

ABSTRACT

SHOCKLEY, DAVID RUSSELL. Learning Styles and Students' Perceptions of Satisfaction in Community College Web-based Learning Environments. (Under the direction of Don C. Locke.)

Understanding web-based course delivery technologies in a world that demands opportunities for continuous learning, flexibility, convenience, and accessibility is increasingly important to higher education. As a result, community colleges must evaluate and assess the effectiveness of web-based course offerings in order to identify how technology impacts learning. This study focused on the overarching question: "What are the associations between learning styles and students' perceptions of satisfaction among community college students enrolled in web-based learning environments?" To address this question, the researcher used the analysis of association methodology to explore the associations between learning styles and students' perceptions of satisfaction in four community college web-based learning environments. While there is limited empirical research available to determine the appropriateness of measuring student learning styles, the review of literature and the results of this study support that there are differences in the learning styles among community college web-based learners.

The review of literature suggested that web-based learning environments should accommodate the various student learning styles in order to increase the performance and satisfaction levels of students enrolled in web-based courses. Furthermore, the literature posited that when there is a mismatch between the web-based environment and the learning style of the student, the student will become inattentive, discouraged, and discontent with the

course. However, the results of this study showed that there were limited associations between learning style preferences and students' perceptions of satisfaction in community college web-based courses.

The findings from this study only apply to the web-based learning environments and the students enrolled in one or more web-based courses at the four community colleges. Due to lack of empirical evidence, additional research is needed for students' learning styles, web-based course delivery methods, and web-based teaching styles if community colleges are to maximize the effectiveness of web-based learning.

**LEARNING STYLES AND STUDENTS' PERCEPTIONS OF SATISFACTION IN
COMMUNITY COLLEGE WEB-BASED LEARNING ENVIRONMENTS**

by

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BIOGRAPHY

David Russell Shockley was born May 1, 1968, in Martinsville, Virginia, the third child of Russell Porter Shockley and Manilla Clovie Shockley. He grew up in Collinsville, Virginia where he graduated from Fieldale-Collinsville High School in 1986. While in high school, David began dating his future wife Stephanie. Today, David and Stephanie live in Granite Falls, North Carolina with their two sons, Braedan and Tristan.

In April 1986, David enlisted in the United States Marine Corp Reserves. After completing his basic training and combat engineering school, David enrolled in college at Patrick Henry Community College in Martinsville, Virginia. During his freshman year, he first discovered that learning could be pleasurable, powerful, and a means of enlightening one's inner self and the surrounding world. As a result, he earned his Bachelor of Science in 1990 and his Master of Arts in 1991. In June 2005, David completed North Carolina State's Adult and Community College Education Doctoral Program under the direction of Don C. Locke.

David has learned to provide leadership to adults throughout his career first as a leader in the Marine Corp, then as a departmental director, an adjunct instructor, as a dean, and as a vice president. At the age of 37, he has served nine years on the President's Executive Council, placing himself among the first technology positions to do so in North Carolina. In 2004, David completed the North Carolina Community College System's Senior Administrator Institute and the North Carolina Community College System's Future President's Institute. Currently, David serves as the Vice President of Student Services at Caldwell Community College and Technical Institute.

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Most of all, I wish to express my love and deepest appreciation for the support and dedication that my family has given me throughout the trial and tribulations of my life. Stephanie, I am so fortunate to have a wife and best friend that loves and sacrifices unconditionally for our family. Together, we have accomplished and experienced so much. This work would mean nothing without sharing it with you. I am so blessed to have Braedan

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CHAPTER ONE:

INTRODUCTION

Context of the Problem

The effectiveness of distance learning versus traditional classroom-based learning has been debated since the first generation of distance learning. As the use of technology to facilitate and deliver distance learning courses has increased, new challenges have emerged for the administration, faculty, staff and students of postsecondary institutions developing and implementing distance learning programs (Drazdowski, Holodick, & Scappaticci, 1998; Fulford & Zhang, 1993). Many instructors fear distance learning is a means whereby administrators can justify the reduction of faculty positions to solve budget shortfalls. According to Novek (1996), many critics of distance learning fear the dehumanization and alienation of students as well as loss of critical thinking and social skills. Farrington (1999) posits that he does not accept that distant learning can be the equivalent of the face-to-face instruction. On the other hand, many other researchers have reported no significant difference between traditional classroom instruction and web-based instruction and that students feel closer to their faculty and peer students in web-based courses (Navarro & Shoemaker, 1999; Wade, 1999). Bloom and Hough (2003) postulate that a number of studies have indicated that web-based instruction decreases student learning levels. Even if there are no differences between distance learning and traditional learning environments, there is a need for additional research for the effectiveness of web-based instruction.

In today's digital economy, distance learning environments provide increased flexibility and opportunities for community colleges desiring to maintain a competitive

advantage through the training and development of students. Distance learning has become an integral part of our lives as we move towards a technology-based society where continuous learning is required for everyone. Distance learning is not a panacea, but as web-based courses continue to evolve, their potential for broadening access to higher education and training and development programs is compelling (Pantazis, 2002). While web-based course implementation requires detailed strategic planning, time and resources, the rewards for community colleges that successfully implement distance learning strategies include empowered students, measurable learning and tangible benefits (Driscoll, 2002).

Statement of the Problem

Understanding web-based course delivery technologies in a world that demands opportunities for continuous learning, flexibility, convenience, and accessibility is increasingly important to higher education (Pantazis, 2002). During the 1990s community colleges rapidly increased their web-based course offerings (Levin, 2001). As a result, community colleges must evaluate and assess the effectiveness of web-based course offerings in order to identify how technology impacts learning. Once a community college decides to deliver web-based instruction, there is a need to assess different methods of teaching/learning. While some teaching/learning models are very much like those used in a traditional classroom, electronic delivery makes the methods different enough to create new opportunities for evaluation (Offir & Lev, 1999; Pantazis, 2002). Consideration of this issue is based on the perspective that students ought to be taught using methods that maximize learning effectiveness. As a result, there is a need for research that examines which learning styles are effective in a web-based learning environment, as well as the association between students' preferred learning styles and satisfaction with web-based learning environments.

Purpose of the Study

The purpose of this study is to provide empirical data that report the association between students' learning style preferences and their perceptions of satisfaction in web-based learning environments. By providing an analysis of students' learning styles, the study can enhance learning and expand the knowledge base of web-based learning, a delivery method characterized as a "kind of teaching method in which the teacher and students are separated from each other by place and/or time" (Offir & Lev, 1999, p. 132). In fact, an understanding of students' learning styles may become even more important to web-based learning environments than traditional methods of learning. An analysis of web-based learning for students' perception of satisfaction in web-based course delivery methods can potentially add to the information base about adult learners. While age, gender, and national origin are important, one cannot ignore the premise that learning styles are essential for effective teaching and learning. Therefore, the knowledge provided from the study can lead an instructor to better fulfill the responsibility of presenting information through a variety of instructional methods (Driscoll, 2002; Dunn & Dunn, 1993).

Research Question

This study examines the overarching question concerning the association between students' learning styles and perceptions of satisfaction for those enrolled in community college web-based learning environments. The participants for the study were enrolled in one or more web-based courses at one of the following community colleges located in the foothills of western North Carolina: Caldwell Community College & Technical Institute, Hudson, NC, Western Piedmont Community College, Morganton, NC, Catawba Valley Community College, Hickory, NC, and Wilkes Community College, Wilkesboro, NC.

For the purpose of this study five research questions will be presented to assist in the understanding of the overarching question as follows:

1. What are the associations between learning styles and the perceptions of satisfaction with computers among community college students enrolled in web-based courses?
2. What are the associations between learning styles and the perceptions of satisfaction with the World Wide Web among community college students enrolled in web-based courses?
3. What are the associations between learning styles and the perceptions of satisfaction with social interaction among community college students enrolled in web-based courses?
4. What are the associations between learning styles and the perceptions of satisfaction with instructor feedback among community college students enrolled in web-based courses?
5. What are the associations between learning styles and the perceptions of overall satisfaction among community college students enrolled in web-based courses?

The Null Hypotheses for these five questions are presented in Chapter Three of this study.

Definitions

For the purposes of this study, the following definitions apply:

Asynchronous – A communication method that provides two-way communications with a time delay (e.g., email, mail, threaded postings).

BlackBoard – Computer-mediated software used to develop and deliver course content using the World Wide Web.

Computer-assisted instruction – When computers are used as a self-contained teaching machine to deliver individual lessons; without the intervention of an instructor.

Computer-mediated instruction – When computers are used as the media that delivers the course content from the instructor to the student (e.g., web-based courses, e-mail, chatrooms, and videoconferencing).

Correspondence Course – A distance learning environment where the course content and communications between the instructor and the student are provided using a postal system.

Delivery Technologies – Electronic media designed to provide asynchronous and synchronous interactions for the purpose of delivering written, verbal, and visual communications.

Distance learning – A set of teaching/learning strategies to meet the learning needs of students that are separated from the traditional classroom environment and the traditional role of faculty.

Internet – The vast collection of inter-connected networks that provide the communication paths for networking components to route communications using a common TCP/IP language/protocol.

Learning Styles – An individual's preferred approach to thinking, information processing, and learning (e.g., verbal, visual, reflective).

Real Time – Live communications that are delivered without significant delays (e.g., face-to-face instruction, videoconferencing, chatrooms).

Satisfaction – An individual's perceived comfort level and feelings regarding the effectiveness of the web-based course environments.

Synchronous Communications – Technology-based communications that provide the vehicle for which interaction between the instructors and students can occur in real time (e.g., videoconferencing, chat rooms).

Teleconferencing – A method of communication that uses telephone-based technologies that provide the vehicle for which interaction between the instructors and students can occur in real time at multiple locations.

Telecourse – A strategy of distance learning that provides instruction to the students using television broadcasts or pre-recorded tapes.

Traditional Learning Environment – A learning environment or classroom where the instructor and the student communicate face-to-face.

Videoconferencing – Synchronous communications that allow the instructors and students to communicate in real time, from multiple locations, using computers, cameras, and sound production technologies.

Web-based Courses – Courses of study that are delivered via the World Wide Web using a web-based computer-software program such as WebCT, BlackBoard, and Campus Cruiser.

Web-based Technologies – Computer-mediated devices and software designed to connect individual to the World Wide Web (e.g., computers hardware, software, networking devices).

World Wide Web – A network of Internet servers that uses a common HTTP language/protocol to transfer documents, graphics, video file and audio files.

Assumptions of the Study

The following assumptions were used to guide this study:

1. Community colleges included in the study follow the course content guidelines established in the common course library of the North Carolina Community College System establishing general consistencies in programs and students.
2. Students will accurately and honestly respond to the learning style inventory and the perception of satisfaction web-based survey.

Limitations of Study

Participants in this study were limited to those students who enrolled in during the fall semester of 2004 at the four participating community colleges. As a result, the study possesses the following limitations:

1. The findings from this study only apply to the four community colleges and students enrolled in one or more web-based courses at the four community colleges.
2. In measuring variables associated with students' learning styles and student's perceptions of satisfaction, the researcher was limited in determining if factors not measured would have higher levels of significance than those that are measured.
3. It proved difficult using the postal service to administer the surveys to students located at the four community colleges.

Significance of the Study

Killion (2001) suggested that until additional research is completed for effective and ineffective web-based learning delivery methods, it is likely that most colleges will continue to develop these methods through trial and error. Because web-based learning is in ever

increasing use, community colleges are faced with utilizing technology in the education of adult learners. Although there are many challenges to consider when implementing web-based learning, they are not insurmountable. Additional research conducted for students' learning styles, web-based course delivery methods, and web-based teaching styles is clearly needed if we are to maximize the effectiveness of web-based learning.

This research provides additional knowledge to the field of technology-enhanced learning environments thereby benefiting community colleges, academic advisors, faculty, and students as we continue to learn what enhances and hinders web-based learning. Empirical data collected about students' learning styles, students' perceptions of satisfaction in web-based learning environments can be utilized to identify the strengths and weaknesses required to make informed decisions relative to web-based program and course development strategies. The more insight that administrators, faculty, students, and technical support personnel have about the learning styles and perceptions of web-based learning, the greater likelihood that courses offered via web-based technologies will meet the expectations and demands of students.

CHAPTER TWO:

LITERATURE REVIEW

Introduction

The purpose of this chapter is (a) to research the past, present, and predicted future of distance learning in higher education, (b) to review the literature concerning distance learning theory, (c) to review the evaluation and assessment methods utilized to capture and analyze students' satisfaction in web-based learning environments, and (d) to report the current research findings that report the impact of students' learning preferences and their perceptions of satisfaction in web-based learning environments.

Historical Background

Traditionally, education has been delivered through a knowledge transfer process whereby an instructor transfers information and knowledge directly to the learner, frequently through lecture, in-class group work or work-shopping (Sloman, 2002). This instructional process promotes a learning environment where instructors and students engage in direct dialogue. The traditional learning environment, a seated environment where lessons are usually delivered using lectures, is appropriate for students that are fortunate enough to be able to gain an education at the physical location of the educational institution. However, the goal of education is to provide accessible learning opportunities for all individuals who seek to benefit from gaining knowledge, and many adult learners lack the flexibility enjoyed by traditional students (Pantazis, 2002). As a result, distance learning opportunities were created to provide the transfer of information and knowledge without the constraints of space and time.

Distance learning is not a new concept; it has been in existence for two centuries in Europe and for more than one century in the United States. During the past two hundred years, the development of new technologies has advanced the options for delivering distance learning opportunities to potential distance learners. Sloman (2002) described the periods of technological advancement as follows:

1. The first generation of distance learning in which correspondence educational systems utilized print-based materials and a postal system to deliver distance learning courses.
2. The second generation of distance learning in which instructional radio and television were utilized to broadcast asynchronous distance learning courses.
3. The third generation of distance learning in which synchronous audio and video technologies were utilized to deliver distance learning courses between multiple locations.
4. The fourth generation of distance learning in which information-based technologies, such as satellite communications and computer-based networking systems, integrated audio and visual communications to provide synchronous and asynchronous distance learning opportunities that can be accessed any place at any time.

First Generation

The first generation of distance learning began with correspondence courses (Sloman, 2002). This distance learning opportunity was pioneered in England, Canada, New Zealand, Australia, China, and the United States in an effort to promote equal access to educational opportunities. Correspondence courses are best characterized as providing an asynchronous learning environment where the instructor and the student communicate at different points in

time (Lau, 2000). During this era, correspondence courses relied on printed materials being delivered from the instructor to the student through a postal system, eliminating the traditional face-to-face interaction between the instructor and the student. A typical interaction between the instructor and his/her students involved the instructor's mailing a lesson to the student, the student's returning the lesson to the instructor using the mail, and the student's waiting for the instructor to return the graded assignment using the mail.

During the 1840's, Sir Issac Pitman, creator of English shorthand, began offering correspondence courses in England by the newly established penny post mail system (Lau, 2000). In 1843, the Phonographic Correspondence Society was created in an effort to formalize the correspondence education movement (Glatter & Wedell, 1971). During the 1850s, The University of London expanded its program of studies to the inhabitants located in the British colonies of Australia, Canada, and India. These institutes were created because these countries were physically large and the citizens lived great distances from university campuses.

Meanwhile, the Chautauqua Institute in New York was founded in 1883 as the first institution in the United States to function using the postal service to deliver correspondence courses (Dede, 1990). This college was authorized by the state of New York to grant academic degrees to students who successfully completed work during the summer at the institute and by correspondence during the academic year. Because of the success of correspondence courses in Europe and at the Chautauqua Institute, the correspondence course movement began to spread throughout higher education. In the late 1800's, the University of Chicago created the first major correspondence program for higher education, the Colliery Engineers School of Pennsylvania began offering correspondence courses in mining, and

Pennsylvania State College began offering correspondence courses in agriculture (Matthews, 1999).

During the next twenty years, thousands of adults wished to pursue postsecondary learning opportunities; however, geographical and occupational barriers prevented many adults from accessing colleges and universities (Glatter & Wedell, 1971). Several colleges and universities within the United States began to meet this demand by creating correspondence programs, most notably the University of Wisconsin, University of Texas, University of Columbia, Iowa State University and Chambers College. As a result, the correspondence course movement of this era exploded with enrollments nearing 200,000 students.

While the correspondence course movement opened doors to higher education for thousands of adults who otherwise would have been excluded from educational advancement opportunities, several critics began to question the effectiveness of correspondence courses (Glatter & Wedell, 1971). In fact, many elitists looked down on this form of education and argued that correspondence courses of study were inferior and designed for those intellectually incapable of functioning within traditional university environments. For example, William Harper, a Yale University professor of Hebrew who taught correspondence courses from 1883 to 1891, believed that even if correspondence studies could supplant oral instruction, they would always be viewed as a substitute (Matthews, 1999). In response to the criticism, many institutions began to question and assess the effectiveness of distance learning. Several colleges and universities decided to reconstruct their correspondence courses to include direct contact sessions. While the criticism of correspondence courses seems insignificant, the argument concerning the effectiveness of distance learning courses

has continued from the correspondence course movement to distance learning delivery methods being used today.

Second Generation

The second generation of distance learning is distinguished by the advancement of electronic communications technologies which allowed colleges and universities to deliver correspondence courses using radio and television (Sloman, 2002). Unlike the first generation deliverers of distance learning, colleges and universities that used radio and television correspondence courses were able to create asynchronous learning environments where one-way communication between the instructor and student occurred at different points in time without the restrictions of printed materials and written communications (Glatter & Wedell, 1971). A typical interaction between an instructor and student would begin with the instructor's delivering a lecture using radio or television broadcast. Next, the student would submit his/her assignments to the instructor using postal services. The instructor would grade the assignments and return the student's graded assignments via the postal service. The ability of the instructor and student to interact using the transmission of non-verbal and verbal communications would ultimately come to solidify the preferred media for third and fourth generations for delivering distance learning courses (Matthews, 1999).

The second generation of distance learning started in 1896 when Marconi patented the first radio used to transmit and receive radio frequencies (Sloman, 2002). By 1901, this technology had been developed to the point that transatlantic radio communications were possible (Buckland & Dye, 1991). The United States Congress passed the Radio Act of 1912 in order to regulate the transmission of radio frequencies by requiring anyone desiring to

operate a radio transmission station to apply for a license. In 1912, Saint Joseph's College in Philadelphia was the first college to receive a license to operate a radio transmission station. Immediately several colleges began to follow their lead.

In 1916, the University of Wisconsin was the first college in the United States to offer correspondence courses using the radio (Buckland & Dye, 1991). During the 1920s, Pennsylvania State University and Columbia University began offering correspondence courses using radio transmission in the United States. Meanwhile, Great Britain's Department of Education in conjunction with the British Broadcasting Corporation started delivering correspondence courses using radio transmission to 10,000 schools. By the end of the 1930s, Turkey, India, Columbia, and Canada began to deliver instruction using the radio to offset the cost of building schools and to overcome the geographical barriers.

In the years between the World Wars (1918-1946), the United States government granted radio broadcasting licenses to 202 colleges, universities, and school boards (Buckland & Dye, 1991). Despite the demands and popularity of instructional radio, by 1940, there was only one college-level credit course offered by radio and that course failed to attract any enrollments. Still, the concept of delivering education by radio was a major reason for development of public education television stations.

In 1927, Phil Farnsworth demonstrated for the first time that it was possible to transmit an image using a vacuum tube, thus transmitting an image without using the large mechanical devices developed during the late 1800's (Buckland & Dye, 1991). In 1935, people lined up for blocks at the Franklin Institute in Philadelphia to view Farnsworth's first public demonstration of television. The response to the event was so overwhelming that the exhibit was kept open for three weeks beyond the originally scheduled 10-day viewing

period. During the 1939 World's Fair in New York, Franklin D. Roosevelt became the first president of the United States to appear on television. While the limited broadcast capability of this era restricted the president's appearance to a small group of individuals who had television sets in New York, the event generated international attention.

Distance learning continued in a state of status quo until the end of World War II, a period of time when higher education enrollments exploded due to the returning veterans who desired access to higher education (Mathews, 1999). During the 1950s, television broadcasting became available to the general public. Kansas State College, Purdue University, and Iowa University began experimenting with educational television programs that could be utilized to offer distance learning course (Buckland & Dye, 1991). The first true educational television program was Sunrise Semester, based in Chicago. From 1959 into the early Sixties, Sunrise Semester featured an instructor standing before a class with a camera shooting the actions of the instructor over the heads of the students. The Sunrise Semester program was aborted after a few years because it was not economically sustainable.

In 1969, the British Open University began offering successful distance learning programs using a blended multimedia approach to teaching (Mathews, 1999). The university designed distance learning courses using textbooks, audio and video materials, radio and television broadcasts, and supplemental audio tapes and filmstrips. The British Open University brought a new vision of independence and respect for delivering courses through distance learning technologies. Mathews postulates that the British Open University pioneered large scale integration of multimedia technologies for delivering distance learning programs on a massive international scale. As a result, the British Open University became the largest and most innovative educational organization in the world, leading other nations

such as the United States, Japan, Sweden, and Canada in the large-scale integration of technology into curriculum programs for the purpose of delivering distance learning courses.

In 1970, California used the funding obtained through a Title I provision to form a task force to design distance learning courses that would be delivered using television networks (Freed, 1999). The project involved all California community colleges and the University of California. The task force developed the concept of the “telecourse,” a distance learning vehicle whereby the instructor sits before a camera in a classroom or studio and the students receive asynchronous or synchronous television transmissions. Because the communications in this environment were one-way, provisions were developed to provide instructor and student interaction, to arrange student submission of assignments to the instructor, and to facilitate the return of graded assignments to the students.

