

Category	CS	AS	AR	CR
WORLD OF REALITY	Concrete world of the Physical senses	Abstract world of the intellect based upon concrete world	Abstract world of feeling and emotion	Concrete world of activity and abstract world of intuition
ORDERING ABILITY	Sequential step-by-step linear progression	Sequential and two-dimensional; tree-like	Random non-linear and multidimensional	Random three-dimensional patterns
VIEW OF TIME	Discrete units of past, present, future	The present, historical, past and projected future	The moment; time is artificial and restrictive	Now: total of the past, interactive present, and seed for the future
THINKING PROCESSES	Instinctive, methodical, deliberate, structured	Intellectual, logical, analytical, rational	Emotional, psychic, perceptive, critical	Intuitive, instinctive,, impulsive, independent
VALIDATION PROCESS	Personal proof via the senses; accredited experts	Personal intellectual formulae; conventionally accredited experts	Inner guidance system	Practical demonstration;; personal proof: rarely accepting of outside authority
FOSUC OF ATTENTION	Material reality; objects of value	Knowledge facts, documentation	Emotional attachments, relationships and memories	Applications, methods, processes and ideals
CREATIVITY	Product, prototype, refinement, duplication	Synthesis, theories, models and matrices	Imagination, the arts, refinement, relationships	Intuition, originality, inventive, and futuristic
APPROACH TO CHANGE	Slightly adverse: speculative, hesitant and slow	Notoriously indecisive, cross-checks, deliberation, fence-straddler	Subject to emotions, level of interest: critical or impressionable	Open and amenable, often instigator, "rolling stone", "trouble shooter"
APPROACH TO LIFE	Realist, patient, conservative and perfection-oriented	Realist; serious, determined, logical, and intellectual	Idealist: emotional, exuberant, transcendent, and intense	Realist/idealist; telescopic attitudinal, inquisitive, and independent
ENVIRNMENTAL PREFERENCE	Ordered, practical, quiet, stable	Mentally stimulating, ordered and quiet, non-authoritative	Emotional and physical freedom: rich: active and colorful	Stimulus-rich, competitive, free from restriction, amenable
USE OF LANGUAGE	Literal meaning and labels: succinct, logical	Polysyllabic words: precise, rational: highly verbal	Metaphoric, uses gestures and body language: colorful	Informative, live, colorful: "words do no convey true meaning"
PRIMARY EVALUATIVE WORDS	GOOD	Excellent	Super, Fantastic, Out-Of-Sight	Superior, Great

Gregorc, A. F. (1994). An adult's guide to style. Columbia CT: Gregorc Associates Inc. (p.38)

Administration of the Gregorc Style Delineator

The Gregorc Style Delineator is not reproducible but can be obtained from:

Gregorc Associates, Inc.
P. O. Box 351
Columbia, Ct 06237-0351

The Researcher prior to subjects starting the Research (Canfield, 1994, p.5) read the following directions which also showed an example of a word set and how to complete it.

Before starting with the word matrix on the next page, carefully read all seven of the following direction and suggestions:

1. **Reference Point.** You must access the relative value of the words in each group using you SELF as a reference point: that is, who you are deep down. NOT who you are at home, at work, at school or who you would like to be or feel you ought to be. THE REAL YOU MUST BE THE REFERENCE POINT.
2. **Words.** The words used in the *Gregorc Style Delineator* matrix are not parallel in construction nor are they all adjectives or all nouns. This was done on purpose. Just react to the words as they are presented.
3. **RANK.** Rank in order the ten sets of four words. Put a "4" in the box above the word in each set which is the best and most powerful descriptor of you self. Give a "3" to the word which is the next most like you, a "2" to the next and a "1" to the word which is the least descriptive of your SELF. Each word in a set must have a ranking of 4, 3, 2, or 1. No two words in a set can have the same rank.
4= **MOST** descriptive of you
1 = **LEAST** descriptive of you
4. **React.** To rank the words in a set, react to your *first impression*. There are no "right" or "wrong" answers. The real, deep-down you is best revealed through a first impression. Go with it. Analyzing each group will obscure the qualities of SELF sought by the Delineator.
5. **Proceed.** Continue to rank all ten vertical columns of words, one set at a time.
6. **Time.** Recommended time for word ranking: 4 minutes.
7. **Start.** Turn the page and start now.

An example is given below the instructions as to how to rank each set. Each set contains 4 words in a vertical column. Each word has a box to put the ranking by the subject. See next page.

Gregorc, A. F. (1994). *An adult's guide to style*. Columbia CT: Gregorc Associates Inc. (p. 9-14)

The Gregorc Style Delineator Instrument

Below is an example of how the instrument looks. There are 5 columns on the page. The top half of the page contains sets 1-5 and the bottom half of the page contains sets 6-10. Each has a number above the sets and total columns on the right hand side of the page for tallying of rows. There are 4 boxes at the bottom below the row tally to total columns a, b, c and d. Below is a facsimile of the instrument containing fictitious word sets and is intended to demonstrate how the instrument is presented and scored.