In 1972, California created Coastline Community College, the first “virtual college,” in order to coordinate the development, distribution and licensing of telecourses (Freed, 1999). Coastline Community College contracted the best instructors to develop telecourses that were broadcasted from KOCE, a public television station, to colleges, universities and libraries located in Los Angeles. By 1976, Coastline Community College was serving 18,500 students within a 150-square-mile area of southern California.

During this same time period, Dallas Community College began developing and producing telecourses that were recorded and prepackaged on video cassette for distribution to other colleges (Freed, 1999). The major benefit of this feature was that students were permitted to view the instructional material at any time and place where there was a video cassette player available. This “video on demand” strategy for delivering courses allowed students enrolled in distance learning courses to train at home, on the job, or in the military

when circumstances prevented them from attending classes in the traditional classroom. The overwhelming success of Dallas Community College in generating revenue from the telecourses motivated Coastline Community College to begin producing and licensing pre-packaged telecourses for other colleges.

The telecourse model began to spread across the nation as many states such as Arizona, Colorado, Oklahoma, and Florida began to offer variations of video on demand telecourses (Freed, 1999). By the 1980s, the Public Broadcasting Service (PBS), a quasi-government broadcasting studio, began producing and broadcasting telecourses. However, when PBS began to experience budget shortfalls in the telcourse production market, the broadcasting company started purchasing licensed educational content and assumed the role of satellite link broadcasting the programs to local schools and colleges.

Following the lead of PBS, several cable television and satellite companies were formed in the late 1980s in effort to broadcast single educational programs to supplement existing curriculums rather than providing pre-packaged telecourses (Freed, 1999). Because of the success and journalistic integrity of these programs, there are approximately 240 consortia of public and private educational and creative enterprises in the United States that produce educational programs that are used by thousands of colleges and universities. Broadcasting and programming channels like Mind Extension University, The Discovery Channel, The Learning Channel and CNN's Cable in the Classroom have steadily gained market shares by delivering superior video quality using satellite communication technologies and multi-channel services. For example, Time Warner's Cable in the Classroom is a coalition of cable companies that offer programs that educators can record and replay without paying licensing fees. This effort to educate students from kindergarten

through high school promotes a genuine commitment to public education within the cable industry. As a result, Cable in the Classroom reaches more than 90 percent of the public primary and secondary schools in the United States.

Third Generation

The third generation of distance learning began after educators began to explore the possibilities of using new technologies which would offer synchronous communications between teacher and students (Sloman, 2002). During the 1970's, Athabasca University was established in Canada to research and provide distance learning opportunities through the combination of synchronous telephone-based communication technologies and home study techniques. As a result, colleges such as the Nova University, University of Wisconsin, Empire State College, and Oklahoma State University began to offer distance learning courses using teleconferencing technologies, a method of communication that enabled colleges to offer synchronous interaction among multiple locations using teleconferencing (Dede, 1990). The major advantage of this learning environment was that the instructor and the student could communicate audibly in real-time, therefore overcoming the asynchronous limitations that existed during the first and second generations of distance learning. While the teleconferencing learning environment provided synchronous communication capabilities between the instructor and the students, once again many educators believed that this environment was inferior to the traditional learning environment. As a result, instructional designers continued to search for a learning environment that closely emulated the intimacy of the traditional education setting.

As cable television and videoconferencing became increasingly available in the 1980s, many educators began to explore the possibility of offering videoconference courses

between different campuses (Hancock, 1999). The videoconferencing learning environment allows the instructor and students to communicate in real time using cameras and sound production technologies. A typical interaction between the instructor and a student takes place in an educational environment where the instructor and the student are located in separate interactive classrooms or studios that are capable of transmitting and receiving live visual and audible communications. When the instructor or the student desires to communicate, he/she looks into a camera and speaks into a microphone. Then the interactive technologies transmit the image and sound to the opposite site where the communication is viewed and heard using an integrated sound and television system.

By the 1990s, most colleges and universities throughout the world abandoned the usage of postal services to deliver correspondence courses (Hancock, 1999). Instead, the colleges and universities started delivering distance learning courses using teleconferencing and videoconferencing technologies. In states like Iowa and North Carolina, comprehensive networks were developed that linked public schools, community colleges, and universities in an effort to provide videoconferencing sessions. The result was an educational environment where one instructor could teach students enrolled in the same class located at different institutions. This feature was beneficial for colleges seeking to offer courses unavailable on their campuses due to financial constraints or the lack of qualified instructors. Today, several colleges and universities are actively videoconferencing with institutions that are located throughout the world. For example, the University of Kebangsaan in Malaysia installed a videoconferencing system that enables them to communicate with universities located in New Zealand and Canada (Hancock, 1999).

Fourth Generation

The fourth generation of distance learning is distinguished as an era that produced the most significant advances in technology since the machine age, a period when mechanization revolutionized industry and homes received electricity (Sloman, 2002). The fourth generation of distance learning began when technology-based distance learning started using mainframe computers and workstations in an effort to meet the demands of companies such as IBM that required a highly skilled workforce capable of developing and supporting their computers (Whalen & Wright, 2000). Initially, large mainframe computers were expensive and difficult to maintain; therefore, large corporations, universities, and government agencies were the first institutions to purchase these systems. Computer-assisted instruction was first explored in 1959 when IBM assisted in the development of the first program to teach mathematics. In 1963, Stanford University and IBM released COURSEWRITER, a programming language specifically designed for computer-assisted instruction, a process whereby computers are used as a self-contained teaching machine to deliver individual lessons. Computer-assisted instruction provided a process of teaching and learning that delivers interactive, responsive, convenient, empowering, and outcome-oriented activities. In this method, the process of teaching and learning is designed based on asynchronous activities without limitations of time and place.

The University of Illinois was one of the first postsecondary institutions to successfully implement a computer-assisted instruction system to teach adult learners (Whalen & Wright, 2000). The university developed their computer-assisted instruction system using PLATO, the most widely used mainframe computer-assisted instruction system in the United States. The university provided student access to PLATO using terminals that

were interfaced to the university's mainframe computer via a telephone line. This approach for mainframe computer-assisted instructional systems was developed primarily to provide college level instruction on university campuses and to provide supplemental instruction to students located at correctional institutions and basic skills centers. This methodology continued until IBM developed the first personal computer in 1981. The advent of the personal computer promoted the widespread usage of computers in colleges and universities. Since then, distance learning delivery methods have been adapted to numerous developing computer-based technologies that include powerful operating systems, networking technologies and compact discs.

In 1994, the development of the Internet created a new digital economy which required institutions of higher education and their faculties, staffs, and students to become flexible while continuously developing new skills to compete in a global economy (Levin, 2001). The Internet allowed colleges to deliver web-based programs and courses directly to the student workstations, residences, and mobile computers. Today, distance learning is best characterized as computer-mediated instruction delivered through web/computer based training, web/electronic performance support, web/virtual asynchronous classrooms, web/virtual synchronous classrooms, technologies for tracking and managing training, and application software for developing web-based courses (Driscoll, 2002; Sloman, 2002).

Distance learning has become an integral part of higher education as offering flexible and accessible course delivery systems enables a college to remain competitive while preparing students to enter the highly skilled workforce (Pantazis, 2002). However, critics argue that most distance learning courses offered by postsecondary institutions via the Internet are crude. Shank and Sitze (2004) suggest that most web-based courses are

substandard because they were designed from the perspective of delivering traditional instruction based largely on lecture notes, assignments and reserved readings. Accordingly, the only difference is the vehicle in that information is posted to a website rather than being delivered orally or on paper. However, private colleges such as Capella University, Cardean University, Nova Southeastern University, and the University of Phoenix design their web-based courses using a team of experts in the fields of adult learning theory, instructional design, and technology (Farrell, 2003). These web-based courses are centrally designed for the Internet in order to promote consistency in quality without depriving instructors of the flexibility necessary to modify the web-based course. As a result, these institutions deliver web-based courses that provide the student with learning opportunities that are entertaining and highly effective in transferring knowledge.

According to Silberman (1998) web-based instruction allows postsecondary institutions to provide a greater volume of courses to more students at a lower cost than traditional classroom-based instruction. The University of Phoenix, a publicly-traded, for-profit private corporation, recognized that many adult learners were restricted from enrolling in baccalaureate and master's degree programs due to the many demands and pressures of life (Pantazis, 2002). The University of Phoenix addressed this problem by providing flexible options that allow students to complete their coursework using web-based instruction. The University of Phoenix provides an example of a new generation of educational delivery system that is not shackled to longstanding educational traditions. Instead, the University of Phoenix operates using a new business model that allows them to capitalize on opportunities to develop and offer web-based distance learning courses using the rapidly developing computer and networking technologies (Farrell, 2003). Today, the

University of Phoenix is the largest and fastest growing private university in the United States with 145,000 students of which 63,500 are enrolled in distance learning programs (University of Phoenix, 2004).

Next Generation

Futurists predict that by 2010 the next generation of distance learning will provide instant and unobtrusive broadband access to interactive courses which will be cheaper and more convenient than the same course offered on college campuses (Dunn, 2000). During the next decade, distance learning will be distinguished by the broadband wireless technologies that will allow students to connect to computer-mediated distance learning programs at any place or any time. The distance learning student of the future will be able to travel anywhere and receive access to email, electronic documents and media, and audio and video clips. The student will use voice activated handheld computers to participate in interactive videoconference sessions with classmates and save a copy of the transcript from the sessions on an interactive course web site. Distance learning courses will become student-centered, whereby students will have access to interactive computer-mediated technologies that continuously assess and adapt to the student's aptitude (Driscoll, 2002). For example, a student will log into class and select a simulated lesson that constantly adapts to his/her personal level of achievement. Additionally, students will have the capability of experiencing virtual reality sessions that will have full visual and auditory technologies that simulate face-to-face encounters with students located throughout the world. Dunn predicts that by 2018 computers will enable international students to communicate with their instructors or peers in their native language using computers that will accurately translate languages in real-time.

How colleges and universities adapt to the changes in computer-mediated course delivery technologies may determine whether they remain competitive in the future. In 1998, 83% of governors identified the ability of students to obtain an education anytime or anywhere as a critical characteristic for universities in the twenty-first century (Sloman, 2002). Given the demand and response, education will become a commodity, making consumers of students and putting them in a position to shop for the best deal (Dubois, 1996; Johnstone, Ewell, Paulson, 2002).

Corporations are seeing higher education as offering an opportunity to earn big profits as the United States spends \$670 billion annually for education. The for-profit education movement is predicted to increase its growth in revenue from \$2.1 billion in 2002 to \$33.6 billion by 2005 (Gallagher, 2003). Currently, only 4 to 5% of all higher-education students are enrolled with for-profit providers, but 33% of all web-based students are enrolled with these same providers. A survey conducted by the US Department of Education, National Center for Education Statistics predicted that college enrollment will grow 16% over the next ten years (Jones, 2003). This projected growth in student enrollment has many institutions acknowledging that within the decade there will be more students than their facilities can accommodate.

As innovative for-profit universities become more and more successful, there is evidence that political leaders throughout the nation are beginning to question the efficiency and effectiveness of state-supported higher education during an era when business and industry are restructuring to meet the demands of globalization, a phenomenon whereby the barriers of time and space separating individuals and places are diminished (Jones, 2003; Levin, 2001). McGuinness (2001) postulates that college and university leaders are

ill-prepared to deal with the education reform movements triggered by the shift in political and economic power at the state level. McGuinness reports the gap between the external and internal definitions and expectations for quality assurance is placing untenable political pressure on postsecondary institutions. Dunn (2000) projected that the number of degree-granting distance learning institutions will continue to grow, while the number of traditional campuses will decline. By 2025, half of today's existing independent colleges will be closed, merged, or significantly altered in mission. The combination of growing markets, increased costs and increased competition will force postsecondary institutions to become market driven in order to compete with institutions such as Capella University, Cardean University, Nova Southeastern University, and the University of Phoenix.

Distance Learning Student Demographics

In the United States, adult learners aged 25 or older are the fastest growing population in higher education (Cetron & Davies, 2001). Currently, 42% of all students enrolled at postsecondary institutions are adult learners. Bishop and Spake (2003) theorize that the factors that might influence this phenomenon include "the growth of continuing education programs, economic necessity, the rapidly changing job market, changes in the economy, and the simple aging of student populations" (p. 374). Additionally, the percentage of women and minority learners is increasing in that more women (57% of all students) than men are enrolled in higher education, a trend also reflected in the fact that more women are entering the workforce (Cetron & Davies). Furthermore, the proportions of women enrolled in higher education among minority ethnic groups are higher; 60% of Hispanic and 67% of African-American college students are women. If postsecondary student enrollment follows

population projections, higher education can expect these trends to continue as the Hispanic population in the U.S. is expected to increase 63% by 2020, reaching 55 million people.

Distance learning students prefer learning environments that are self-directed, goal-oriented, and relevant to their needs (Dortch, 2003). They are motivated by professional advancement, external expectations, the need to better serve others, social relationships, escape or stimulation, and pure interest in the subject. Their demands include time and scheduling, money, and long-term commitment constraints. They also tend to feel insecure about their ability to succeed in distance learning, find instruction that matches their learning style, and have sufficient instructor contact, support services, and technology training (Diaz, 2002; Dubois, 1996).

Distance learning students enrolled in web-based programs are evolving into a subpopulation of higher education learners. According to Diaz (2002), these students are middle-aged adults that have completed more college credit hours and degrees than their traditional-aged counterparts. Bates (2003) adds that today's distance learning students are interested in flexible educational opportunities that consist of small modules and short programs that can be completed at home and fitted around work, family, and social obligations. Web-based learners prefer doing to knowing, trial-and-error to logic, and typing to handwriting. Multitasking is a way of life for them, staying connected is essential, and there is zero tolerance for delays. Furthermore, modern literacy includes not only text but also image and screen literacy—it involves navigating information and assembling knowledge from fragments (Shea-Shultz & Foagarty, 2002).

Distance Learning Theory

Adult Learning Theory

To successfully instruct adult learners in a distance learning environment, educators must become familiar with the concepts of andragogy, the study of the assumptions and processes used to facilitate adult learning (Wlodkowski, 1993). Merriam and Brockett (1997) define adult education as “activities intentionally designed for the purpose of bringing about learning among those whose age, social roles, or self-perception define them as adults” (p. 8). Knowles' (1980) classic learner-focused theory of andragogy suggests that much of adults' intentional learning activity is motivated by desire to move from their current level of proficiency to a new, higher level. Knowles developed his adult learning theory of andragogy to address the inappropriateness of teaching adults using the developmental processes of pedagogy, the study of childhood learning (Knowles, Holton, & Swanson, 1989). Knowles felt that the customary characteristics of childhood learning fail to take into account the adult learner's age, life-long experiences, physical stature, and practical approach to learning (Knowles, 1989). Adults are more self-directed, having as their specific goal the immediate application of what they have learned.

The adult student generally enters the learning environment, whether traditional or distant, with a high degree of motivation (Ehrman, 1990). Adult learners possess different motives that encourage them to participate in education, as well as many factors that limit their active participation. Educators should realize that although adults do respond to outside motivators, such as career advancement, higher salaries, and promotion, internal motivators such as self-esteem, quality of life, pride, and quality of work are also important factors that

drive adults to improve their education (Wlodkowski, 1999). Wlodkowski (1993) identifies the following motivational assumptions as critical for helping adults learn:

1. Adults are always motivated to do something, whether they are motivated to learn or not to learn.
2. Adults are responsible for their own motivation. However, the educator's role in a web-based learning environment is to influence and affect learners in positive ways.
3. All instruction/teaching should be delivered in a motivating manner.
4. There is no one best instructional method.
5. Every instructional plan should include a positive motivational plan.

Attitudes are learned, resulting in well-defined values that are either favorable or unfavorable (Wlodkowski, 1999). For example, the independence that adults have experienced in their lives will cause them to create barriers to protect themselves against instructors or web-based learning environments they perceive as imposing, degrading, or threatening to their concept of adulthood. The adult learner will be receptive to new concepts and principles that he/she recognizes as critical to his/her personal and professional life (Knowles, 1989). Creating positive attitudes towards the subject and learning situations are critical for the adult learner's success in a Web-based learning environment (Wlodkowksi).

Web-based learning environments have the potential to support a learner-centered paradigm by which individuals assume a more active role in the learning process. For instance, in Web-based learning environments, learners often initiate communication with their instructors through the regular use of electronic mail and other computer-mediated communication tools when assignment clarification is needed or when content questions are raised about a course topic. In addition, learners can assume control of their learning

experience by initiating discussion groups with peers during critical periods in a web-based course. Increased responsibility and accountability for learning are required of web-based learners (Shank & Sitze, 2004). They become active seekers and producers of information, anytime and from any location, by sharing information with or retrieving information from various resources such as instructors, other students, electronic libraries and databases, and other internal and external information resources.

Learning Styles

Felder and Silverman (1998), Kolb (1993), Saba (1999), and Shank and Sitze (2004) support accommodating student learning styles in web-based learning environments in order to increase the performance and satisfaction levels of students enrolled in web-based courses. According to Saba, distance learning requires students to take greater responsibility for their learning, which can be enhanced by identifying their learning style using a learning style inventory. Shank and Sitze believe web-based education should be student-centered rather than teacher-centered. Felder and Silverman posit that students have differing strengths and preferences in the way they process and learn new concepts. For example, Prensky (1998) suggests that learning styles change from generation to generation requiring faster speed, a more visual approach, and greater active engagement for students that grew up during the information age. When there is a mismatch between the instructors teaching style and the learning style of the student, the students will become inattentive, discouraged, and discontent with the course (Felder & Silverman). As a result, Shank and Sitze report that it is critical for distance learning instructors to understand the potential learning style differences among their students.

The Institute of Learning Styles reports that there are no fewer than seven perceptual learning styles. Perceptual learning styles are characterized as the methods that individuals use to extract information from their environment (The Institute of Learning styles, 2004). The seven perceptual learning styles are print, aural, interactive, visual, haptic, kinesthetic, and olfactory. Shea-Shultz and Fogarty (2002) characterizes the seven perceptual learning styles as follows:

1. The print learning style refers to seeing printed or written characters.
2. The aural learning style refers to hearing and listening to sounds.
3. The interactive learning styles refer to verbal communications.
4. The visual learning style refers to the ability to see visual images, such as pictures and graphics.
5. The haptic learning style refers to the sense of touch.
6. The kinesthetic learning style refers to motor skills and coordinated body movements.
7. The olfactory learning style refers to an individual's sense of smell and taste.

Kolb's (1993) research suggests that individuals possess preferences for learning that favor some learning abilities over others. He reports that there are four basic learning modes: concrete experience, reflective observation, abstract conceptualization, and active experimentation that describe the learning preferences of everyone. Furthermore, his research supports that the majority of people utilize only two of the four basic learning modes. Kolb (1984) describes the four learning modes as follows:

1. Concrete experience is real life experiences that are external to the learner.
2. Reflective observation is an individual's internal reflection of the relevance of an actual event and how it is important/applies to their lives.

3. Abstract conceptualization is the process whereby an individual internalizes new ideas in the process of creating new theories.
4. Active experimentation is external to an individual as he/she puts the theories and ideas into practice.

Kolb (1984) posits that in different learning situations, individuals often use different combinations of learning modes; hence, no one learning mode clearly identifies an individual's learning style. The combination of learning modes are used to establish four quadrants reflecting four learning styles: Accommodator, Diverger, Assimilator, and Converger. Kolb describes the association between the learning modes and the learning styles as follows:

1. The Convergent learning style moves in cycles in which theory is moved into practice and back again.
2. The Divergent learning style focuses on action and reflection whereby the individual ponders the relevance of real life experiences.
3. The Assimilative learning style utilizes theorization and logic to convert observations into knowledge constructs.
4. The Accommodation learning style relies on practicality whereby an individual focuses on moving into action.

The Myers-Briggs Type Indicator (MBTI) is an instrument for gathering data relative to individual personality differences (Schroeder, 1993). The MBTI is designed to indicate a person's personality preference on each of four dichotomous dimensions: Extroversion-Introversion, Sensing-iNtuition, Thinking -Feeling, and Judging-Perceptive. The four dimension of the MBTI are described as follows:

1. The Extroversion-Introversion dimension indicates whether an individual prefers to focus attention on their external environment or toward their internal thoughts and ideas. Extroverts prefer to participate in action oriented activities that allow them to interact with their peers. Introverts prefer to focus their energy internally and tend to be reflective thinkers.
2. The Sensing-Intuition dimension indicates whether an individual prefers to perceive the world through a reality lens or through impressions and imagination. Individuals that prefer the Sensing mode rely on their sensory inputs. These individuals are interested in the facts and solve problems using proven step-by-step instructions and solutions. Intuitive people seek out patterns and relationships among the facts they have gathered. These individuals trust their instincts and try to solve problems through creativity and imagination. Intuitive people tend to look at the big picture without worrying about the individual details.
3. The Thinking-Feeling dimension indicates whether an individual prefers to make decisions through logical analysis or through personal values. Individuals that prefer the thinking mode make decisions based on concrete analysis, logic, and principle. Feelers value harmony by focusing on human values and empathy. Individuals that prefer the feeling mode focus on human values and needs as they make decisions or arrive at judgments.
4. The Judging-Perceptive dimension indicates whether an individual views the world as a structured environment or as a spontaneous environment. Individuals that operate using the judging mode are decisive, self-starters and self-regimented.

These individuals focus on completing the task, knowing the essentials, and they take action quickly. Perceptive individuals are best characterized as curious, adaptable, and spontaneous. They start many tasks, want to know everything about each task, and often find it difficult to complete a task.

Felder and Silverman (1988) developed a learning model that assembled the most prevalent learning style differences among students in effort to provide empirical evidence that supports the need for instruction that addresses the learning preferences of students. The Felder-Silverman learning style model consists of the following distinct learning style dimensions: Processing (Active-Reflective), Perception (Sensing-Intuitive), Input (Visual-Verbal), and Understanding (Sequential-Global). Felder and Silverman report that parallels exist between their four dimensions and Kolb's (1984) Active, Reflective, Concrete, and Abstract learning modes and the Myers Briggs Type Indicator's extravert/introvert and the Sensing-Intuitive categories. Felder and Silverman describe the dimensions of their learning style model as follows:

1. The Processing dimension focuses on the individual's tendency to process of contextualizing new information and concepts. Active learners tend to retain and understand information through participation in activities. Reflective learners prefer to think and internalize information before taking action. Active learners prefer to work in group activities whereas reflective learners desire to work independently of others.
2. The Perception dimension focuses on the individual's preference for contextualizing new information and concepts via concrete or abstract stimuli. Sensing learners prefer to learn the facts and practical solutions. These individuals

are good at memorizing facts and doing hands-on work. Intuitive learners prefer discovering the possibilities and relationships. These individuals are innovative and prefer to work with abstract concepts such as mathematical formulas.

3. The Input dimension focuses on the individual's preference for internalizing new information or concepts through visual or verbal sensory inputs. Visual learners prefer to learn from visual images such as pictures, diagrams, flow charts, video, and demonstrations. Verbal learners prefer to learn from audible cues such as lectures, reading material that is written in textbooks or articles.
4. The Understanding dimension focuses on the individual's thinking process preference. Sequential learners tend to gain understanding by thinking in logical and linear steps. These learners tend to follow lock and step paths to finding solutions. Global learners prefer to think holistically by take large jumps without paying attention to the details. These learners tend to randomly absorb material without seeing the individual connections before grasping the big picture.

Shank and Sitze (2004) posit that the most effective web-based courses are designed with several options that allow students to learn using their preferred perceptual learning style. For example, in a web-based course a student that prefers the print learning style could choose to read a printed text file that contains the contents of a lesson whereas a student that prefers a combination of the aural and visual learning styles would use interactive media that contain visual and audible communications. When Shea and Shultz (2002) studied the effectiveness of audio and video medium in a corporate training environment, they found that the rate for retention increased from 20% to 75% when computer-mediated instruction was introduced into the course. Shea-Shultz and Fogarty suggest that assessing the learning styles

of the students at the outset of a distance learning course will enable the instructor to gauge how the students need the content to be delivered.

In order to accommodate the different learning styles of students, adult educators must recognize their own instruction styles. According to Ebeling (2000), there is evidence that instructors typically use the teaching style that is most comfortable for them, invariably the learning style with which they are most comfortable. As a result, many learning activities fail to achieve their potential because instructors concentrate only on one stage of the learning cycle. Taylor (1998) suggests that instructors in a web-based learning environment should be flexible in their teaching styles in order to accommodate the various learning styles of students. For example, students that are Sensing learners and Intuitive learners that operate within Felder and Silverman's Perception dimension would benefit from the instructor using different media and activities to present the content of a web-based course. As a result, the instructor should provide abstract information to Intuitive learners who prefer to apply theory to practice and concrete information to Sensing learners who prefer to construct meaning from observations into real life experiences. Verduin & Clark's (1991) research of learning styles within the distance education setting found that when the teaching styles and the learner styles match, the students report being more satisfied with the course. Additional research has shown that grade point averages, student satisfaction and student success increase whenever there is a match between instructors' teaching style and the student's learning style (Borg & Shapiro, 1996; Filbeck & Smith, 1996; Hayes & Allinson, 1996).

Constructivism and Self-Directed Learning

Teaching in a web-based environment requires different instructional approaches from those used in a traditional learning environment (Powers & Guan, 2000). Most

web-based instruction is based on objectivism, which is the underlying theory for behaviorism and cognitive information processing views of learning. Objectivism is a view that knowledge exists in the external environment and learning is the learner's attempt to represent that external reality internally (Gagne & Medsker, 1996). According to Powers and Guan, most web-based courses offered by institutions are substandard because they were adapted from the course contents of seated courses where the students read lecture notes, view web-streamed video clips, exchange assignments with the instructor via email, and take exams that are often administered at an onsite testing center. Shank and Sitze (2004) posit that distance learning courses designed using objectivism perspectives create an environment where the role of the instructor is to determine and transmit the information that is important for the student to learn, while the role of the student is to receive the information that is delivered by the instructor. When web-courses are designed in this manner, there is minimal interaction between the instructor and the student and the prior experience of the instructor and the student is discarded.

Constructivism is a philosophy of learning centered on the premise that we construct our own understanding of the world through life's experiences. In constructivism, knowledge is the meaning that individuals create from their experiences and learning is a process of constructing a system of meanings and then using these to interpret events, ideas, or circumstances (Shank & Sitze, 2004). The learning process occurs when students internalize the construction of meaning into their long term memory, which in turn builds and reshapes their knowledge through experience and interaction with the world (Janassen, 1994). Constructivism acknowledges the knowledge and experience that instructors and students bring into the learning environment. In a constructivist learning environment the instructor

assumes the role as a coach or guide who uncovers the content and processes behind the expertise, whereas the role of the student is to develop and apply the knowledge gained through learning activities with those who share his/her learning environment (Morphew, 2000).

According to Gagne' and Medsker (1996), constructivism is becoming the preferred perspective for distance learning instructional designers whose goals are to simulate reality and help students develop their own sequence of learning. The challenge in constructivist design of web-based courses lies in finding the balance between interaction and personalization and between asynchronous and synchronous learning environments. In a study of 200 undergraduate students, Powers and Guan (2000) report that students enrolled in web-based courses scored an average of 15% higher than those who enrolled in the traditional classroom version of the same course regardless of gender, ethnicity, academic background, computer skills or academic aptitude. They note that web-based courses work well if they are designed from the ground up for web-based delivery.

Constructivism is closely related to self-directed learning because it emphasizes the combined characteristics of active inquiry, independence, and individuality in a learning environment (Shank & Sitze, 2004). Froh and Hawkes (1996) suggest that self-directed learning is developed through a context of personal involvement, whereby the learner moves into action while simultaneously interpreting their individual outcomes. Candy (1991) postulates that self-directed learning has two domains: learner control, which allows student to maintain the ownership of learning and autodidaxy, the process where the learner is isolated from the instructor and does not realize that he/she is actively learning. According to Powers and Guan (2000), the benefit of web-based instruction in a constructivist

environment is that students have varying degrees of control over when and where they gain the knowledge. They postulate that developing a web-based course that fosters interaction while meeting the expectations of students requires an understanding of cognitive learning and psychological and social perspectives.

Shank and Sitze (2004) recommend that instructional designers developing web-based courses use a student-centered learning assessment at the core of the designing process in order to guide decisions, set priorities and allocate resources. Active-based learning environments include activities that explore and stimulate learners' motivations, foster and encourage participation and interaction among students, and provide considerable amounts of personal and humanist caring elements (Powers & Guan, 2000). The strength of this model is that it emphasizes the social context in which learning takes place (Merriam & Brockett, 1997).

Theory of Interaction

Interaction influences learning by causing the student to act, think and react (Shank & Sitze, 2004). At a minimum, interaction requires that a student's effort result in some form of response. Without interaction, there would not be a means to gather feedback throughout the learning process. According to Shank and Sitze, there are four types of interaction that must occur in distance learning environments: student-content, student-instructor, student-student and student-technology. Student-content is the process through which students garner intellectual information from the material. Student-instructor interaction provides motivation, feedback, and dialog between the instructor and student. Student-student interaction is the exchange of information, ideas, and dialog that takes place between the students concerning the course. Student-technology is the students' ability to use the media within a particular

learning environment. In Biner, Barone, Welsh, and Dean's (1997) study of 288 undergraduates enrolled in 17 telecourses, they identified the following relationships in distance learning environments that impact the student satisfaction: instructor/instruction, technological aspects of the course, course management, support services, and out-of-class communication with the instructor. The study showed that higher levels of student performance were positively correlated with the technological aspects of the course, the promptness of the material exchange with the instructor and overall satisfaction.

While the types of interaction that exist in distance learning environments are important to students' satisfaction, how these interactions take place and the degree to which there is interplay between them is important. Shank and Sitze (2004) emphasize the importance of interactivity as an instructional activity. In a constructivist environment, interaction stimulates student motivations and promotes more effective learning as it enables students to learn quicker, retain knowledge longer, and transfer and apply the knowledge into real life situations. Offir and Lev (1999) found that increased interaction between instructor and student increased the effectiveness of distance learning. LaRose and Whitten's (2000) study on instructor immediacy in distance learning also found that learning is increased through the interaction created from email or web-based group. Providing multiple venues for communication like email, web-based group discussions, giving prompt feedback, utilizing the beginning and end of class and breaks to meet and greet students, and creating an atmosphere of sharing can aid in helping instructors and students feel connected and result in enhanced learning (Beattie, Spooner, Jordan, Algozzine, Spooner, 2002; LaRose & Whitten, 2000).

Another aspect of interaction pertains to perceptions of instructors and students in distance learning settings, specifically as it relates to nonverbal communication (Mottet, 2000; Pitcher, Davidson, Goldfinch, 2000). The inability of students to see the instructor and vice versa can be unsettling. Mottet conducted a study in which he explored “the relationship between videoconferencing instructors’ perceptions of students’ nonverbal responsiveness and the influence of those perceptions on distance teaching” (p. 146). He found that the ability to receive both visual and audible nonverbal cues increased not only the positive perceptions of students, but the distance teaching process as well. The more nonverbal responsiveness the instructor perceived while teaching resulted in positive impressions of the students, positive perceptions of his/her teaching effectiveness and satisfaction, positive perceptions of teacher-student interpersonal relationships, and preference for teaching in an interactive television setting versus a regular classroom setting. Understanding the relationship between nonverbal responsiveness and the resulting perceptions of students and distance learning can be helpful for instructors as they consider how to create interaction in a synchronous web-based environment.

Ironically, other distance education researchers (Keegan, 1996; Lewis, Snow, Farris, & Levin, 1999) have questioned the need for too much student-instructor interaction. They warn that a large amount of interaction will inhibit the independence of the learner. Although distance education is premised on creating the potential for greater independence for the learner, it is often "just as confining and inflexible as other forms of education" (Lewis et al., p. 9). Stewart (1987) suggests that students be prepared to accept the responsibilities that are tied to the freedom created by distance learning environments. For example, in a web-based learning environment the students must become managers of their own learning process and

realize an internally focused causality for their learning. Essentially, learners must become self-immersed by initiating interaction and communication with faculty, fellow peers, and instructional events. Sewart stated:

It is an interesting and perhaps sometimes infuriating paradox this provision of flexibility to cater for individuals needs inevitably results in increasing complexity of administrative and organizational procedures which may present the student with problems. (p. 168)

Social Presence

Short, Williams, and Christie (1976), the initial investigators of social presence, hypothesized that social presence is a critical element in communication medium. Social presence is defined “as the degree of salience of the other person in the interaction and the consequent salience of the interpersonal relationships” (p. 65). Social presence is inherent in the media itself. In essence, social presence is the degree to which a person is perceived as a real person in computer-mediated communication (Gunawardena & Zittle, 1997; Shank and Sitze, 2004). Gunawardena and Zittle’s research shows that the ability of the medium, materials and services to assist students in feeling socially present and in perceiving the instructor and peer students as real within the course environment make a difference in student retention and satisfaction. In a study of the social presence of students enrolled in distance learning courses at Empire State College, Gunawardena and Zittle revealed that there was a correlation between high levels of social presences for students with high terms for perceived learning and perceived satisfaction with the instructor. Clearly, the challenge for instructional designers is to build in sufficient social interaction to assist students in feeling socially present within a computer-mediated environment.

Theory of Transactional Distance

The term transactional emphasizes that the distance between the instructor and student is pedagogical and not geographic (Moore & Kearsley, 1996). The theory of transactional distance postulates that distance learning is a pedagogical phenomenon. Moore and Kearsley hypothesize that transactional distance is important to theorists and practitioners because it explains the effect of distance on learning, the students, the instructors, the forms of communication and interaction, the curriculum and the management of the course. Transactional distances exist between the instructor and the student in face-to-face instruction as well as in web-based learning environments; transactional distance always impacts understanding and perceptions. The transactional distance is exacerbated by geographical distance in distance learning and must be overcome by instructors and students for effective, deliberate and planned instruction to occur.

The physical distance that exists in distance learning creates a communications gap or psychological space where there are potential misunderstandings between the behaviors and expectations of instructors and students. Moore and Kearsley (1996) suggest that special teaching behaviors are essential to bridge the gap of transactional distance; they classify these behaviors into two clusters: dialog and structure. The capabilities of the computer-mediated technologies used to deliver the web-based course affect the level of dialog that can occur within the class as well as the course structure. Although adult learners may possess a high degree of motivation, the technology associated with distance education, coupled with the transactional distance separating the student and instructor, may lead to high degrees of anxiety (Darke, 1988).

While student anxiety in learning can be a source of motivation, more often anxiety debilitates the processes of learning (Darke, 1988). The significance of student anxiety cannot be underestimated in facilitating interaction between students and instructors in distance learning environments. In fact, the painful anxieties that learners experience in any instructional setting tend to be exacerbated when that learning is mediated by technology. According to Moore and Kearsley (1996), the greater the transactional distance, the greater the level of responsibility the student must exercise to insure his/her learning.

Computer Self-Efficacy

Computer self-efficacy is another major factor in determining student satisfaction in web-based instruction Shank and Sitze (2004). Computer efficacy is characterized as one's belief in the ability to use computers to learn new skills and to navigate electronic information sources using resources such as the Internet. Clark (1994) suggests that motivation is influenced more by beliefs and expectations and is therefore attributable to individual differences in beliefs about media rather than the type of media. A stable predictor of motivation over time appears to be student beliefs about their own abilities and the demands of different computer-mediated tasks. As a result, Clark suggests that students' perceptions and beliefs about computer-based learning tasks and their own self-efficacy as learners should be evaluated.

Evaluation and Assessment Methods

Web-based distance learning courses are growing venues for providing education in a world that demands opportunities for continuous learning, flexibility, convenience, and accessibility (Pantazis, 2002). As institutions expand the distance learning opportunities for students, it is important to evaluate and assess the effectiveness of these venues in order to

identify how technology enhances or detracts from learning. Lincoln and Guba (1989) recommend performing a continuous evaluation process, consisting of formative evaluations, evaluations performed throughout the life of a program in order to make improvements, as well as summative evaluations, evaluations based on the outcomes of a program. Dricoll (2002) suggests that it is critical to perform routine evaluations of the entire program development phase in order to a) verify the integrity of the needs and analysis phase, b) determine if the design is still appropriate, and c) evaluate the piloted program and final rollout plan. Cheung (1998) reports that student evaluations of distance learning courses should (a) provide feedback for improving the instructional quality of the course, (b) allow the students to express their concerns through a systematic process, (c) advance the research that exists for distance teaching and learning, and (c) measure the quality of distance learning over time. However, Caffarella (2002) suggests that there is not a mutually exclusive program evaluation method for judging the value and effectiveness of technology-based programs.

Shank and Sitze (2004) emphasize the importance of course evaluation because of the miscommunications that can occur when the instructor and the student are separated by distance. However, Theall and Franklin (2002) report that the end-of-course student ratings of the instructor and course content serve as the only summative evaluation for distance learning environments. They suggest that the majority of these evaluations do not consider that distance learning courses are very different from the traditional classroom setting. As a result, these evaluations do not address the uniqueness characteristics of the web-based environment; therefore the evaluation is not valid for determining the outcomes of instruction.

Shank and Sitze (2004) posit that distance learning environments are complex, therefore evaluative instruments should include measures of the effectiveness of the technology, instruction, interaction, and student perception of satisfaction. Student's perceptions are important to consider when judging the quality of web-based courses because instruction is judged by how well the students' expectations are met. Effectiveness is judged by the degree to which the students interact with course content and the degree to which they learn the concepts presented throughout the instructional period.

Current Research

Learning Style and Distance Learning

Killion (2001) notes that too many instructors use trial and error approaches to design course content to be delivered via the Internet. Shank and Sitze (2004) suggest that instructors that desire to accommodate the needs of the distance learning student should familiarize themselves with the principals of learning styles. While there is limited empirical research available to determine the appropriateness of measuring student learning style, three studies have concluded that there are differences in the learning styles among web-based learners and that there are differences between the preferred learning styles of students enrolled in web-based courses and traditional seating courses (Barnes, Presiosi, & Gooden, 2004; Diaz & Cartnal, 1999; Halsne & Gatta, 2002).

Diaz and Cartnal's (1999) study utilized the Grasha-Riechmann Student Learning Style Scales to tests to compare the learning style preferences of students enrolled in a web-based nursing course with students enrolled in the equivalent nursing course in a traditional classroom environment. The results of the research revealed the students who enrolled in the web-based course to be significantly more independent learners than students

in the equivalent traditional course ($p < .01$). Accordingly, the students enrolled in the equivalent traditional courses were significantly more dependent learners than the distance group ($p < .01$). The results showed that the traditional students preferred collaborative learning styles that were positively related to their needs for competition and reinforcement in the classroom. In contrast, the web-based students were motivated by intrinsic motives and clearly not by the reinforcement structure of the class.

Halsne and Gatta's (2002) study used the Barsch Learning Style Inventory (1996) to study the relationship between learning styles of students enrolled in web-based courses and the learning styles of students enrolled in traditional classroom settings. The participants in this study were chosen randomly from one community college in the Chicago suburbs and were taking at least one course during the spring semester, either online or on-campus. The participants were chosen from the courses that were taught over the Internet in the spring 2001 semester and compared to those who were taking the same course on-campus during the same semester. Halsne and Gatta concluded that community college students enrolled in a web-based course are likely to have different learning styles from those of equivalent traditional students. Their study found that the most significant difference between the web-based students and the traditional students was the visual learning style linked to web-based learners. The traditional students were found to prefer the auditory and kinesthetic learning style.

Barnes et al. (2004) used Kolb's Learning Style Inventory to research the relationship between students' learning styles and their preferred web-based delivery technologies. The study included a sample size of 48 graduate students who were taking online business courses at Huizenga School. The results of the study demonstrated that there are differences

in the learning styles of students pursuing higher education opportunities using web-based delivery. They found that 66% of the students studied preferred the Diverger learning style, while the Accommodator, Assimilator, and Converger learning styles were nearly absent. Their findings suggest that students do indeed prefer certain web-based course delivery methods over others. The most prevalent operating mode for the distance learning students was reflective observation, representing 45% of the population. In this stage of the learning cycle, students learn by watching and listening. The abstract conceptualization mode accounted for 32% of the web-based students tested. In this stage of the learning cycle, students learn by using logic and ideas. Eighteen percent of the sample used the concrete experience mode where the student relies on feeling rather than on a systematic approach to problems and situations. The remaining seven percent of the sample used a combination of concrete experience and reflective observation.

Barnes et al. (2004) suggested that students had a preference toward exams submitted on-line while PowerPoint presentations were preferred the least. Furthermore, the web-based lecture and chatroom were also among the least preferred course delivery methods. The Divergers' preferred learning method was web-based exams which match their propensity for using imagination in responding to essay questions. The Assimilators' preferred learning method was cases which can be explained by their desire to construct information into concise and logical form.

Traditional Classroom versus Distance learning

In distance learning, the role of instructor shifts from being instructor-centered to student-centered, whereby the instructor serves as a guide in the knowledge transfer process. As a result, many opponents of distance learning argue that web-based delivery methods do

not provide learners the opportunity to develop critical thinking skills or to experience interpersonal contact (Rudestam & Schoenholtz-Read, 2002). However, supporters of distance learning argue that web-based courses produce results that are equivalent to those in traditional classroom training, video-based training, and correspondence course training (Driscoll, 2002; Russell, 1999; Spooner, Jordan, Algozzine, & Spooner, 1999).

Several studies indicate there is no difference in the academic performance or amount of learning that takes place between distance learning and the typical classroom setting (Offir & Lev, 1999; Pitcher et al., 2000; Russell, 1999; Spooner et al., 1999). For example, exam scores in one study indicated “students had in no way suffered academically as a result of the videoconferencing” (Pitcher et al., 2000, p. 206). The review of literature on the effectiveness of distance learning by Moore and Thompson (1997) indicated that in most cases there was no difference in academic performance and learning between undergraduate students enrolled in distance learning courses and those enrolled in traditional courses. Driscoll’s (2002) studies of web-based delivery methods for training and development found that there was no statistically significant difference in academic performance between students in web-based learning environments and those in traditional classroom settings. Even when individuals have expressed a preference for face-to-face instruction, research repeatedly reveals that there are not significant differences in the outcomes in the distance learning environment (Rudestam & Schoenholtz-Read, 2002). Furthermore, Lapadat’s (2000) research reveals that meta-skills such as higher order thinking and the ability to comprehend and accept the viewpoint of others are strengths of an interactive web-based learning environment. Like traditional classroom delivery, web-based learning can be an effective training and development strategy if the environment is designed to empower the learner.