					ROW TOTALS			
1	2	3	4	5	a	b	c	d
a. cow	a. clouds	a. dog	a. snow	a. leaves	___			
b. horse	b. sun	b. cat	b. ice	b. trees		___		
c. pig	c. stars	c. hamster	c. sleet	c. flowers			___	
d. sheep	d. moon	d. bird	d. hail	d. weeds				___

6	7	8	9	10				
a. barn	a. measles	a. hair	a. door	a. man	___			
b. house	b. mumps	b. nails	b. porch	b. woman		___		
c. condo	c. hepatitis	c. skin	c. floor	c. son			___	
d. shack	d. rubella	d. scar	d. wall	d. daughter				___
			Column	Totals:	CS	AS	AR	CR

Concrete-Sequential (CS), Abstract- Sequential (AS), Abstract-Random (AR) and Concrete Random (CR)

Gregorc, A. F. (1994). An adult's guide to style. Columbia CT: Gregorc Associates Inc. (p. 9-14)

Scoring the Gregorc Style Delineator

The following directions are given by Gregorc in scoring the instrument (p. 11):

1. **Add Across.** Add across the "a." row of words in the first five sets. Put that total in the top "a" column box. Do the same for the "b", "c" and "d" rows of the first set. Next do the last group of five set, putting the row totals in the bottom group of boxes. These totals are those of each of the 4 channels *. (See the Example on previous page.)
2. **Add down.** Add the top and bottom box in each scoring column to get the total for that column.
3. **Check.** If you combined total scores of CS (a), AS (b), AR (c), and CR (d) is greater or less than 100, please recheck your addition. All four columns should total exactly 100.

All subject instruments were scored in this way by the researcher.

INTERPRETATION of Gregorc Scores (p. 14)

Gregorc states that every individual has the ability to demonstrate all four channels (CS, AR, AS, and CR) but will strongly lean toward one of the channels. This channel is the one most strongly used by the person. Some maybe strongly oriented to one, two, or even three; an individual's qualities will seldom be distributed equally (p.11).

SCORES

1. **HIGH (27-40)** – mediation qualities are powerful means of transaction for the students.
2. **Intermediate (16-26)** – means the students will have moderate mediation ability and capacity to transact in the channel indicated.
3. **Low (1-15)** – If a score on a channel falls within this range, the channel has the least mediation ability and least powerful.
4. **An even distribution in all 4 channels (25-25-25-25)** – A) This demonstrates that all four channels are equally distributed and the person has "great momentum and concentration in all or channels, or B) the person has equal and moderately distributed abilities in all four of the channels

- **NOTE:** The four Channels are: Concrete-Sequential, Abstract- Sequential, Abstract-Random and Concrete Random

Gregorc, A. F. (1994). An adult's guide to style. Columbia CT: Gregorc Associates Inc. (p. 9-14)

APPENDIX E

THE COMFORT INSTRUMENT

NAME: _____

Comfort Instrument

The following are rating scales and are designed to get feed back about using the Internet in a traditionally taught course such as Nursing 151. Please determine your response to the following seven scales. Please respond to these not just about your feeling on using the Internet, but using the Internet as a part of Pharm 151. Remember using the Internet includes access to the Internet and e-mail as well as completion of the assignments.

- | | | | | | | |
|------------------|---|---|---|---|---|-------------|
| 1. DIFFICULT | | | | | | EASY |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |
| 2. TENSE | | | | | | RELAXED |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |
| 3. STRESSFUL | | | | | | UNSTRESSFUL |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |
| 4. ANXIOUS | | | | | | CALM |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |
| 5. CONFIDENT | | | | | | UNSURE |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |
| 6. UNPLEASANT | | | | | | PLEASANT |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| | | | | | | |
| 7. UNCOMFORTABLE | | | | | | COMFORTABLE |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

TOTAL Comfort SCALE _____
(POSSIBLE 7-49)

APPENDIX F

WEB ASSIGNMENTS

General Information About Web Assignments

From this page you can reach the web assignments to be completed. Clicking on each assignment below will take you to the assigned page. Make sure to read each assignment completely before continuing with each.

Web Assignment #1

E-mail the Instructor. TOPIC: What are your feelings, observations about using this web site?

In the SUBJECT box type: ASSIGNMENT #1.

Hit tab key and type your response to the above topic (my feelings, observations about USING THIS WEB SITE) in the large white box.

Make sure to type your name at the end of the message so the message has an author. No name, no points.

Click on the SEND button and send the message when done with answering the topic question.

Click on the following e-mail address and you will go to e-mail and complete the assignment (What are your feelings, observations about using this web site?):

dhoisington@net-port.com

Web Assignment #2

You will visit a web site on pharmacology in this assignment. Move around the site and find out what information you can find there.