Perceptions of Satisfaction

Despite the numerous studies that support the equality of cognitive factors such as student performance, learning, and achievement between web-based instruction and traditional instruction, there is evidence that suggests that perceptions and satisfaction levels of instructors and students are not consistent (Bower, 2001; Carr, 2000; Hara & Kling, 1999). Bowers posits that factors such as accessibility to materials, instructors, peer students, support personnel, and control of time can influence the student's perception of distance learning. Carr (2000) found that undergraduate students enrolled in a web-based psychology course performed higher than the students enrolled in the traditional psychology course; however, the web-based students were consistently dissatisfied with the distance learning environment. Carnevale (2000) found that distance education students look for the same environment that is found in traditional courses including a knowledgeable instructor, interaction with the instructor and peer students, and a feeling of self-presence.

Ham (2002) and Sanders and Morrison-Shetlar (2002) found that a correlation exists between undergraduate students' attitudes toward the Internet and their overall satisfaction with web-based instruction. Ham's study of 269 graduate students enrolled in web-based courses at three Doctoral/Research Universities found that when the students expressed high computer self-efficacy their overall satisfaction with web-based instruction increased ($p<.05$). Additionally, Ham's study revealed that there is a correlation between students' satisfaction with web-based instruction and the level of communications with their instructor ($p<.01$).

Computer Efficacy

Computer efficacy is used by researchers to evaluate the impact of the students' self-perceived ability to use computer-mediated media on their success and satisfaction with a distance learning program. Brinkerhof, Klein, and Koroghlanian (2001) surveyed onsite undergraduate students taking web-based courses to test for computer skills related to negotiating the web-based course software, attitudes toward the web-based course, and prior experiences with web-based courses. Brinkerhoff et al. found that students with limited computer skills were neutral to slightly positive toward web-based courses and that students were neutral to slightly negative regarding the class interactivity and their desire to enroll in another web-based course. Furthermore, Ham and Lim (2001) investigated computer self-efficacy, academic self-concept and other predictors of satisfaction and the intent to participate in future web-based courses. Lim found a relationship exists between computer self-efficacy and students' satisfaction. Students with higher computer self-efficacy skills are more likely to be satisfied with their web-based courses and opt to enroll in web-based course in the future.

Technical Difficulties

Although technology is the means that enables distance learning to exist, Bloom and Hough's (2003) research shows that when technological difficulties occur in the delivery of distance learning courses, the result is often frustrated students and faculty. The technology challenges that were identified involved inclement weather, lack of experience and familiarity (faculty and student) with the available technology, lack of technical support, blocked access to available web resources, system outages, and faulty equipment (Bloom & Hough, 2003; LaFuze, Osborne, & McDaniel, 1998; Pitcher et al., 2000; Ranieri, 1998).

Lafuze, Osborne, and McDaniel suggested that having “technical difficulty” backup plans, an expanded syllabus, a detailed workbook, and videotaping the sessions could address many of the technological issues. Technical difficulties are inevitable. Although instructors and technicians can be proactive by coming up with alternate plans in case of technical trouble, as one instructor puts it, “patience and a sense of humor are vital to success in the virtual classroom” (McNames, 1998, p. 4).

Summary

Through the research of the past, present, and predicted future of distance learning in higher education, learning styles, and learning theory, it is evident that designing cost-effective and educationally-effective learning environments are the greatest challenges of integrating new technologies and instruction. The issues facing the adult educator and learner are vast and include identifying the appropriate teaching strategies needed to effectively teach adult learners, the ability to overcome the social and physical barriers inherent to web-based learning environments, and the technical ability to utilize web-based instructional delivery technologies effectively. Through an analysis of the research in web-based learning environments, it is apparent that when mistakes in judgment are made while implementing web-based courses, the implications may have a negative impact on the adult learner's educational experience and the financial stability of community colleges. As a result, post secondary institutions should develop web-based learning environments and assessment methods that are grounded on the best practices and established theories such as adult learning theory and constructivism.

CHAPTER THREE:

METHODOLOGY

Introduction

The purpose of this chapter is to describe the research design of the study, describe the subjects, describe the instruments applied, describe the method for data collection, and describe the statistical techniques used to analyze the data. This study focused on the overarching question: “What are the associations between learning styles and students’ perceptions of satisfaction among community college students enrolled in web-based learning environments?

Research Design

To address this question, the researcher used the analysis of association methodology to explore the associations between learning styles and students’ perceptions of satisfaction in community college web-based learning environments (Agresti & Finlay, 1997). The components of the study consisted of four different parts of description and analysis. The first analysis was based on the demographics of the community college students enrolled in web-based courses from the four participating community colleges. The second analysis was computed on variables related to the individual learning styles of the participants. The third analysis was computed on variables related to students’ perceptions of satisfaction in community college web-based courses. The final analysis used the Chi-square test of independence to test the association between learning styles and students’ perceptions of satisfaction in community college web-based courses.

The researcher used three sets of variables that focused on the students’ demographic profile, the students’ preferred learning style, and students’ satisfaction with community

college web-based courses. The first set of variables focused on the students' demographic profile. These variables consisted of information concerning gender, age, number of community college web-based courses taken, the number of hours dedicated to the web-based course weekly, and the college in which the student was enrolled. The second set of variables focused on the participant's preferred learning style. These variables were analyzed based on responses of the participants to Felder and Silverman's (1988) Index of Learning Styles Inventory. The third set of variables focused on the participant's satisfaction with community college web-based learning environments. These variables were analyzed based on the participant's responses to Ham's (2002) web-based version of Hiltz's Distance Learning Perception Survey. Finally, the learning style variables and the satisfaction with community college web-based courses variables were analyzed to determine if a statistically significant association exists between learning styles and students' perceptions of satisfaction in community college web-based learning environments.

The Research Sites

Caldwell Community College & Technical Institute, Hudson, NC (CCC&TI), Western Piedmont Community College (WPCC), Morganton, NC, Catawba Valley Community College (CVCC), Hickory, NC, and Wilkes Community College (WCC), Wilkesboro, NC were used as the research sites for this study. These community colleges were chosen because they are geographically located in adjoining counties that are located in the foothills of the Appalachian region of western North Carolina. Historically, the region's population has consisted of white, Protestant, Scots-Irish members of the working class that earn incomes significantly less than state and national averages. The regional economy,

based on the furniture and textile industries, has not required an education for immediate employment.

CCC&TI, WPCC, CVCC, and WCC are comprehensive community colleges that are part of the North Carolina Community College System. Each college provides a variety of programs including college transfer, business, and vocational/technical programs. The colleges are similar in size with CTI serving 5,032 students, WPCC serving 3,563 students, CVCC serving 6,121 students, and WCC serving 2,690 students. Additionally, the community colleges' web-based technologies are compatible and interconnected by a state-wide network. The state-wide network provides each college the connectivity required to offer web-based courses using the World Wide Web, while BlackBoard, a computer-mediated software system, is used to develop and deliver web-based courses.

Subjects

The target population of this study included all students who were enrolled in one or more web-based courses during the fall semester of 2004 at CCC&TI, WPCC, CVCC, and WCC. Permission to administer the student survey instruments was obtained from the president of each participating community college. Permission from the North Carolina State University's Institutional Review Board for the Use of Human Subjects in Research was obtained to perform the study. The research project was exempt from the policy on human subjects, outlined in Title 45 part 46 of the Code of Federal Regulations, because the study involved only the administration of a learning style instrument and a student survey. Measures to ensure the confidentiality of the students were established. As a result, students' records and responses were kept strictly confidential and stored securely in a locked filing

cabinet. Access was restricted to persons conducting the study. Upon completion of the study, the student data records and responses will be destroyed.

According to the administrative records provided by each community college, there were 628 students enrolled in one or more web-based courses during the spring semester of 2004. To obtain an acceptable response rate, the researcher administered the survey instruments to the total population. A summary of the students enrolled in one or more web-based courses at each college is listed in Table 3.1.

Table 3.1. Web-based Students at each Community College

College	Web-based Students
CCC&TI	220
WPCC	178
CVCC	121
WCC	109
Target Population	628

Instrumentation

Index of Learning Styles

Felder and Silverman's Index of Learning Styles (ILS) instrument was used to identify the preferred learning style of each participant (see Appendix A for ILS). The ILS instrument was developed from Felder and Silverman's (1988) learning style model. The ILS instrument contains 44 questions that are designed to measure the participant's preferred learning style based on the Processing (Active-Reflective), Perception (Sensing-Intuitive), Input (Visual-Verbal), and Understanding (Sequential-Global) dimensions discussed in Chapter Two of this study.

The range of data associated with each learning style dimension is from 0 to 11 (e.g., (A-R) Active-Reflective, (S-N) Sensing-Intuitive, (VS-VB) Visual-Verbal, and (SQ-G) Sequential-Global), resulting in 16 possible learning style preferences for each respondent. For statistical analyses, a scoring method that counts each dimension's corresponding value, (a) or (b), is used to determine the learning style preference for each dimension. The ILS instrument learning style dimensions are categorical data, meaning that a learner's preference on a given scale can be strong, moderate, or mild. For example, if a learner responds to the 11 questions relative to the Processing dimension at a rate of 9a (Active learning) to 2b (reflective learning), then it would be determined that the respondent has a strong preference towards the Active learning style versus the reflective learning style (see Appendix B for ILS Scoring Sheet).

Index of Learning Styles Instrument Validity

Zwyno (2003), Livesay et al. (2002), and Van Zwanenberg, Wilkinson, and Anderson (2000) have tested the construct validity of the Felder-Silverman ILS instrument's individual dimensions using Cronbach's alpha test. A summary of the reported alpha levels from each study are listed in Table 3.2. With the exception of the .41 alpha value for the Sequential-Global dimension reported by Van Zwanenberg, Wilkinson, and Anderson, the ILS instrument yields alpha values that range between .53 and .70 for every learning style dimension.

Zwyno (2003) posits that the widely accepted social science cutoff value for alpha tests is $\alpha \geq .70$. However, Tuckman (1999) reports that it is acceptable for attitudinal tests to yield an alpha value that is greater than .50. As a result, Zwyno and Livesay et al. suggest that the ILS instrument is a suitable psychometric tool to assess the learning styles of

individuals for the purpose of providing effective learning environments. As a result, this researcher accepts that the construct validity of the instrument is valid for the purpose of assessing the learning styles for the students enrolled in one or more web-based courses at the four community colleges.

Table 3.2. Conbach's alpha values for ILS

A-R	S-N	VS-VB	SQ-G	SOURCE
.60	.70	.63	.53	Zwyno
.56	.72	.60	.54	Livesay et al.
.51	.65	.56	.41	Zwanenberg et al.

Adapted from "Applications, reliability and validity of the index of learning styles," by R. M. Felder and J. E. Spurlin, 2005, *International Journal of Engineering Education*, 21(1), p. 108.

Perceptions of Web-based Courses Survey

Hiltz's Distance Learning Perception Survey (HDLPS) instrument was developed in the late 1980s by Hiltz (1994) to evaluate the effectiveness of distance learning programs delivered in a closed network system. Hiltz (1994) designed the survey to measure student subjective assessment of computer-based courses based on Centra's (1982) literature review of teaching effectively and Paulhus and Christie's (1981) scales for measuring personal self-efficacy and interpersonal control. Hiltz postulated that conceptualized effectiveness occurs along course content, characteristics of teaching, course outcomes and comparison of the process in technology-based formats. While the Internet is a newer delivery method for collegiate programs and courses of study, the same principles addressed by Hiltz are equally

pertinent today as when the computer-based distance learning courses were delivered on closed systems (Ham, 2002).

For the purpose of this study, the researcher chose to use Ham's (2002) revised version of the HDLPS to capture the data required to reflect the changes that have occurred in today's web-based courses of study (see Appendix A for HDLPS). The researcher received permission to use Ham's web-based distance learning version of the HDLPS on November 11, 2004 (see Appendix D). The HDLPS used in this study focused on five sets of variables to gather data concerning students' perceptions of satisfaction in web-based courses including: (Two Sections) current feelings about computers (CEFFICACY), current feelings about the World Wide Web (WEFFICACY), social interaction (SINTERACT) (items 1-12 and 14 on survey), instructor feedback (IRESPONSE) (items 13 and 15-20 on the survey), and overall satisfaction (SATISFY) with web-based course environments (items 21-34 on the survey). Additionally, the HDLPS asked open-ended questions that addressed the "likes" and "dislikes" of the web-based environment. The open-ended questions were coded using frequency of response analyses.

HDLPS Validity

Ham's (2002) revised version of the HDLPS was reviewed by three distance learning professionals who analyzed the face validity of the survey. Based on their feedback, the decision was made to decrease the potential for response bias by negatively phrasing questions in the Likert-scale (items 22, 23, 24, 27, 28, 30 on the survey). Zwyno (2003) posits that the widely accepted social science cutoff value for alpha tests is $\alpha >=.70$. The HDLPS yields alpha values that range between .78 and .89 for every component tested in this study. The reported alpha levels for the HDLPS are listed in Table 3.3.

Table 3.3. Construct Validity of the HDLPS

Composite Scale	Cronbach's Alpha
Current feelings about computers	.81
Current feelings about the World Wide Web	.83
Social Interaction	.78
Instructor Feedback	.81
Overall Satisfaction	.89

Data Collection

In December 2004, the researcher submitted a letter to the presidents of each participating college requesting the mailing and email addresses for students enrolled in one or more web-based courses during the fall 2004 semester. In January 2005, the researcher secured the mailing addresses for 628 students. Originally, the researcher planned to administer electronic versions of the ILS instrument and the HDLPS using the students' email accounts. However, WPCC and WCC could not provide email account addresses for the students who were enrolled in one or more web-based courses during the fall semester of 2004. As a result, the decision was made to use the postal service to mail a single survey that consisted of the cover letter, the consent form, the ILS instrument and the HDLPS (see Appendix A for Combined Survey).

On February 17, 2005, the researcher mailed 628 surveys to the target population. The students were given a March 15, 2005 deadline to submit the surveys. An effort to increase response rate for the survey, the students who completed the survey instrument by the March 15, 2005 deadline were eligible for a drawing of four \$50.00 cashier checks that would be awarded to one participant from each participating community college. By March

9, 2005, the researcher had received 131 completed surveys. Due to the low number of responses, the researcher sent out a letter to encourage the students to participate in the study by returning a completed survey. To cut costs on postage, the letter was sent via email to the participants enrolled at CCC&TI and CVCC and via postal service to the participants enrolled at WPCC and WCC. Only those students who met the March 15, 2005 deadline were eligible for the \$50.00 cashier check drawings. By April 1, 2005, the researcher had received 221 completed surveys out of the population of 628 web-based students, a cumulative response rate of 35%. Table 3.3 shows the response rate for each of the participating colleges.

Table 3.4. Community College Response Rates

College	Subjects	Responses	Response Rate
CCC&TI	220	91	41.4%
WPCC	178	40	22.3%
CVCC	121	37	30.5%
WCC	109	53	48.6%

Hypotheses

The following null hypotheses for each of the five research questions were tested using a Chi-square test of independence. As shown in table 3.4, there were a total of 204 null hypotheses tested for the five research questions. The null hypotheses were tested at the .05 alpha level.

Table 3.5. Null Hypothesis Statement Total

Description	A-R	S-N	VS-VB	SQ-G	Total
CEFFICACY	9	9	9	9	36
WEFFICACY	9	9	9	9	36
SINTERACT	11	11	11	11	44
IRESPONSE	8	8	8	8	32
SATISFIED	14	14	14	14	56
Total	51	51	51	51	204

Because of the magnitude of tests, the null hypotheses for the five research questions are consolidated into individual null hypothesis statements. A complete listing of the five research questions and their corresponding null hypotheses statements are included in the Appendix (see Appendix C for Null Hypotheses Statements).

Research Question 1: What are the associations between learning styles and the perceptions of satisfaction with computers among community college students enrolled in web-based courses?

Null Hypotheses:

H_{1a-i} : There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of computers (CEFFICACY) among community college students enrolled in web-based courses.

H_{1j-r} : There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of computers (CEFFICACY) being stimulating among community college students enrolled in web-based courses.

H_{1s-aa} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of computers among community college students enrolled in web-based courses.

H_{1bb-jj} : There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of computers (CEFFICACY) among community college students enrolled in web-based courses.

Research Question 2: What are the associations between learning styles and the perceptions of satisfaction with the World Wide Web among community college students enrolled in web-based courses?

Null Hypotheses:

H_{2a-i} : There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

H_{2j-r} : There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

H_{2s-aa} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

H_{2bb-jj} : There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

Research Question 3: What are the associations between learning styles and the perceptions of satisfaction with the level of social interaction among community college students enrolled in web-based courses?

Null Hypotheses:

H_{3a-m} : There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

H_{3n-z} : There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

H_{3aa-mm} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

H_{3nn-zz} : There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

Research Question 4: What are the associations between learning styles and the perceptions of satisfaction with instructor response among community college students enrolled in web-based courses?

Null Hypotheses:

H_{4a-g} : There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

H_{4h-n} : There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

H_{4o-u} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

H_{4v-bb} : There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

Research Question 5: What are the associations between learning styles and the perceptions of overall satisfaction among community college students enrolled in web-based courses?

Null Hypotheses:

H_{5a-n} : There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

H_{5o-bb} : There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

H_{5cc-pp} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

$H_{5qq-ddd}$: There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

Data Analysis

The purpose of this study was to measure the association between learning styles and students' perceptions of community college web-based learning environments. Descriptive statistics were used in the preliminary analysis of the data captured by the ILS instrument and HDLPS. The descriptive statistics gave measures of frequency for the data. The open-ended questions relative to the "likes" and dislikes" of web-based courses were coded using the frequency of response. The categorical data obtained from the ILS instrument were analyzed using data from the Felder-Silverman ILS to determine the learning style for each dimension. Once the categorical data were captured from the HDLPS and the ILS instrument, a Chi-square test of independence was used to test the association between the student's learning style and perceptions of satisfaction in community college web-based learning environments.

CHAPTER FOUR:

DATA ANALYSIS

Introduction

The purpose of this chapter is to report the associations between learning styles and students' perceptions of satisfaction among community college students enrolled in web-based learning environments. The researcher used three sets of variables that focused on the students' demographic profile, the students' preferred learning style, and the student's satisfaction with community college web-based courses. The null hypotheses were tested at the .05 alpha level. The data will be presented in the following sequence.

1. Demographic data regarding participants will be presented to show characteristics of the target population and web-based courses.
2. Learning style data produced using the ILS instrument will be presented to show the students' learning styles (A-R, S-N, VS-VB, and SQ-G).
3. Perceptions of satisfaction about web-based learning environments data produced using HDLPS will be presented to show the students' feelings about computers (CEFFICACY), feelings about the World Wide Web (WEFFICACY), attitudes about social interaction (SINTERACT), attitudes about instructor feedback (IRESPONSE) , and perceptions of overall satisfaction (SATISFY) with web-based courses.
4. Analysis of association data produced using Chi-square tests of independence to show the associations between the students' learning styles and perceptions of satisfaction in community college web-based environments.

Demographics

Target Population

The target population of this study was 628 students enrolled in one or more web-based courses at Caldwell Community College and Technical Institute (CCC&TI), Western Piedmont Community College (WPCC) , Catawba Valley Community College (CVCC) and Wilkes Community College (WCC). The researcher received 221 completed surveys from the target population, a cumulative response rate of 35%. The students enrolled in web-based courses accounted for 3.7% of the fall 2005 curriculum enrollment totals for the participating community colleges, which is significantly less than the web-based students who account for 27% of the North Carolina Community College System's curriculum enrollment in 2003 – 2004 (NCCCS, 2005).

The descriptive frequency analysis for gender showed that 72.4% (n = 160) of the participants were female and 27.6% (n = 61) of the participants were male. When compared to the NCCCS's (2004) enrollment by gender, 63% female and 37% male, and the enrollment statistics in higher education in the United States, 57% female and 43% male, the population of this study had a higher concentration of female web-based students (Bishop, 2003).

The descriptive analysis for age showed that 21.7% (n = 49) of participants were between the ages 18 and 24, 30.3% (n = 67) of the participants were between the ages 25 and 34, 26.2% (n = 58) of the participants were between the ages 35 and 44, 16.7% (n = 37) of the participants were between the ages 45 and 54, and 4.5% (n = 10) of the participants of the participants were age 55 and older. In comparison, the NCCCS (2005) had a higher percentage of students enrolled between the ages of 25 and 34 (43%) than the participants of this study (21.7%). While the percentage of students between the ages 25 and 34 were similar

between the NCCCS (27%) and the participants of this study (30.3%), the percentage students between the ages of 35 and 44 was higher for this study (26.2%) when compared to the NCCCS (16%). Despite the differences in the percentages between the age groups of this study and the NCCCS, the rank order of the age groups for each were the same.

To determine the level of web-based course experience, students were asked to identify the number of web-based courses previously completed. Seventy percent ($n = 155$) of the participants were previously enrolled in two or more web-based courses. The majority of the students (87.3%) ($n = 193$) spent between three and nine hours per week completing their web-based course assignments. This was computed by adding the following responses: 15.4% spent one to two hours per week, 44.8% spent between three and five hours per week, and 27.1% spent six to nine hours per week.

Table 4.1. Participants' Computer and World Wide Web Experience.

Experience Level	Computers		World Wide Web	
	Frequency	Percentage	Frequency	Percentage
Central Professional	82	37.1	34	15.4
Central Studies	60	27.1	58	26.2
Frequent User	71	32.1	104	47.1
Occasional User	8	3.6	23	10.4
Novice	0	0	2	.9

Table 4.1 indicated that the majority of the participants were experienced using computers and the World Wide Web. The frequency statistics showed that 37.1% ($n = 82$) of the participants used computers in their professions, 27.1% ($n = 60$) of the participants felt that computers were central to their studies, and 32.1% ($n = 71$) of the participants used computers on a regular basis. The frequency statistics showed that 15.4% ($n = 34$) of the

participants used the World Wide Web in their professions, 26.2% ($n = 58$) of the participants reported that the World Wide Web was central to their studies, and 47.1% ($n = 104$) of the participants used the World Wide Web on a regular basis.

Web-based Courses

The students were asked to identify the web-based learning activities available in their web-based courses and to identify the web-based learning activities for which participation was part of their grade. As presented in Table 4.2, a variety of web-based learning activities were available to the participants; however, the data suggested that the web-based learning activities were used at varying levels. The most frequently used web-based learning activities were bulletin board discussions (BDISCUSS) and web-based reading assignments (READING). Web-based bibliographies and group projects were used moderately in the web-based courses while student web-pages and chat rooms were the least used web-based learning activities.

Table 4.2. Web-based Learning Activities

Web-Based Activity	Available		Graded	
	Frequency	Percentage	Frequency	Percentage
CHAT	64	29.0	36	16.3
GROUUPPROJECT	77	34.8	67	30.3
BDISCUSSION	175	79.2	161	72.9
BIBLIOGRAPHY	99	44.8	53	24.0
STUDENTPAGE	84	38.0	61	27.6
READING	173	78.3	149	67.4

Student Learning Styles

Felder and Silverman's Index of Learning Styles (ILS) instrument was used to identify the preferred learning style dimensions of each participant. The ILS instrument measured the participants' preferred learning styles based on the (A-R) Active-Reflective, (S-N) Sensing-Intuitive, (VS-VB) Visual-Verbal, and (SQ-G) Sequential-Global dimensions. Felder and Silverman (1998) indicate that students who prefer to learn within the mild range of the ILS learning style dimensions are balanced learners. These learners are characterized by their ability to adapt their learning style to match various learning environments. For example, there are little differences among learners that prefer to learn in the mild-Visual learning style mode versus learners that prefer to learn in the mild-Verbal mode. As a result, the percentages for the mild ranges of each ILS learning style dimension were combined for the frequency data analysis of this study.

As shown in Table 4.3, 57% of the participants ranged between the mild-Active (MILDACT) (30.3%) and mild-Reflective (MILDREF) range (26.7%). These participants were relatively balanced between their preference for the Active and Reflective learning style dimensions. Eighteen percent ($n = 40$) of the participants reported they preferred to learn in the moderate-Active (MODERATEACT) range while 17.2% ($n = 38$) of the participants preferred to learn in the moderate-Reflective (MODERATEREF) range. The data showed that very few participants, 7.7% ($n = 17$), preferred to learn in the strong-Active (STRONGACT) and strong-Reflective (STRONGREF) ranges. As indicated by the data presented in Table 4.3, the participants were essentially balanced between their preference for the Active mode, 52% ($n = 115$) and Reflective mode, 48% ($n = 106$).

Table 4.3. Frequency Statistics for Active-Reflective Learning Style Dimension

Learning Style Mode	Frequency	Percentage
MILDACT	67	30.3%
MILDREF	59	26.7%
MODERATEACT	40	18.1%
MODERATEREF	38	17.2%
STRONGACT	8	3.6%
STRONGREF	9	4.1%

Table 4.4. Frequency Statistics for Sensing-Intuitive Learning Style Dimension

Learning Style Mode	Frequency	Percentage
MILDSEN	52	23.5%
MILDINT	18	8.1%
MODERATESEN	75	33.9%
MODERATEINT	16	7.2%
STRONGSEN	53	24.0%
STRONGINT	7	3.2%

Table 4.4 showed that 31.6% ($n = 70$) of the participants ranged between the mild-Sensing (MILDSEN) (23.5%) and mild-Intuitive (MILDINT) (8.1%) range. These participants were relatively balanced between their preference for the Sensing and Intuitive learning style dimensions. However, the data showed that 81% ($n=180$) of the participants

preferred to learn in the Sensing mode. The highest single concentration of learners, 33.9% (n = 75), preferred to learn in the moderate-Sensing (MODERATESEN) range while 7.2% (n = 16) of the participants preferred to learn in the moderate-Intuitive (MODERATEINT) range. Furthermore, 24% of the participants preferred to learn in the strong-Sensing (STRONGSEN) range and 3.2% (n = 7) of the participants preferred to learn in the strong-Intuitive (STRONGINT) range.

Table 4.5. Frequency Statistics for Visual-Verbal Learning Styles Dimension

Learning Style Mode	Frequency	Percentage
MILDEVIS	55	24.9%
MILDEVRB	43	19.5%
MODERATEVIS	58	26.2%
MODERATEVRB	25	11.3%
STRONGVIS	35	15.8%
STRONGVRB	5	2.3%

Table 4.5 showed that 44.4% (n = 98) of the participants ranged between the mild-Visual (MILDVIS) (24.9%) and mild-Verbal (MILDVRB) (19.5%) range. These participants were relatively balanced between their preference for the Verbal and Visual learning style dimensions. However, the data showed that 66.9% (n = 148) of the participants preferred to learn in the Visual mode. The highest single concentration of participants, 26.2% (n = 58) of the participants reported a preference for the moderate-Visual (MODERATEVIS) range while 11.3% (n = 25) of the participants preferred to learn in the moderate-Verbal

(MODERATEVRB) range. Furthermore, the data showed that 15.8% (n = 35) of the participants preferred to learn in the strong-Visual (STRONGVIS) range and 2.3% (n=5) of the participants preferred to learn in the strong-Verbal (STRONGVRB) range.

Table 4.6 showed that 51.5% (n = 114) of the participants ranged between the mild-Sequential (MILDSEQ) (33.9%) and mild-Global (MILDGLO) (17.6%) range. These participants were relatively balanced between their preference for the Sequential and Global learning style dimensions. However, the data showed that 65.5% (n = 145) of the participants preferred to learn in the Sequential mode. The data showed that 23.5% (n = 52) of the participants reported a preference for the moderate-Sequential (MODERATESEQ) range, while 12.7% (n = 28) of the participants preferred to learn in the moderate-Global (MODERATEGLO) range. Furthermore, the statistics showed that 8.1% (n = 18) of the participants preferred to learn in the strong-Sequential (STRONGSEQ) range and 4.1% (n = 9) of the participants preferred to learn in the strong-Global (STRONGGLO) range.

Table 4.6. Frequency Statistics for Sequential-Global Learning Style Dimension

Learning Style Mode	Frequency	Percentage
MILDSEQ	75	33.9%
MILDGLO	39	17.6%
MODERATESEQ	52	23.5%
MODERATEGLO	28	12.7%
STRONGSEQ	18	8.1%
STRONGGLO	9	4.1%

Students' Perception of Satisfaction

Ham's (2002) revised version of the HDLPS was used to capture data concerning students' perceptions of satisfaction in community college web-based environments including the following three composite sections: the current feelings about computers section (CEFFICACY), the current feelings about the World Wide Web section (WEFFICACY), and the satisfaction in web-based courses section. The satisfaction in web-based courses section was comprised of three sub-sections including: social interaction levels in web-based courses (SINTERACT) (items 1-12 and 14 on survey section), instructor feedback in web-based courses (IRESPONSE) (items 13 and 15-20 on the survey section), and overall satisfaction (SATISFY) with web-based courses (items 21-34 on the survey section). Additionally, the HDLPS asked open-ended questions that addressed the "likes" and "dislikes" of the web-based environment.

Computer Efficacy

The students' feelings about computers were gathered using HDLPS computer efficacy scale. Reliability analysis of the computer efficacy scale of HDLPS revealed an Alpha of .76. For the purpose of analyzing each of the computer efficacy (CEEFICACY) variables, a frequency distribution was used to report the combined strong-to-moderate ranges for each extreme variable on each scale included in Table 4.7.

Table 4.7. Frequency Statistics for Computer Efficacy

Perception	Strong	Moderate	Neutral	Moderate	Strong	Perception	
	1	2	3	4	5		
Stimulating	33.9 (75)	36.2 (80)	17.6 (39)	8.1 (18)	2.3 (5)	.9 (2)	.9 (2) Dull
Fun	35.7 (79)	34.8 (77)	19.0 (42)	6.8 (15)	2.7 (6)	.5 (1)	.5 (1) Dreary
Easy	23.1 (51)	37.1 (82)	20.8 (46)	10.4 (23)	7.7 (17)	0 (0)	.9 (2) Difficult
Personal	14.0 (31)	15.4 (34)	26.2 (58)	25.8 (57)	9.0 (20)	5.0 (11)	4.5 (10) Impersonal
Helpful	33.9 (75)	31.7 (70)	11.3 (25)	10.9 (24)	6.3 (14)	3.2 (7)	2.7 (6) Hindering
Unthreatening	29.4 (65)	26.7 (59)	13.1 (29)	18.1 (40)	6.3 (14)	4.5 (10)	1.8 (4) Threatening
Efficient	37.6 (83)	36.2 (80)	12.7 (28)	8.1 (18)	3.6 (8)	1.4 (3)	.5 (1) Inefficient
Obliging	7.7 (17)	12.7 (28)	17.2 (38)	38.5 (85)	11.8 (26)	6.3 (14)	5.9 (13) Demanding
Reliable	14.5 (32)	38.0 (84)	24.4 (54)	14.5 (32)	5.0 (11)	2.7 (6)	.9 (2) Unreliable

Overall, the data revealed that the participants' feelings about computers (CEFFICACY) were positive. The following statements described the individual variables relative to the participants' feelings about computers.

1. The data showed that 87.7% ($n = 194$) of the participants felt that computers were stimulating, 8.1% ($n = 18$) of the participants expressed feelings of neutrality about computers being stimulating, and 4.1% ($n = 9$) of the participants felt that computers were dull.

2. The data showed that 89.5% (n = 198) of the participants felt that computers were fun, 6.8% (n = 15) of the participants expressed feelings of neutrality about computers being fun, and 3.7% (n = 8) of the participants felt that computers were dreary.
3. The data showed that 81% (n = 79) of the participants felt that computers were easy, 10.8% (n = 23) of the participants expressed feelings of neutrality about computers being easy, and 8.6% (n = 19) of the participants felt that computers were difficult.
4. The data showed that 55.6% (n = 123) of the participants felt that computers were personal. However, when compared to other computer efficacy (CEFFICACY) variables, a higher percentage of participants expressed less positive feelings about computers being personal whereas 25.8% (n = 57) of the participants were neutral and 18.5% (n = 41) reported that computers were impersonal.
5. The data showed that 76.9% (n = 170) of the participants felt that computers were helpful, 10.9% (n = 24) of the participants expressed feelings of neutrality about computers being helpful, and 12.2% (n = 27) of the participants felt that computers were hindering.
6. The data showed that 69.2% (n = 153) of the participants felt that computers were unthreatening, 18.1% (n = 40) of the participants expressed feelings of neutrality about computers being threatening, and 12.6% (n = 28) of the participants felt that computers were threatening.
7. The data showed that 86.5% (n = 191) of the participants felt that computers were efficient, 8.1% (n = 18) of the participants expressed feelings of neutrality about

computers being efficient, and 5.5% ($n = 12$) of the participants felt that computers were inefficient.

8. The data showed that only 37.6% ($n = 83$) of the participants felt that computers were obliging. The majority of the participants 38.5% ($n = 85$) expressed feelings of neutrality about computers being obliging, while 24% ($n = 53$) of the participants felt that computers were demanding.
9. The data showed that 76.9% ($n = 170$) of the participants felt that computers were reliable, 14.5% ($n = 32$) of the participants expressed feelings of neutrality about computers being reliable, and 8.6% ($n = 19$) of the participants felt that computers were unreliable.

World Wide Web Efficacy

The students' feelings about the World Wide Web were gathered using HDLPS World Wide Web Efficacy Scale. Reliability analysis of the World Wide Web Efficacy Scale of HDLPS revealed an Alpha of .80. For the purpose of analyzing each of the World Wide Web Efficacy (WEFFICACY) variables, a frequency distribution was used to report the combined strong-to-moderate ranges for each extreme variable on each scale included in Table 4.8.

Table 4.8. Frequency Statistics for World Wide Web Efficacy

Perception	Strong	Moderate	Neutral	Moderate	Strong		Perception	
	1	2	3	4	5	6		
Stimulating	39.8 (88)	30.8 (68)	19.5 (43)	4.5 (10)	3.6 (8)	1.4 (3)	.5 (1)	Dull
Fun	38.9 (86)	35.3 (78)	16.7 (37)	5.4 (12)	1.8 (4)	1.4 (3)	.5 (1)	Dreary
Easy	39.8 (88)	31.2 (69)	14.5 (32)	7.2 (16)	4.5 (10)	.9 (2)	1.8 (4)	Difficult
Personal	12.2 (27)	13.6 (30)	19.0 (42)	29.4 (65)	8.6 (19)	10.9 (24)	6.3 (14)	Impersonal
Helpful	34.4 (76)	24.0 (53)	15.8 (35)	12.2 (27)	6.8 (15)	5.9 (13)	.9 (2)	Hindering
Unthreatening	24.0 (53)	15.4 (34)	14.5 (32)	25.8 (57)	8.6 (19)	10.0 (22)	1.8 (4)	Threatening
Efficient	25.3 (56)	32.6 (72)	21.7 (48)	15.8 (35)	1.4 (3)	2.7 (6)	.5 (1)	Inefficient
Obliging	10.9 (24)	16.7 (37)	15.8 (35)	33.0 (73)	10.4 (23)	8.6 (19)	4.5 (10)	Demanding
Reliable	17.2 (38)	33.5 (74)	21.3 (47)	19.9 (44)	5.0 (11)	2.3 (5)	.9 (2)	Unreliable

Overall, the data revealed that the participants' feelings about the World Wide Web (WEFFICACY) were positive. The following statements described the individual frequency distributions for the variables that relative to the participants' feelings about computers.

1. The data showed that 90.1% ($n = 199$) of the participants felt the World Wide Web was stimulating, 4.5% ($n = 10$) of the participants expressed feelings of neutrality about the World Wide Web as being stimulating or dull, and 5.5% ($n = 12$) of the participants felt the World Wide Web was dull.

2. The data showed that 90.9% (n = 201) of the participants felt the World Wide Web was fun, 5.4% (n = 12) of the participants expressed feelings of neutrality about the World Wide Web as being fun or dreary, and 3.7% (n = 8) of the participants felt the World Wide Web was dreary.
3. The data showed that 85.5% (n = 189) of the participants felt the World Wide Web was easy, 7.2% (n = 16) of the participants expressed feelings of neutrality about the World Wide Web as being easy or difficult, and 7.2% (n = 16) of the participants felt the World Wide Web was difficult.
4. The data showed that 44.6% (n = 99) of the participants felt the World Wide Web was personal. However, when compared to other World Wide Web Efficacy (WEFFICACY) variables, a higher percentage of participants expressed less positive feelings about the World Wide Web as being personal, whereas 29.4% (n = 65) of the participants were neutral, and 25.8% (n = 57) reported the World Wide Web was impersonal.
5. The data showed that 76.2% (n = 164) of the participants felt the World Wide Web was helpful, 12.2% (n = 27) of the participants expressed feelings of neutrality about the World Wide Web as being helpful or hindering, and 13.6% (n = 30) of the participants felt the World Wide Web was hindering.
6. The data showed that 53.9% (n = 119) of the participants felt the World Wide Web was unthreatening, 25.8% (n = 57) of the participants expressed feelings of neutrality about the World Wide Web as being unthreatening or threatening, and 20.4% (n = 45) of the participants felt the World Wide Web was threatening.

7. The data showed that 79.6% (n = 176) of the participants felt the World Wide Web was efficient, 15.8% (n = 35) of the participants expressed feelings of neutrality about the World Wide Web as being efficient or inefficient, and 4.6% (n = 10) of the participants felt the World Wide Web was inefficient.
8. The data show that 43.4% (n = 96) of the participants felt the World Wide Web was obliging, 33.0% (n = 73) of the participants expressed feelings of neutrality about the World Wide Web as being obliging or demanding, and 23.5% (n = 52) of the participants felt the World Wide Web was demanding.
9. The data showed that 72.0% (n = 159) of the participants felt the World Wide Web was reliable, 19.9% (n = 44) of the participants expressed feelings of neutrality about the World Wide Web as being reliable or unreliable, and 8.2% (n = 18) of the participants felt the World Wide Web was unreliable.

Social Interaction

The students' perceptions of satisfaction about social interaction were gathered using HDLPS (items 1-12 and 14 of the survey). Reliability analysis of the social interaction (SINTERACT) component of HDLPS revealed an Alpha of .77.

As shown in Table 4.9, the participants' overall feelings about social interaction ranged between neutral and dissatisfied. Eleven out of the 13 SINTERACT variables (SINTERACT- Q1, Q2, Q3, Q4, Q5, Q6, Q7, Q8, Q10, Q11, and Q14) showed that the plurality of the participants expressed feelings of neutrality about the social interaction levels of web-based courses. Five out of the 13 SINTERACT variables (SINTERACT- Q4, Q5, Q7, Q8, and Q10) showed that many participants were dissatisfied with the social interaction levels present in the web-based courses. The SINTERACTQ12 variable was the only

variable where the majority of the participants expressed feelings of satisfaction about the social interaction levels of web-based courses.

Table 4.9. Frequency Statistics for Social Interaction Variables

VARIABLE	SD	MD	D	N	A	MA	SA
	1	2	3	4	5	6	7
SINTERACTQ1	13.6 (30)	10.0 (22)	11.3 (25)	23.1 (51)	14.5 (32)	10.0 (22)	17.6 (39)
SINTERACTQ2	5.9 (13)	7.2 (16)	11.8 (26)	32.1 (71)	14.0 (31)	15.4 (34)	13.6 (30)
SINTERACTQ3	8.1 (18)	7.7 (17)	15.8 (35)	22.6 (50)	18.1 (40)	14.9 (33)	12.7 (28)
SINTERACTQ4	10.8 (24)	12.2 (27)	11.3 (25)	44.8 (99)	7.6 (17)	9.5 (21)	3.6 (8)
SINTERACTQ5	21.7 (48)	13.1 (29)	7.7 (17)	41.6 (92)	8.6 (19)	4.1 (9)	3.2 (7)
SINTERACTQ6	10.4 (23)	6.8 (15)	7.7 (17)	46.2 (102)	9.0 (20)	9.0 (20)	10.9 (24)
SINTERACTQ7	18.6 (41)	10.0 (22)	9.5 (21)	44.3 (98)	10.4 (23)	5.4 (12)	1.8 (4)
SINTERACTQ8	14.5 (32)	14.0 (31)	6.3 (14)	35.3 (78)	10.4 (23)	10.4 (23)	9.0 (20)
SINTERACTQ9	5.0 (11)	7.2 (16)	7.2 (16)	21.3 (47)	17.6 (39)	26.7 (59)	14.9 (33)
SINTERACTQ10	14.5 (32)	14.0 (31)	10.0 (22)	31.7 (70)	10.4 (23)	12.2 (27)	7.2 (16)
SINTERACTQ11	5.0 (11)	6.8 (15)	5.9 (13)	25.3 (56)	20.8 (46)	17.6 (39)	18.6 (41)
SINTERACTQ12	4.5 (10)	3.2 (7)	6.8 (15)	11.8 (26)	17.2 (38)	23.1 (51)	33.5 (74)
SINTERACTQ14	6.8 (15)	4.5 (10)	11.8 (26)	35.3 (78)	10.4 (23)	17.6 (39)	13.6 (30)

Instructor Feedback

The students' perceptions of satisfaction about instructor feedback were gathered using HDLPS (items 13 and 15-20 of the survey). Reliability analysis of the instructor feedback (IRESPONSE) component of HDLPS revealed an Alpha of .73.

As shown in Table 4.10, the majority of the participants expressed feelings of satisfaction about instructor feedback. Five out of the seven IRESPONSE variables (IRESPONSE- Q13, Q15, Q16, Q17, and Q20) showed that the majority of the participants expressed feelings of satisfaction about the instructor feedback levels of the web-based courses. The IRESPONSEQ18 and IRESPONSEQ19 variables were the only variables for which the majority of the participants expressed feelings of neutrality or dissatisfaction about the instructor feedback levels of web-based courses.