There are several sites. You may look at them all, but you must go to at least the first one (FDA) and find out what information you could mine there to use in your nursing practice.

When done, come back to the assignment and go to the discussion button (bottom of page) and click on it. Read the instructions on that page, read other comments already submitted, and answer the question of the discussion page. Go to the first web site below and play around. Note what information you could find and think of how you could use it in your pharmacology course. You need only go to the first site, but feel free to look at more! When done, go to the assignment below, and get into the discussion page and answer the questions posed.

<http://www.fda.gov/fdahomepage.html>

<http://www.healthtouch.com>

http://pharminfo.com/pin_hp.html

Don't forget there are other sites on nursing at <http://net-port.com/~dhoisington/professi.html>.

When done viewing the web site on pharmacology above, to complete the assignment you must go to the discussion group, register and answer the questions posed. To go to the discussion group click "discussion group" below.

DISCUSSION GROUP

Web Assignment #3

This assignment entails answering questions and filling in information about yourself and then submitting it to the instructor.

use the mouse or tab keys to move from box to box. Type in the information needed or click the appropriate answer.

Make sure you fill in ALL information. You will receive no points if info is missing.

Before you leave this page, make sure to click SUBMIT below. It is the last box at the very bottom of the page to send the information. You will be notified by the program if any information is missing. If so, go back and provide the information and relick SUBMIT.

Information Form

1. Last Name
2. First Name:
3. Gender
 - Male
 - Female
4. I have a computer at home hooked to access the Web/Internet.
 - Yes
 - No
5. How long have you been using a computer?
 1. 0 months
 2. Fewer than 6 months
 3. 6 months-1 year
 4. 1-2 years
 5. 2-3 years
 6. 3-5 years
 7. 5-10 years
6. Have you taken a prior course on the Web/Internet?
7. What is your highest educational background?
 1. High school diploma
 2. Associate degree
 3. Bachelor's degree
 4. Higher than a bachelor's degree
8. How many hours do you normally spend on the Web/Internet? _____

9. What is your age? _____

10. Have you ever taken a course that uses the Internet/Web? _____

Read each statement below. Click on the arrow next to the box below each statement. In the box then click on the phrase (from Strongly Agree to Strongly Disagree) that best describes your reaction to each statement.

11. I am computer literate and am comfortable using a computer.
Strongly Agree Agree Disagree Strongly Disagree

12. I had difficulty completing the web assignments (e-mail, visiting the web site, using the discussion group, and filling out this information).
Strongly Agree Agree Disagree Strongly Disagree

13. I was able to find pages in the web syllabus with little problem.
Strongly Agree Agree Disagree Strongly Disagree

14. I would not buy a paper copy of the syllabus from the university if it were available on the web.
Strongly Agree Agree Disagree Strongly Disagree

15. Overall, I feel the web assignments were a valuable learning experience.
Strongly Agree Agree Disagree Strongly Disagree

16. I will use the web again to find information to assist me in completion of course work even if no other assignments are made in subsequent courses.
Strongly Agree Agree Disagree Strongly Disagree

17. I will use the web again for personal use.
Strongly Agree Agree Disagree Strongly Disagree

18. I feel that a course in Internet use is needed prior to these web assignments.
Strongly Agree Agree Disagree Strongly Disagree

19. I felt comfortable using the web/Internet.
Strongly Agree Agree Disagree Strongly Disagree

20. On a scale of 1 to 7, how frustrating was the Internet to use?
Not Frustrating 1 2 3 4 5 6 7 Frustrating

In the box below, answer the following question:

21. What part(s) of the use of the web/Internet was (were) the most **uncomfortable (frustrating, stressful, difficult, anxiety producing, made you unsure, or unpleasant)** for you?

EXPLAIN! Click in the white box below and type COMMENT/ANSWER.

Don't forget to click SUBMIT below the box in which you have typed your answer when you are done.

When finished entering all the information, push the SUBMIT button below.

SUBMIT

Discussion Group

Fill in the boxes below for first and last name.

Read the text following your name and then answer the question in the large white box below the questions.

When done click on POST ARTICLE found below the comments box to submit your comments. If you do not click on POST ARTICLE, your comments will not be saved and you will receive no credit.

POST ARTICLE

Last Name:

First Name:

Read the following and answer/comment on the question below.

I do not want to know your comments on the pharm course, but what you have experienced while using the web for assignments. Don't just say "I don't like it" or "I had no problems." Tell me what you have experienced. No one-liners will do. To get credit, you will need to do some explaining to me as to what you feel about the assignments.

1. What is/are your experience/feelings of visiting the web sites, using the discussion group and e-mail for completion of web assignments for this course?

CLICK IN THE BOX BELOW AND TYPE YOUR COMMENTS IN BOX BELOW.

When done, click the POST ARTICLE button below the comment box to save your comments.

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