Table 4.10. Frequency Statistics for Instructor Feedback Variables

VARIABLE	SD	MD	D	N	A	MA	SA
	1	2	3	4	5	6	7
IRESPONSEQ13	2.3 (5)	4.5 (10)	2.7 (6)	6.3 (14)	10.0 (22)	23.5 (52)	50.7 (112)
IRESPONSEQ15	1.8 (4)	2.7 (6)	4.1 (9)	4.5 (10)	7.2 (16)	17.2 (38)	62.4 (138)
IRESPONSEQ16	5.4 (12)	3.6 (8)	10.4 (23)	9.5 (21)	10.4 (23)	27.6 (61)	33.0 (73)
IRESPONSEQ17	5.4 (12)	4.1 (9)	3.6 (8)	13.1 (29)	13.1 (29)	27.6 (61)	32.6 (72)
IRESPONSEQ18	14.5 (32)	19.0 (42)	13.1 (29)	23.1 (51)	10.4 (23)	10.4 (23)	9.5 (21)
IRESPONSEQ19	7.2 (16)	9.0 (20)	11.3 (25)	28.5 (63)	14.9 (33)	15.4 (34)	13.6 (30)
IRESPONSEQ20	1.4 (3)	4.5 (10)	4.1 (9)	18.1 (40)	14.0 (31)	27.6 (61)	30.3 (67)

Overall Satisfaction

The students' perceptions of satisfaction about overall satisfaction were gathered using HDLPS (items 21-34 of the survey). Reliability analysis of the instructor feedback (IRESPONSE) component of HDLPS revealed an Alpha of .85.

Table 4.11. Frequency Statistics for Overall Satisfaction

VARIABLE	SD	MD	D	N	A	MA	SA
	1	2	3	4	5	6	7
SATISFYQ21	3.6 (8)	3.2 (7)	1.8 (4)	7.7 (17)	8.6 (19)	21.3 (47)	53.8 (119)
SATISFYQ22	5.4 (12)	7.2 (16)	9.5 (21)	18.1 (40)	10.9 (24)	18.1 (40)	30.8 (68)
SATISFYQ23	11.8 (26)	10.9 (24)	19.5 (43)	22.6 (50)	14.9 (33)	10.4 (23)	10.0 (22)
SATISFYQ24	7.7 (17)	3.2 (7)	5.9 (13)	6.3 (14)	5.4 (12)	11.3 (25)	60.2 (133)
SATISFYQ25	14.9 (33)	10.4 (23)	13.6 (30)	32.1 (71)	7.7 (17)	9.0 (20)	11.8 (26)
SATISFYQ26	10.0 (22)	5.4 (12)	5.4 (12)	20.8 (46)	15.4 (34)	19.9 (44)	23.1 (51)
SATISFYQ27	4.1 (9)	3.2 (7)	4.5 (10)	14.5 (32)	10.4 (23)	21.7 (48)	41.6 (92)
SATISFYQ28	3.6 (8)	5.0 (11)	8.6 (19)	16.7 (37)	12.2 (27)	21.3 (47)	32.6 (72)
SATISFYQ29	5.9 (13)	5.9 (13)	3.6 (8)	13.1 (29)	10.0 (22)	17.6 (39)	43.9 (97)
SATISFYQ30	5.4 (12)	5.0 (11)	5.0 (11)	18.1 (40)	13.1 (29)	21.7 (48)	31.7 (70)
SATISFYQ31	5.9 (13)	2.7 (6)	4.1 (9)	14.9 (33)	17.6 (39)	16.7 (37)	38.0 (84)
SATISFYQ32	12.7 (28)	10.0 (22)	7.7 (17)	24.0 (53)	18.1 (40)	14.0 (31)	13.6 (30)
SATISFYQ33	5.4 (12)	7.7 (17)	8.6 (19)	18.6 (41)	15.8 (35)	24.9 (55)	19.0 (42)
SATISFYQ34	4.5 (10)	4.5 (10)	7.7 (17)	14.5 (32)	15.8 (35)	19.9 (44)	33.0 (73)

As shown in Table 4.11, the majority of the participants expressed feelings of satisfaction about instructor feedback. Eleven out of the 14 satisfaction variables (SATISFY- Q21, q22, Q24, Q26-Q31, Q33 and Q34) revealed that the majority of the participants expressed feelings of satisfaction about web-based courses. The SATISFYQ23, SATISFYQ25, AND SATISFYQ32 variables were the only variables that the majority of the participants expressed feelings that ranged between neutrality and dissatisfaction about the instructor feedback levels of web-based courses.

Open-Ended Questions

The participants were asked to list what they “liked best” and “liked least” about their web-based courses. The participants’ responses to these questions were analyzed using the frequency of each coded response. The frequency analysis for the “liked best” coded data yielded 180 responses out of the 221 population. Based on the 180 responses, the majority of the participants, 50% ($n = 90$), indicated that the convenience of web-based courses was the best characteristic of web-based learning. Furthermore, the participants indicated that the greatest benefits of web-based courses were flexibility, 20% ($n = 36$), and the ability to complete assignments self-paced, 15.8% ($n = 35$).

The frequency analysis for the “liked least” coded data yielded 148 responses out of the 221 population. Based on 148 responses, the plurality of the participants, 27.7% ($n = 41$), reported that instructor feedback was their least favorite characteristic of web-based courses. Additionally, 20.2% ($n = 30$) of the participants indicated that the lack of social interaction with their peers was a negative factor of web-based courses. Technical problems, 12.8% ($n = 19$), and too much busy work, 11.4% ($n = 17$) were the only other significant data frequencies reported about the weaknesses of web-based courses.

Research Questions

This study examined the overarching question concerning the association between students' learning styles and perceptions of satisfaction for those enrolled in community college web-based learning environments. The following null hypotheses for each of the five research questions were tested using Chi-square tests of independence. The null hypotheses were tested at the .05 alpha level.

Research Question 1: What are the associations between learning styles and the perceptions of satisfaction with computers among community college students enrolled in web-based courses?

H_{1a-i}: There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of computers (CEFFICACY) among community college students enrolled in web-based courses.

Table 4.12. Association of Active-Reflective Learning Style Dimension and Computer Efficacy

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{1a}	.621	.054	.156	No
H _{1b}	.760	.041	.148	No
H _{1c}	.324	.024	.158	No
H _{1d}	.809	.041	.145	No
H _{1e}	.168	.063	.184	No
H _{1f}	.750	.042	.149	No
H _{1g}	.343	.055	.172	No
H _{1h}	.864	.017	.140	No
H _{1i}	.439	.031	.166	No

As shown in Table 4.12, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Active-Reflective (A-R) learning style modes and computer efficacy (CEFFICACY) variables. Each of the null hypotheses included in Table 4.12 were not rejected.

H_{1j-r}: There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of computers (CEFFICACY) being stimulating among community college students enrolled in web-based courses.

As shown in Table 4.13, the Chi-square test of independence for 7 of the 9 null hypotheses yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Sensing-Intuitive learning style dimension (S-N) and these computer efficacy (CEFFICACY) variables. The null hypotheses were retained for these hypotheses.

Table 4.13 showed a statistically significant association existed between the Sensing-Intuitive learning style dimension and perceptions of computers being stimulating with a .014 p-value. As a result, H_{1j} was rejected. The lambda value of .031 indicated that the error of determining the Sensitive-Intuitive learning style based on the participants' perceptions of computers being stimulating (ComputersQ1) can be reduced by 3.1%. The Cramer's V coefficient of .212 indicated that there was a limited association between the Sensing-Intuitive learning style dimension and the participants' perceptions of computers being stimulating.

Table 4.13 showed a statistically significant association existed between the Sensing-Intuitive learning style dimension and perceptions of computers being personal with

a .007 p-value. As a result, H_{1m} was rejected. The lambda value of .061 indicated that the error of determining the Sensitive-Intuitive learning style based on the participants' perceptions of computers being personal (COMPUTERSQ4) can be reduced by 6.1%. The Cramer's V coefficient of .217 indicated that there was a limited association between Sensing-Intuitive learning style dimension and the participants' perceptions of computers being personal.

Table 4.13. Association of Sensing-Intuitive Learning Style Dimension and Computer Efficacy

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H_{1j}	.014*	.031	.212	Yes
H_{1k}	.363	.038	.170	No
H_{1l}	.775	.011	.133	No
H_{1m}	.007*	.061	.217	Yes
H_{1n}	.654	.058	.155	No
H_{1o}	.622	.066	.156	No
H_{1p}	.656	.049	.154	No
H_{1q}	.477	.025	.164	No
H_{1r}	.527	.021	.161	No

* $p < .05$.

H_{1s-aa} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of computers among community college students enrolled in web-based courses.

As shown in Table 4.14, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Visual-Verbal (VS-VB) learning style

dimension and computer efficacy (CEFFICACY) variables. Each of the null hypotheses included in Table 4.14 were retained.

Table 4.14. Association of Sequential-Global Learning Style Dimension and Computer Efficacy

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{1s}	.798	.036	.146	No
H _{1t}	.543	.066	.161	No
H _{1u}	.680	.020	.139	No
H _{1v}	.664	.040	.154	No
H _{1w}	.129	.058	.187	No
H _{1x}	.209	.047	.180	No
H _{1y}	.217	.070	.180	No
H _{1z}	.644	.054	.155	No
H _{1aa}	.393	.047	.169	No

H_{1bb-jj}: There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of computers (CEFFICACY) among community college students enrolled in web-based courses.

As shown in Table 4.15, the Chi-square test of independence for 8 of the 9 null hypotheses yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Sequential-Global (SQ-G) learning style dimension and these computer efficacy (CEFFICACY) variables. The null hypotheses were retained for these hypotheses.

Table 4.15 showed a statistically significant association existed between the Sequential-Global (SQ-G) learning style dimension and perceptions of computers being personal (COMPUTERSQ4) with a .026 p-value. As a result, H_{1ee} was rejected. The lambda value of .068 indicated that the error of determining the Sequential-Global (SQ-G) learning style based on the participants' perceptions of computers being personal (COMPUTERSQ4) can be reduced by 6.8%. The Cramer's V coefficient of .206 indicated that there was a limited association between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of computers being personal (COMPUTERSQ4).

Table 4.15. Association of Sequential-Global Learning Style Dimension and Computer Efficacy

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H_{1bb}	.365	.049	.170	No
H_{1cc}	.081	.069	.193	No
H_{1dd}	.262	.007	.162	No
H_{1ee}	.026*	.068	.206	Yes
H_{1ff}	.929	.027	.133	No
H_{1gg}	.518	.020	.162	No
H_{1hh}	.061	.063	.197	No
H_{1ii}	.882	.000	.138	No
H_{1jj}	.217	.021	.180	No

* $p < .05$.

Research Question 2: What are the associations between learning styles and the perceptions of satisfaction with the World Wide Web among community college students enrolled in web-based courses?

H_{2a-i}: There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

As shown in Table 4.16, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Active-Reflective (A-R) learning style and World Wide Web efficacy (WEFFICACY) variables. Each of the null hypotheses included in Table 4.16 were retained.

Table 4.16. Association of Active-Reflective Learning Style Dimension and World Wide Web Efficacy

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{2a}	.543	.056	.161	No
H _{2b}	.251	.073	.177	No
H _{2c}	.090	.031	.192	No
H _{2d}	.554	.029	.160	No
H _{2e}	.181	.054	.183	No
H _{2f}	.751	.035	.149	No
H _{2g}	.638	.026	.156	No
H _{2h}	.520	.023	.162	No
H _{2i}	.368	.027	.170	No

H_{2j-r}: There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

As shown in Table 4.17, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Sensing-Intuitive (S-N) learning style and World Wide Web efficacy (WEFFICACY) variables. Each of the null hypotheses included in Table 4.17 were retained.

Table 4.17. Association of Sensing-Intuitive Learning Style Dimension and World Wide Web Efficacy

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{2j}	.592	.032	.158	No
H _{2k}	.634	.021	.156	No
H _{2l}	.928	.011	.133	No
H _{2m}	.415	.062	.168	No
H _{2n}	.381	.034	.169	No
H _{2o}	.291	.068	.175	No
H _{2p}	.820	.020	.144	No
H _{2q}	.273	.037	.176	No
H _{2r}	.361	.071	.171	No

H_{2s-aa}: There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

As shown in Table 4.18, the Chi-square test of independence for 8 of the 9 null hypotheses yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Visual-Verbal (VS-VB) learning style

dimension and these World Wide Web efficacy variables. The null hypotheses were retained for theses hypotheses.

Table 4.18 showed a statistically significant association existed between the Visual-Verbal (VS-VB) learning style dimension and perceptions of the World Wide Web being hindering (WEFICACYQ5) with a .003 p-value. As a result, H_{2w} was rejected. The lambda value of .062 indicated that the error of determining the Visual-Verbal (VS-VB) learning style based on the participants' perceptions of the World Wide Web being hindering (WEFICACYQ5) can be reduced by 6.2%. The Cramer's V coefficient of .223 indicated that there was a limited association between the Verbal-Visual (VS-VB) learning style dimension and the participants' perceptions of the World Wide Web being hindering (WEFICACYQ5).

Table 4.18. Association of Association of Visual-Verbal Learning Style Dimension and World Wide Web Efficacy

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H_{2s}	.382	.047	.169	No
H_{2t}	.904	.067	.136	No
H_{2u}	.408	.020	.168	No
H_{2v}	.824	.041	.144	No
H_{2w}	.003*	.062	.223	Yes
H_{2x}	.349	.073	.171	No
H_{2y}	.874	.038	.139	No
H_{2z}	.729	.042	.150	No
H_{2aa}	.154	.055	.185	No

* $p < .05$.

H_{2bb-jj}: There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

As shown in Table 4.19, the Chi-square test of independence for 5 of the 9 null hypotheses yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Sequential-Global (SQ-G) learning style dimension (S-N) and these World Wide Web (WEFFICACY) efficacy variables. The null hypotheses were retained for these hypotheses.

Table 4.19. Association of Sequential-Global Learning Style Dimension and World Wide WEB Efficacy

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{2bb}	.002*	.061	.227	Yes
H _{2cc}	.000*	.071	.254	Yes
H _{2dd}	.801	.022	.145	No
H _{2ee}	.223	.033	.179	No
H _{2ff}	.108	.007	.190	No
H _{2gg}	.509	.026	.162	No
H _{2hh}	.032*	.051	.204	Yes
H _{2ii}	.904	.007	.136	No
H _{2jj}	.032*	.038	.204	Yes

*p < .05.

Table 4.19 showed a statistically significant association existed between the Sequential-Global (SQ-G) learning style dimension and perceptions of the World Wide Web being stimulating (WEFICACYQ1) with a .002 p-value. As a result, H_{2bb} was rejected. The lambda value of .061 indicated that the error of determining the Sequential-Global (SQ-G)

learning style based on the participants' perceptions of the World Wide Web (WEFFICACY) being stimulating (WEFICACYQ1) can be reduced by 6.1%. The Cramer's V coefficient of .227 indicated that there was a limited association between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of the World Wide Web being stimulating (WEFICACYQ1).

Table 4.19 showed a statistically significant association existed between the Sequential-Global (SQ-G) learning style dimension and perceptions of the World Wide Web being fun (WEFICACYQ2) with a .000 p-value. As a result, H_{2cc} was rejected. The lambda value of .071 indicated that the error of determining the Sequential-Global (SQ-G) learning style based on the participants' perceptions of the World Wide Web (WEFFICACY) being fun (WEFICACYQ2) can be reduced by 7.1%. The Cramer's V coefficient of .254 indicated that there was a limited association between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of the World Wide Web being fun (WEFICACYQ2).

Table 4.19 showed a statistically significant association existed between the Sequential-Global (SQ-G) learning style dimension and perceptions of the World Wide Web being efficient (WEFICACYQ6) with a .032 p-value. As a result, H_{2hh} was rejected. The lambda value of .051 indicated that the error of determining the Sequential-Global (SQ-G) learning style based on the participants' perceptions of the World Wide Web (WEFFICACY) being efficient (WEFICACYQ6) can be reduced by 5.1%. The Cramer's V coefficient of .204 indicated that there was a limited association between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of the World Wide Web being efficient (WEFICACYQ5).

Table 4.19 showed a statistically significant association existed between the Sequential-Global (SQ-G) learning style dimension and perceptions of the World Wide Web being reliable (WEFICACYQ9) with a .032 p-value. As a result, H_{2jj} was rejected. The lambda value of .038 indicated that the error of determining the Sequential-Global (SQ-G) learning style based on the participants' perceptions of the World Wide Web (WEFFICACY) being reliable (WEFICACYQ9) can be reduced by 3.8%. The Cramer's V coefficient of .204 indicated that there was a limited association between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of the World Wide Web being reliable (WEFICACYQ9).

Research Question 3: What are the associations between learning styles and the perceptions of satisfaction with the level of social interaction among community college students enrolled in web-based courses?

H_{3a-m}: There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

As shown in Table 4.20, the Chi-square test of independence for 12 of the 13 null hypotheses yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Active-Reflective (A-R) learning style dimension and these social interaction (SINTERACT) variables. The null hypotheses were retained for these hypotheses.

Table 4.20 showed a statistically significant association existed between the Active-Reflective (A-R) learning style dimension and the participants' perceptions of computer conferencing (SINTERACTQ14) with a .001 p-value. As a result, H_{3m} was

rejected. The lambda value of .057 indicated that the error of determining the Active-Reflective (A-R) learning style based on the participants' perceptions of computer conferencing (SINTERACTQ14) can be reduced by 5.7%. The Cramer's V coefficient of .234 indicated that there was a limited association between the Active-Reflective (A-R) learning style dimension and the participants' perceptions of computer conferencing (SINTERACTQ14).

Table 4.20. Association of Active-Reflective Learning Style Dimension and Social Interaction

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{3a}	.618	.049	.157	No
H _{3b}	.562	.043	.160	No
H _{3c}	.403	.031	.168	No
H _{3d}	.390	.029	.169	No
H _{3e}	.443	.032	.166	No
H _{3f}	.106	.029	.190	No
H _{3g}	.075	.032	.194	No
H _{3h}	.101	.034	.191	No
H _{3i}	.108	.041	.190	No
H _{3j}	.517	.033	.162	No
H _{3k}	.097	.028	.191	No
H _{3l}	.167	.043	.184	No
H _{3m}	.001*	.057	.234	Yes

*p < .05.

H_{3n-z}: There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

As shown in Table 4.21, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Sensing-Intuitive (S-N) learning style and social interaction (SINTERACT) variables. Each of the null hypotheses included in Table 4.21 were retained.

Table 4.21. Association of Sensing-Intuitive Learning Style Dimension and Social Interaction

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{3n}	.901	.028	.136	No
H _{3o}	.311	.017	.174	No
H _{3p}	.945	.006	.130	No
H _{3q}	.286	.011	.175	No
H _{3r}	.245	.015	.178	No
H _{3s}	.708	.008	.151	No
H _{3t}	.713	.015	.151	No
H _{3u}	.886	.021	.138	No
H _{3v}	.448	.029	.166	No
H _{3w}	.346	.040	.206	No
H _{3x}	.177	.061	.183	No
H _{3y}	.504	.014	.163	No
H _{3z}	.814	.010	.144	No

H_{3aa-mm}: There is no association between the visual/verbal (VS-VB) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

As shown in Table 4.22, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Visual-Verbal (VS-VB) learning style and social interaction (SINTERACT) variables. Each of the null hypotheses included in Table 4.22 were retained.

Table 4.22. Association of Visual-Verbal Learning Style Dimension and Social Interaction

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{3aa}	.394	.066	.157	No
H _{3bb}	.503	.038	.160	No
H _{3cc}	.459	.033	.168	No
H _{3dd}	.751	.025	.169	No
H _{3ee}	.754	.055	.166	No
H _{3ff}	.217	.031	.190	No
H _{3gg}	.782	.031	.194	No
H _{3hh}	.755	.033	.191	No
H _{3ii}	.979	.025	.190	No
H _{3jj}	.145	.038	.162	No
H _{3kk}	.545	.058	.191	No
H _{3ll}	.532	.055	.184	No
H _{3mm}	.229	.042	.234	No

H_{3nn-zz}: There is no association between the sequential/global (SQ-G) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

As shown in Table 4.23, the Chi-square test of independence for 12 of the 13 null hypotheses yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Sequential-Global (SQ-G) learning style dimension and these social interaction (SINTERACT) variables. The null hypotheses were retained for these hypotheses.

Table 4.23. Association of Sequential-Global Learning Style Dimension and Social Interaction

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{3nn}	.615	.032	.157	No
H _{3oo}	.282	.024	.175	No
H _{3pp}	.278	.060	.176	No
H _{3qq}	.148	.022	.186	No
H _{3rr}	.760	.007	.148	No
H _{3ss}	.097	.026	.191	No
H _{3tt}	.307	.041	.174	No
H _{3uu}	.078	.028	.194	No
H _{3vv}	.290	.029	.175	No
H _{3ww}	.176	.020	.183	No
H _{3xx}	.328	.061	.172	No
H _{3yy}	.846	.038	.142	No
H _{3zz}	.001*	.042	.235	Yes

*p < .05.

Table 4.23 showed a statistically significant association existed between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of computer conferencing (SINTERACTQ14) with a .001 p-value. As a result, H_{3zz} was rejected. The lambda value of .042 indicated that the error of determining the

Sequential-Global (SQ-G) learning style based on the participants' perceptions of computer conferencing (SINTERACTQ14) can be reduced by 4.2%. The Cramer's V coefficient of .235 indicated that there was a limited association between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of computer conferencing (SINTERACTQ14).

Research Question 4: What are the associations between learning styles and the perceptions of satisfaction with instructor feedback among community college students enrolled in web-based courses?

H_{4a-g}: There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

Table 4.24. Association of Active-Reflective Learning Style Dimension and Instructor Feedback

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{4a}	.711	.038	.151	No
H _{4b}	.242	.042	.178	No
H _{4c}	.191	.056	.182	No
H _{4d}	.701	.030	.152	No
H _{4e}	.813	.034	.144	No
H _{4f}	.404	.016	.168	No
H _{4g}	.826	.052	.143	No

As shown in Table 4.24, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Active-Reflective (A-R) learning style and

instructor feedback (IRESPONSE) variables. Each of the null hypotheses included in Table 4.24 were retained.

H_{4h-n}: There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

As shown in Table 4.25, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Sensing-Intuitive (S-N) learning style and instructor feedback (IRESPONSE) variables. Each of the null hypotheses included in Table 4.25 were retained.

Table 4.25. Association of Sensing-Intuitive Learning Style Dimension and Instructor Feedback

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{4h}	.495	.016	.163	No
H _{4i}	.319	.026	.173	No
H _{4j}	.073	.031	.195	No
H _{4k}	.489	.020	.028	No
H _{4l}	.028	.073	.205	No
H _{4m}	.911	.000	.135	No
H _{4n}	.576	.040	.159	No

H_{4o-u}: There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

As shown in Table 4.26, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Verbal-Visual (VB-VS) learning style and instructor feedback (IRESPONSE) variables. Each of the null hypotheses included in Table 4.26 were retained.

Table 4.26. Association of Visual-Verbal Learning Style Dimension and Instructor Feedback

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{4o}	.936	.040	.132	No
H _{4p}	.305	.024	.174	No
H _{4q}	.574	.048	.159	No
H _{4r}	.986	.026	.119	No
H _{4s}	.659	.054	.154	No
H _{4t}	.439	.034	.166	No
H _{4u}	.322	.085	.173	No

H_{4v-bb}: There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

As shown in Table 4.27, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Sequential-Global (SQ-G) learning style and instructor feedback (IRESPONSE) variables. Each of the null hypotheses included in Table 4.27 were retained.

Table 4.27. Association of Sequential-Global Learning Style Dimension and Instructor Feedback

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{4v}	.691	.027	.132	No
H _{4w}	.585	.035	.158	No
H _{4x}	.602	.041	.157	No
H _{4y}	.724	.044	.151	No
H _{4z}	1.00	.013	.097	No
H _{4aa}	.065	.033	.196	No
H _{4bb}	.727	.043	.150	No

Research Question 5: What are the associations between learning styles and the perceptions of overall satisfaction among community college students enrolled in web-based courses?

Null Hypotheses:

H_{5a-n}: There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

As shown in Table 4.28, the Chi-square test of independence for 13 of the 14 null hypotheses yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Active-Reflective (A-R) learning style dimension and the overall satisfaction (SATISFY) variables. The null hypotheses were retained for these hypotheses.

Table 4.28 showed a statistically significant association existed between the Active-Reflective (A-R) learning style dimension and the participants' perceptions of

web-based courses being boring (SATISFYQ2) with a .005 p-value. As a result, H_{5b} was rejected. The lambda value of .055 indicated that the error of determining the Active-Reflective (A-R) learning style based on the participants' perceptions of web-based courses being boring (SATISFYQ2) can be reduced by 5.5%. The Cramer's V coefficient of .220 indicated that there was a limited association between the Active-Reflective (A-R) learning style dimension and the participants' perceptions of web-based courses being boring (SATISFYQ2).

Table 4.28. Association of Active-Reflective Learning Style Dimension and Overall Satisfaction

Null Hypothesis	Alpha Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{5a}	.517	.020	.162	No
H _{5b}	.005*	.055	.220	Yes
H _{5c}	.726	.028	.150	No
H _{5d}	.345	.050	.171	No
H _{5e}	.458	.036	.166	No
H _{5f}	.755	.040	.149	No
H _{5g}	.796	.039	.159	No
H _{5h}	.454	.023	.165	No
H _{5i}	.197	.054	.181	No
H _{5j}	.489	.023	.164	No
H _{5k}	.852	.024	.141	No
H _{5l}	.355	.034	.171	No
H _{5m}	.096	.053	.191	No
H _{5n}	.265	.036	.176	No

*p < .05.

H_{50-bb}: There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

As shown in Table 4.29, the Chi-square test of independence for each null hypothesis yielded p-values that were greater than the .05 alpha level. As a result, there was not a statistically significant association between the Sensing-Intuitive (S-N) learning style and overall satisfaction (SATISFY). Each of the null hypotheses included in Table 4.29 were retained.

Table 4.29. Association of Sensing-Intuitive Learning Style Dimension and Overall Satisfaction

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H ₅₀	.071	.040	.195	No
H _{5p}	.619	.017	.157	No
H _{5q}	.192	.050	.182	No
H _{5r}	.340	.009	.172	No
H _{5s}	.216	.020	.180	No
H _{5t}	.123	.051	.188	No
H _{5u}	.068	.029	.209	No
H _{5v}	.677	.020	.153	No
H _{5w}	.579	.004	.159	No
H _{5x}	.074	.017	.194	No
H _{5y}	.480	.018	.164	No
H _{5z}	.060	.045	.197	No
H _{5aa}	.677	.019	.153	No
H _{5bb}	.270	.017	.176	No

H_{5cc-pp}: There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

As shown in Table 4.30, the Chi-square test of independence for 13 of the 14 null hypotheses yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Visual-Verbal (S-N) learning style dimension and these overall satisfaction (SATISFY) variables. The null hypotheses were retained for these hypotheses.

Table 4.30. Association of Visual-Verbal Learning Style Dimension and Overall Satisfaction

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{5cc}	.132	.060	.187	No
H _{5dd}	.809	.038	.145	No
H _{5ee}	.513	.060	.162	No
H _{5ff}	.758	.036	.148	No
H _{5gg}	.449	.045	.166	No
H _{5hh}	.021*	.108	.208	Yes
H _{5ii}	.120	.038	.202	No
H _{5jj}	.289	.054	.175	No
H _{5kk}	.476	.035	.164	No
H _{5ll}	.644	.045	.184	No
H _{5mm}	.714	.027	.151	No
H _{5nn}	.701	.036	.152	No
H _{5oo}	.391	.061	.169	No
H _{5pp}	.373	.055	.170	No

*p < .05.

Table 4.30 showed a statistically significant association existed between the Visual-Verbal (VS-VB) learning style dimension and the participants' perceptions of professional skills gained in web-based courses (SATISFYQ26) with a .021 p-value. As a result, $H_{5\text{hh}}$ was rejected. The lambda value of .108 indicated that the error of determining the Visual-Verbal (VS-VB) learning style based on the participants' perceptions of professional skills gained in web-based courses (SATISFYQ26) can be reduced by 10.8%. The Cramer's V coefficient of .208 indicated that there was a limited association between the Visual-Verbal (VS-VB) learning style dimension and the participants' perceptions of professional skills gained in web-based courses (SATISFYQ26).

$H_{5\text{qq-ddd}}$: There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

As shown in Table 4.31, the Chi-square test of independence for 12 of the 14 null hypotheses yielded p-values that were greater than the .05 alpha level. As a result, there were no statistically significant associations between the Sequential-Global (SQ-G) learning style dimension and the overall satisfactions (SATISFY) variables. The null hypotheses were retained for these hypotheses.

Table 4.31 showed a statistically significant association existed between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of professional skills gained in web-based courses (SATISFYQ26) with a .025 p-value. As a result, $H_{5\text{vv}}$ was rejected. The lambda value of .054 indicated that the error of determining the Sequential-Global (SQ-G) learning style based on the participants' perceptions of professional skills gained in web-based courses (SATISFYQ26) can be reduced by 5.4%.

The Cramer's V coefficient of .206 indicated that there was a limited association between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of professional skills gained in web-based courses (SATISFYQ26).

Table 4.31. Association of Sequential-Global Learning Style Dimension and Overall Satisfaction

Null Hypothesis	P-Value	Lambda	Cramer's V	Null Hypothesis Rejected
H _{5qq}	.133	.008	.187	No
H _{5rr}	.579	.023	.159	No
H _{5ss}	.491	.038	.163	No
H _{5tt}	.199	.034	.181	No
H _{5uu}	.163	.017	.185	No
H _{5vv}	.025*	.054	.206	Yes
H _{5ww}	.507	.033	.176	No
H _{5xx}	.624	.010	.156	No
H _{5yy}	.350	.019	.171	No
H _{5zz}	.221	.061	.180	No
H _{5aaa}	.504	.032	.163	No
H _{5bbb}	.603	.025	.157	No
H _{5ccc}	.311	.054	.174	No
H _{5ddd}	.014*	.082	.212	Yes

*p < .05.

Table 4.31 showed a statistically significant association exists between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of satisfaction (SATISFYQ34) with a .014 p-value. As a result, H_{5ddd} was rejected. The lambda value of .082 indicated that the error of determining the Sequential-Global (SQ-G) learning style based on the participants' perceptions of satisfaction (SATISFYQ34) can be reduced by

8.2%. The Cramer's V coefficient of .212 indicated that there was a limited association between the Sequential-Global (SQ-G) learning style dimension and the participants' perceptions of satisfaction (SATISFYQ34).

CHAPTER FIVE:

CONCLUSIONS, RECOMMENDATIONS, AND IMPLICATIONS

Introduction

The purpose of this study was to provide empirical support for the association between students' learning style preferences and their perceptions of satisfaction in web-based learning environments. This study was conducted at four comprehensive two-year public community colleges, Caldwell Community College & Technical Institute, Western Piedmont Community College, Catawba Valley Community College, and Wilkes Community College, using a questionnaire to measure learning styles and students' perceptions of distance learning web-environments. The target population of the study was 628 students who were enrolled in one or more web-based learning courses at one of the four community colleges during the fall semester of 2004. This chapter is divided into four sections to increase the understanding of the conclusions, recommendations and implications: (a) overview of the study, (b) key findings and conclusions, (c) recommendations for future research, and (d) implications for practice.

Overview of the Study, Research Questions, and Hypotheses

Overview of the Study

The researcher used the analysis of association methodology to explore the association between students' learning styles and perceptions of satisfaction for those enrolled in community college web-based learning environments. Constructivism and adult learning theory provided a theoretical foundation for the study. This study focused on the principles of learning styles, interaction, social presence, transactional distance, and computer efficacy.

The components of this study consisted of four different parts of description and analysis. The first analysis was based on the demographics of the community college students enrolled in web-based courses from the four participating community colleges. The first set of variables focused on the populations' demographic profile. The variables consisted of gender, age, number of community college web-based courses taken, the number of hours dedicated to the web-based course weekly, and the college in which the student was enrolled. The second analysis was computed on variables related to the individual learning styles of the participants. The second set of variables focused on the participant's preferred learning style. These variables were analyzed based on the responses of the participants to Felder and Silverman's (1998) Index of Learning Styles Inventory (ILS). The third analysis was of variables related to students' perceptions of satisfaction in community college web-based courses. The third set of variables focused on the participant's satisfaction with community college web-based learning environments. The variables were analyzed using the participant's responses to Ham's (2002) web-based version of Hiltz's Distance Learning Perception Survey (HDLPS). The final analysis used the Chi-square test of independence to test the association between learning styles and students' perceptions of satisfaction in community college web-based courses. The learning style variables and the satisfaction with community college web-based courses variables were analyzed to determine if a statistically significant association existed between learning styles and students' perceptions of satisfaction in community college web-based learning environments.

Overview of Research Questions

This study examined the overarching question concerning the association between students' learning styles and perceptions of satisfaction for those enrolled in community

college web-based learning environments. Five research questions were presented to assist in the understanding of the overarching question. A total of 204 null hypotheses were tested for each of the five research questions using a Chi-square test of independence. As shown in Table 5.1, 14 of the 204 null hypotheses were tested at the .05 alpha level. Because of the magnitude of tests, the null hypotheses for the five research questions were consolidated into individual null hypothesis statements.

Research Question One

What are the associations between learning styles and the perceptions of satisfaction with computers among community college students enrolled in web-based courses?

Null Hypotheses:

H_{1a-i} : There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of computers (CEFFICACY) among community college students enrolled in web-based courses.

The null hypotheses, H_{1a-i} , were retained.

H_{1j-r} : There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of computers (CEFFICACY) as being stimulating among community college students enrolled in web-based courses.

Seven of the nine null the null hypotheses, H_{1j-r} , were retained. H_{1j} and H_{1m} were rejected.

H_{1s-aa} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of computers among community college students enrolled in web-based courses.

The null hypotheses, H_{1s-aa} , were retained.

H_{1bb-jj} : There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of computers (CEFFICACY) among community college students enrolled in web-based courses.

Eight of the nine null hypotheses, H_{1bb-jj} , were retained. H_{1ee} was rejected.

Research Question Two

What are the associations between learning styles and the perceptions of satisfaction with the World Wide Web among community college students enrolled in web-based courses?

Null Hypotheses:

H_{2a-i} : There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

The null hypotheses, H_{2a-i} , were retained.

H_{2j-r} : There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

The null hypotheses, H_{2j-r} , were retained.

H_{2s-aa} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

Eight of the nine null hypotheses, H_{2s-aa} , were retained. H_{2w} was rejected.

H_{2bb-jj} : There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of the World Wide Web (WEFFICACY) among community college students enrolled in web-based courses.

Five of the nine null hypotheses, H_{2bb-jj} , were retained. H_{2bb} , H_{2cc} , H_{2hh} , and H_{2jj} were rejected.

Research Question Three

What are the associations between learning styles and the perceptions of satisfaction with social interaction among community college students enrolled in web-based courses?

Null Hypotheses:

H_{3a-m} : There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

Twelve of the 13 null hypotheses, H_{3a-m} , were retained. H_{3m} was rejected.

H_{3n-z} : There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

The null hypotheses, H_{3n-z} , were retained.

H_{3aa-mm} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

The null hypotheses, H_{3aa-mm} , were retained.

H_{3nn-zz} : There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of social interaction (SINTERACT) among community college students enrolled in web-based courses.

Twelve of the 13 null hypotheses, H_{3nn-zz} , were retained. H_{3z} was rejected.

Research Question Four

What are the associations between learning styles and the perceptions of satisfaction with instructor feedback among community college students enrolled in web-based courses?

Null Hypotheses:

H_{4a-g} : There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

The null hypotheses, H_{4a-g} , were retained.

H_{4h-n} : There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

The null hypotheses, H_{4h-n} , were retained.

H_{4o-u} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

The null hypotheses, H_{4o-u} , were retained.

H_{4v-bb} : There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of instructor feedback (IRESPONSE) among community college students enrolled in web-based courses.

The null hypotheses, H_{4v-bb} , were retained.

Research Question Five

What are the associations between learning styles and the perceptions of overall satisfaction among community college students enrolled in web-based courses?

Null Hypotheses:

H_{5a-n} : There is no association between the Active-Reflective (A-R) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

Thirteen of the 14 null hypotheses, H_{5a-n} , were retained. H_{5b} was rejected.

H_{5o-bb} : There is no association between the Sensing-Intuitive (S-N) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

The null hypotheses, H_{5o-bb} , were retained.

H_{5cc-pp} : There is no association between the Visual-Verbal (VS-VB) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

Thirteen of the 14 null hypotheses, H_{5cc-pp} , were retained. H_{5hh} was rejected.

$H_{5qq-ddd}$: There is no association between the Sequential-Global (SQ-G) learning style dimension and the perceptions of overall satisfaction (SATISFY) among community college students enrolled in web-based courses.

Twelve of the 14 null hypotheses, $H_{5qq-ddd}$, were retained. H_{5vv} and H_{5ddd} were rejected.

Table 5.1. Null Hypotheses that were rejected.

Research Question	Null Hypothesis	Independent Variable	Dependent Variable	P-Value
One	H _{1j}	Sensing-Intuitive (S-N)	Computers Stimulating (COMPUTERSQ1)	.014*
	H _{1M}	Sensing-Intuitive (S-N)	Computers Personal (COMPUTERSQ4)	.007*
	H _{1ee}	Sequential-Global (SQ-G)	Computers Personal (COMPUTERSQ4)	.026*
Two	H _{2w}	Visual-Verbal (VS-VB)	World Wide Web Hindering (WEFFICACYQ5)	.007*
	H _{2bb}	Sequential-Global (SQ-G)	World Wide Web Stimulating (WEFFICACYQ1)	.002*
	H _{2cc}	Sequential-Global (SQ-G)	World Wide Web Fun (WEFFICACYQ2)	.000*
	H _{2hh}	Sequential-Global (SQ-G)	World Wide Web Efficient (WEFFICACYQ7)	.032*
	H _{2jj}	Sequential-Global (SQ-G)	World Wide Web Reliable (WEFFICACYQ9)	.032*
Three	H _{3m}	Active Reflective (A-R)	Computer Conferencing (SINTERACTQ14)	.001*
	H _{3zz}	Sequential-Global (SQ-G)	Computer Conferencing (SINTERACTQ14)	.001*
Five	H _{5b}	Active Reflective (A-R)	Web-Based Courses Boring (SATISFYQ22)	.005*
	H _{5hh}	Visual-Verbal (VS-VB)	Professional Skills Gained (SATISFYQ26)	.021*
	H _{5vv}	Sequential-Global (SQ-G)	Professional Skills Gained (SATISFYQ26)	.025*
	H _{5ddd}	Sequential-Global (SQ-G)	Overall Satisfaction (SATISFYQ34)	.014*

*P < .05

Key Findings and Conclusions

The findings of this study supported the viewpoint that distance learning students possess preferences for learning that favor some learning abilities over others (Felder & Silverman, 1998; Kolb, 1993; Shank & Sitze, 2004). The analyses of the learning style data suggested there were different learning style preferences represented within the population of this study. With the exception of the strong-Sensing (STRONGSEN) and the strong-Visual (STRONGVIS) learning style modes, the data indicated that the majority of the participants preferred learning style modes that were between the mild and moderate ranges for each learning style dimension. Felder and Silverman suggest that learners who prefer the mild to moderate learning style modes are adaptive to differing learning environments. As a result, the majority of the participants of this study were flexible in their ability to learn within the opposing learning style modes for each dimension of Felder and Silverman's ILS.

With the exception of social interaction, the participants of this study were satisfied in the web-based courses provided by the participating community colleges during the fall semester of 2005. The data revealed that the participants were comfortable with computers, the World Wide Web, and the levels of instructor feedback that occurred throughout the web-based course. However, the participants' responses to the social interaction component of HDLPS provided evidence that the participants were not satisfied with the social interaction levels that occurred in the web-based courses. Furthermore, 20.2% ($n = 30$) of the participants who responded to the open-ended questions ($n = 148$) reported that social interaction was their least favorite characteristic of community college web-based course environments. As a result, additional research is recommended to further explore

participants' dissatisfaction with the levels of social interaction in web-based learning environments.

Shank and Sitze (2004) posit that web-based learning environments should accommodate the various student learning styles in order to increase the performance and satisfaction levels of students enrolled in web-based courses. Furthermore, Felder and Silverman (1988) theorize that when there are mismatches between learning styles and web-based learning environments, the students will become inattentive, discouraged, and discontent with the course. While it is plausible that developing web-based learning environments that compliment a variety of learning styles would promote the students' perceptions of satisfaction and success, the results from this study indicated that the associations between learning styles and students' perceptions of satisfaction in community college web-based environments were limited.

Based on the results of this study, there was marginal evidence that an association existed between learning styles and students' perception of satisfaction in community college web-based environments. Chi-square tests for independence indicated that there were no statistically significant associations at the .05 alpha level between learning styles and students' perception of satisfaction in web-based environments for 190 of the 204 null hypotheses. While 14 null hypotheses were rejected, the statistical associations between learning styles and students' perceptions of satisfaction in web-based community college were limited. The adaptive nature of the mild to moderate ILS learning style modes preferred by the majority of the participants of this study may have contributed to the homogeneity of the results, therefore, reducing the statistical dependency between learning styles and students' perceptions of satisfaction in community college web-based environments. As a

result, additional research is recommended before web-based instructors and designers pass judgments regarding the impact of learning styles on students' perceptions of satisfaction in web-based learning environments.

Recommendations for Future Research

1. Additional research is needed with different populations to confirm the findings based on the association of learning styles and students' satisfaction of web-based learning environments.
2. Future research could explore a variety of dependent and independent variables that impact the students' satisfaction of web-based environments.
3. Qualitative studies should be conducted to reveal "thick descriptions" about learning styles and students' satisfaction in web-based learning environments.
4. The exploration of the use of other instruments or tools could provide another dimension of the relationship between learning styles and web-based learning environments.
5. Additional research is needed to explore social interaction and instructor feedback of web-based learning environments.
6. To increase the low response rate, it is recommended that future research be included as part of the web-based course.

Implications for Practice

The effectiveness of distance learning versus traditional classroom-based learning has been debated since the first generation of distance learning. As the use of technology to facilitate and deliver distance learning courses has increased, new challenges have emerged for the administration, faculty, staff and students of postsecondary institutions developing and implementing distance learning programs (Drazdowski, Holodick, & Scappaticci, 1998;

Fulford & Zhang, 1993). The more insight that administrators, faculty, students, and technical support personnel have about the learning styles and perceptions of web-based learning, the greater likelihood that courses offered via web-based technologies will meet the expectations and demands of students. This research provided additional knowledge to the field of technology-enhanced learning environments thereby benefiting community colleges, academic advisors, faculty, and students as we continue to learn what enhances and hinders web-based learning. However, the restrictive nature of the population and the low response rate exclude the findings of this study from being generalized to community colleges that were not included in the study. As a result, the implications from this study should be critically reviewed before making decisions that impact web-based learning environments.

Overall, the results of this study showed the participants' feelings about computers (CEFFICACY), the World Wide Web, instructor feedback, and satisfaction in web-based courses were positive. Furthermore, the participants indicated that the greatest benefits of web-based courses were flexibility and the ability to complete assignments self-paced. This implies that the community college web-based environments at the participating community colleges are meeting the overall needs of the students enrolled in web-based courses.

The participants' responses to HDLPS showed that their feelings about the social interaction levels in web-based courses ranged between neutral and dissatisfied. Additionally, the frequency analysis for the "liked least" coded data indicated that the lack of social interaction with their peers was a negative factor of web-based courses. According to Shank and Sitze (2004), there are four types of interaction that must occur in distance learning environments: student-content, student-instructor, student-student and student-technology. Powers and Guan (2000) postulate that web-based learning environments should include

activities that explore and stimulate learners' motivations, and foster participation and interaction among students. To increase the social interaction levels of the web-based learning environments, the instructors and designers of web-based courses at the participating community colleges should familiarize themselves with the principles and best practices of active-based learning.

Killion (2001) notes that too many instructors use trial and error approaches to design course content to be delivered via web-based technologies. Shank and Sitze (2004) suggest that instructors that desire to accommodate the needs of students enrolled in web-based learning environments should familiarize themselves with the principles of learning styles. This study revealed that the majority of the participants preferred learning style modes that were between the mild and moderate ranges for each Felder and Silverman ILS (1988) learning style dimension. This implies that the majority of the participants of this study were flexible in their ability to learn within the opposing learning style modes for each dimension. However, the results of this study revealed that there was marginal evidence that an association existed between learning styles and students' perception of satisfaction in community college web-based environments. As a result, the administrators, faculty, students, and technical support personnel of the participating community colleges should seek additional information concerning the association of learning styles and perceptions of web-based learning in effort to meet the expectations and demands of students enrolled in web-based courses.

Summary

Distance learning is not a panacea, but as web-based courses continue to evolve, their potential for broadening access to higher education and training and development programs

is compelling (Pantazis, 2002). Understanding web-based course delivery technologies in a world that demands opportunities for continuous learning, flexibility, convenience, and accessibility is increasingly important to higher education (Pantazis, 2002). As a result, community colleges must evaluate and assess the effectiveness of web-based course offerings in order to identify how technology impacts learning. While some teaching/learning models are very much like those used in a traditional classroom, electronic delivery makes the methods different enough to create new opportunities for evaluation (Offir & Lev, 1999; Pantazis, 2002). Consideration of this issue is based on the perspective that students should be taught using methods that maximize learning effectiveness. As a result, there is a need for research that examines which learning styles are effective in a web-based learning environment, as well as the association between students' preferred learning styles and satisfaction with web-based learning environments.

This study focused on the overarching question: "What are the associations between learning styles and students' perceptions of satisfaction among community college students enrolled in web-based learning environments?" To address this question, the researcher used the analysis of association methodology to explore the associations between learning styles and students' perceptions of satisfaction in four community college web-based learning environments. While there is limited empirical research available to determine the appropriateness of measuring student learning styles, the review of literature and the results of this study support that there are differences in the learning styles among community college web-based learners (Barnes, Presiosi, & Gooden, 2004; Diaz & Cartnal, 1999; Halsne & Gatta, 2002).

The review of literature suggested that web-based learning environments should accommodate the various student learning styles in order to increase the performance and satisfaction levels of students enrolled in web-based courses. Felder and Silverman (1988) postulate that when there is a mismatch between the web-based environment and the learning style of the student, the students will become inattentive, discouraged, and discontent with the course. However, the results of this study showed that there were limited associations between learning style preferences and students' perceptions of satisfaction in community college web-based courses.

The findings from this study only apply to the four community colleges and students enrolled in one or more web-based courses at the four community colleges. Due to lack of empirical evidence, additional research is needed for students' learning styles, web-based course delivery methods, and web-based teaching styles if community colleges are to maximize the effectiveness of web-based learning. Until additional research is completed for effective and ineffective web-based learning delivery methods, it is likely that most community colleges will continue to develop these methods through trial and error. Because web-based learning is in ever increasing use, community colleges are faced with utilizing technology in the education of adult learners. Although there are many challenges to consider when implementing web-based learning, they are not insurmountable.

References

- Agresti, A. A., & Finlay, B. (1997). *Statistical methods for the social sciences*. Upper Saddle River, NJ: Prentice Hall.
- Altmann, H., & Arambasich, L. (1982). A study of locus of control with adult students. *Canadian Counselor* 16(2), 97-101
- Barsch, J. (1996). *Barsch Learning Style Inventory*. Novato, CA: Academic Therapy Publications.
- Barnes, B. F., Preziosi, R. C., Gooden, D. J. (2004). An examination of the learning styles of mba online students and their preferred course delivery methods. *New Horizons in Education*, 2, 19-30. Retrieved October 20, 2004, from <http://www.nova.edu/~aed/horizons/volume18no2Spring2004.pdf>
- Bates, T. (2003) Higher education and e-learning: Integration or change? Paper presented at the University of British Columbia. Retrieved October 20, 2004, from <http://bates.cstudies.ubc.ca/>
- Baynton, M. (1992). Dimensions of control in distance education: A factor analysis. *Journal of Rural and Small Schools*, 4(2), 17-31.
- Beattie, J., Spooner, F., Jordan, L., Algozzine, B., & Spooner, M. (2002). Evaluating instruction in distance learning classes. *Teacher Education and Special Education*, 25, 124-132.
- Biner, P., Barone, N., Welsh, K., & Dean, R. (1997). Relative academic performance and its relations to facet and overall satisfaction with interactive telecourses. *Distance Education*, 18(2), 318-326.

- Bishop, J. S., & Spake, D. F. (2003) Distance education: A bibliographic review for educational planners and policymakers: 1992-2002. *Journal of Planning Literature*, 368, 372-391. Retrieved October 20, 2004, from
<http://jpl.sagepub.com/cgi/framedreprint/17/3/372>
- Bloom, K. C., & Hough, M. C. (2003). Student satisfaction with technology-enhanced learning. *CIN: Computers, Informatics, Nursing*, 21, 241-246.
- Borg, M. O., & Shapiro, S. L. (1996). Personality type and student performance in principles of economics. *The Journal of Economic Education*, 27(1), 3-25.
- Bower, B. (2001). Distance education: Facing the faculty challenge. *Online Journal of Distance Learning Administration*, 42(2). Retrieved September 12, 2004, from
<http://www.westga.edu/~distance/ojdl/summer42/bower42.html>
- Brady, L. (2001) Fault lines in the terrain of distance education. *Computers and Composition*, 18, 347-358.
- Brinkerhoff, J. D., Klein, J. D., & Koroghlanian, C. M. (2001). Effects of overviews and computer experience on learning from hypertext. *Journal of Educational Computing Research*, 25(4), 427-440.
- Buckland, M., & Dye, C. M. (1991). *The development of electronic distance education delivery systems in the United States. Recurring and emerging themes in history and philosophy of education*. Chicago: Midwestern Educational Research Association.
(ERIC Document Reproduction Service No. ED345 713)
- Cafarella, R. S. (2002). *Planning programs for adult learners: A practical guide for educators, Teachers, and staff developers*. San Francisco: Jossey-Bass.

- Candy, P. C. (1991). *Self-direction for lifelong learning: A comprehensive guide to theory and practice*. San Francisco: Jossey-Bass.
- Carnevale, D. (2000). Study assesses what participants look for in high-quality online courses. *Chronicle of Higher Education*, 47(9), A46.
- Carr, S. (2000). Online psychology instruction is effective, but not satisfying, study finds. *Chronicle of Higher Education*, 46(27), A48.
- Centra, J. A. (1982). *Determining faculty effectiveness*. San Francisco: Jossey-Bass.
- Cetron, M. J., & Davies, O. (2001). Trends now changing the world: Technology, the workplace, management, and institutions. *The Futurist*, 35(2), 27-42.
- Cheung, D. (1998). Developing a student evaluation instrument for distance education. *Distance Education*, 19(1) 23-42.
- Clark, R. E. (1994). Assessment of distance learning technology. In E. L. Baker & J. H. O'Neil (Eds.), *Technology assessment in education and training* (pp. 63-78). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Darke, S. (1988). Effects of anxiety on inferential reasoning task performance. *Journal of Personality and Social Psychology*, 55(3), 499-505.
- Dede, C. J. (1990). The evolution of distance learning: Technology-mediated interactive learning. *Journal of Research on Computing in Education*, 22(1), 7-18.
- Diaz, D. P. (2002). Online drop rates revisited. *The Technology Source*. Retrieved October 19, 2004, from <http://ts.mivu.org/default.asp?show=issue&id=145>

- Dortch, K. D. (2003, April). *How to get learners to learn*. Paper presented at the Distance Education and Training Council: Report on the DETC 77th Annual Conference, Maui, Hawaii. Retrieved October 20, 2004, from http://www.detc.org/77th_conference.html
- Drazdowski, T. A., Holodick, N. A., & Scappaticci, F. T. (1998). Infusing technology into a teacher education program: Three different perspectives. *Journal of Technology and Teacher Education*, 6(23), 141-149.
- Driscoll, M. (2002). *Web-based training: Creating e-learning experiences*. San Francisco: Jossey-Bass/Pfeiffer.
- Dubois, J. R. (1996). Going the distance: A national distance learning initiative. *Adult Learning*, 8(1), 19-21.
- Dunn, S. (2000). The virtualizing of education. *The Futurist*, 34(2), 34-38.
- Dunn, R., & Dunn, K. (1993). *Teaching secondary students through their individual learning styles*. Boston: Allyn and Bacon.
- Ebeling, D. G. (2000). Adapting your teaching to any learning style. *Phi Delta Kappan*, 82(3), 247-248.
- Ehrman, M. (1990). Psychological factors and distance education. *The American Journal of Distance Education*, 4(1), 10-24.
- Farrell, E. (2003). Phoenix's unusual way of crafting courses. *Chronicle of Higher Education*, 49(23), A10.
- Farrington, G. C. (1999). *The new technologies and the future of residential undergraduate education, dancing with the devil: Information technology and the new competition in higher education*. San Francisco: Josey-Bass.

- Felder, R. M., & Silverman, L. K. (1988). Learning and teaching styles in engineering education. *Journal of Engineering Education*, 78(7), 674-681.
- Felder, R. M., & Spurlin, J. E. (2005). Applications, reliability and validity of the index of learning styles. *International Journal of Engineering Education*, 21(1), 103-112.
- Filbeck, G. & Smith, L. L. (1996). Learning styles, teaching strategies, and predictors of success in corporate finance. *Financial Practice and Education*, 6(1), 74-85.
- Freed, K. (1999). The history of distance learning. *Media Visions Journal*. Retrieved October 16, 2004, from <http://www.media-visions.com/ed-distlrn1.html>
- Froh, R. C., & Hawkes, M. (1996). Assessing student involvement in learning. In R. J. Menges & M. Weimer (Eds.), *Teaching on solid ground: Using scholarship to improve practice* (pp. 125-146). San Francisco: Jossey-Bass.
- Fulford, C., & Zhang, S., (1993). Predicting student satisfaction from perceptions of interaction in distance learning. In G. Davies and B. Samways (Eds.), *The Tele-teaching* (pp. 259-268). North Holland: Elsevier Science.
- Gagne' R. M., & Medsker K. L. (1996). *The conditions of learning: Training applications*. Belmont, CA: Wadsworth Group.
- Gallagher, R. (2003, March). *The next 20 years: How is online distance learning likely to evolve?* Paper presented at the 2003 UCEA 88th Annual Conference, Chicago, Illinois.
- Glatter, R., & Wedell, E. G. (1971). *Study by correspondence*. United Kingdom: Longman.
- Gunawardena, C. N., & Zittle, F. J. (1997). Social presence as a predictor of satisfaction within a computer-mediated conferencing environment. *American Journal of Distance Education*, 11(3), 8-26.

- Halsne, A. M., & Gatta. L. A. (2002). Online versus traditionally-delivers instruction: A descriptive study of learner characteristics in a community college setting. *Online Journal of Distance Learning Administration*, 5(1), 1-20. Retrieved October 15, 2004, from <http://www.westga.edu/%7Edistance/ojdla/spring51/halsne51.html>
- Ham, M. K. (2002). Students' perceptions of web-based distance learning courses. *Dissertations Abstracts International*, 63(04A), 3050298.
- Hancock, A. (1999). The evolving terrain of distance learning. *Satellite Communications*, 23(3), 1-4.
- Hara, N., & Kling, R. (1999). Students frustrations with web-based distance education courses. *First Monday*, 4(12). Retrieved October 20, 2004, from http://firstmonday.org/issues/issue4_12/hara/index.html
- Hayes, J., & Allinson, C. W. (1996). The implications of learning styles for training and development: A discussion of the matching hypothesis. *British Journal of Management*, 7(1), 63-73.
- Hiltz, S. (1994). *The virtual classroom: Learning without limits via computer networks*. Norwood, NJ: Ablex.
- Janasssesn, D. H. (1994). Thinking technology towards a constructivist design model. *Education Technology*, 34(3), 34-37.
- Johnstone, S. M., Ewell, P., & Paulson, K. (2002). Student learning as academic currency. *ACE Center for Policy Analysis*. Retrieved October, 15, 2004, from <http://www.acenet.edu/bookstore/pdf/distributed-learning/distributed-learning-04.pdf>

- Jones, R. (2003). A recommendation for managing the predicted growth in college enrollment at a time of adverse economic conditions. *Online Journal of Distance Learning Administration*, 6(1). Retrieved September 20, 2004, from <http://www.westga.edu/%7Edistance/ojdla/spring61/jones61.htm>
- Keegan, D. (1996). *Foundations of distance learning*. London: Routledge.
- Killion, J. (2001). Log on to learn. *Journal of Staff Development*, 21(3), 48-53.
- Knowles, M. S. (1980). *The modern practice of adult education: From pedagogy to andragogy*. Chicago: Follett.
- Knowles, M. S. (1989). *The making of an adult educator: An autobiographical journey*. San Francisco: Jossey-Bass.
- Knowles, M. S., Holton, E. F., III, & Swanson. (1989). *The adult learner*. Houston: Gulf.
- Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.
- Kolb, D. A. (1993). *Learning Style Inventory*. Boston: McBer and Company.
- LaFuze, J. E., Osborne, R. E., & McDaniel, A. (1998). Closing the distance with technology: Changing how we teach to meet student needs. Retrieved February 3, 2004, from http://www.ihets.org/progserv/education/distance/faculty_papers/1998/iupui2.html
- Lapadat, J. C. (2000). *Teaching online: Breaking new ground in collaborative thinking* [Electronic Version]. Paper presented at the annual conference of the Canadian Society for Study of Education Congress of the Social Sciences and Humanities, Edmonton, Alberta.

- LaRose, R., & Whitten, P. (2000). Re-thinking instructional immediacy for web courses: A social cognitive exploration. *Communication Education*, 49, 320-338.
- Lau, R. M. S. (2000). Issues and outlook of e-learning [Electronic Version]. *South Dakota Business Review*, 59(2), 1-6.
- Levin, J. S. (2001). *Globalizing the community college: Strategies for change in the twenty-first century*. New York: Palgrave.
- Lewis, L., Snow, K., Farris, E., & Levin, D. (1999). Distance education for postsecondary institutions: 1997-98. Washington, DC: U.S. Department of Education, National Center for Education Statistics.
- Lim, C. K. (2001). Computer self-efficacy, academic self-concept, and other predictors of satisfaction and future participation of adult learners. *American Journal of Distance Learning*, 15(2), 41-51.
- Lincoln, Y. S., & Guba, E. G. (1989). *Fourth generation evaluation*. Newbury Park: Sage.
- Livesay, G., Dee, K., Felder, R., Hites, L., Nauman, E., & O'Neal, E. (2002). Statistical evaluation of the Index of Learning Styles and Honey and Mumford's Learning Styles Questionnaires: How they compare and do they predict academic performance? *Psychology*, 20(3), 364-381.
- Matthews, D. (1999). The origins of distance education and its use in the United States. *T.H.E Journal*, 27(2), pp. 54-66.
- McGuinness, A. C. (2001). *State policy and postsecondary education*. Denver, Co: Educational Commission of the States.
- McNames, P. (1998). *Going the distance with distance education*. Retrieved February 3, 2004, from http://old.ihets.org/learntech/distance_ed/fdpapers/1998/technology.html

- Merriam, S. B., & Brockett, R. G. (1997). *The profession and practice of adult education*. San Francisco, CA: Jossey-Bass.
- Moore, M. G., & Kearsley, G. (1996). *Distance education: A systems view*. Belmont, California: Wadsworth.
- Moore, M. G., & Thompson, M. M. (1997). *The effects of distance learning*. University Park, PA: The Pennsylvania State University.
- Morphew, V. N. (2000). Web-based learning and instruction: A constructivist approach. In L. Lau (Ed.), *Distance learning technologies: Issues, trends, and opportunities* (pp. 1-15). London: Ideal Group.
- Mottet, T.P. (2000). Interactive television instructors' perceptions of students' nonverbal responsiveness and their influence on distance teaching. *Communication Education*, 49, 146-164.
- Navarro, P., & Shoemaker, J. (1999). The power of cyberlearning: An empirical test. *Journal of Computing in Higher Education*, 11, 29-54.
- Novek, E. M. (1996). Do professors dream of electronic sheep? Academic anxiety about the information age. (ERIC Clearinghouse on Resources ED399594).
- North Carolina Community College System. (2005). The North Carolina Community College System fact book. Retrieved May, 15, 2005, from <http://www.ncccs.cc.nc.us/Publications/docs/Publications/fb2005.pdf>.
- Offir, B., & Lev, Y. (1999). Teacher-learner interaction in the process of operating distance learning systems. *Educational Media International*, 36, 132-136.
- Pantazis, C. (2002). Maximizing e-learning to train the 21st century workforce. *Public Personnel Management*, 31(1), 21-26.

- Paulhus, D., & Christie, R. (1981). Spheres of control: An interactionist approach to assessment of perceived control. In H. M. Lefcourt (Ed.), *Research with the locus of control aspect* (pp. 161-188). New York: Academic Press.
- Pitcher, N., Davidson, K., & Goldfinch, J. (2000). Videoconferencing in higher education. *Innovations in Education and Training International*, 37, 199-209.
- Powers, S. M. & Guan, S. (2000). Examining the range of student needs in the design and development of a web-based course. In B. Abbey (Ed.), *Instructional and cognitive impacts of web-based education* (pp. 200-216). London: Ideal Group.
- Prensky, M. (1998). Bankers trust: Training is all fun and games. *HR Focus*, 75(10), 11-12.
- Ranieri, P. W. (1998). *Measuring ourselves: Adapting a first-year writing course for distance education*. Retrieved February 3, 2004, from http://www.ihets.org/progserv/education/distance/faculty_papers/1998/bsu1.html
- Rotter, J. (1999). Internal versus external control of reinforcement. *American Psychologist*, 45(4), 489-493.
- Rudestam, K. E., & Schoenholtz-Read, J. (2002). *Handbook of online learning: Innovations in higher education and corporate training*. Thousand Oaks, CA: Sage.
- Russell, T. L. (1999). *The no significant difference phenomenon*. Raleigh: North Carolina State University. Retrieved October 20, 2004, from <http://www.nosignificantdifference.org>
- Saba, F. (1999). Helping students learn online: Learning how to learn. *Distance Education Report*, 3(2), 3-10.

- Sanders, D. W., & Morrison-Shetlar, A. I. (2002). Student attitudes toward web-enhanced instruction in an introductory biology course. *Journal of Research on Computing in Education*, 33(3), 251-262.
- Sewart, D. (1987). *Staff development needs in distance education and campus-based education: Are they so different?* London: Croom Helm.
- Shank, P., & Sitze, A. (2004). *Making sense of online learning: A guide to beginners and the truly skeptical*. San Francisco: Pfieffer.
- Shea-Shultz, H., & Fogarty, J. (2002). *Online learning today: Strategies that work*. San Francisco: Berrett-Koehler.
- Short, J., Williams, E., & Christie, B. (1976). *The social psychology of communications*. London: Wiley.
- Schroeder, C. (1993, September). New participants - new learning styles. *Change*, 21-26.
- Silberman, M. (1998). *Active training: A handbook of techniques, designs, case examples, and tips*. San Francisco: Jossey-Bass.
- Sloman, M. (2002). *The e-learning revolution*. New York: Amacom.
- Spooner, F., Jordan, L., Algozzine, B. & Spooner, M. (1999). Student ratings of instruction in the distance learning and on-campus classes. *Journal of Educational Research*, 92, 132-141.
- Taylor, J. (1998). Learning styles: A practical tool for improved communications. *Supervision*, 59(7), 18-19.
- Theall, M., & Franklin, J. (2000). Creating a responsive student rating systems to improve evaluation practice. In K. E. Ryan (Ed.), *Evaluating teaching in higher education: A vision for the future* (pp. 95-107). San Francisco: Jossey Bass.

The Institute for Learning Styles Research, (1999). The seven perceptual learning styles.

Retrieved October 3, 2004, from <http://www.learningstyles.org>

Tuckman, B. W. (1999). *Conducting educational research* (5th ed.). Belmont, CA:

Wadsworth.

University of Phoenix. (2004). The nation's leading online university. Retrieved October 15, 2004, from <http://www.uopxonline.com/aboutus.asp>

Van Zwanenberg, N., Wilkinson, L. J., & Anderson, A. (2000). Felder and Silverman's Index of Learning Styles and Honey and Mumford's Learning Style Questionnaire: How do they compare and how do they predict? *Education Psychology*, 20(3), 365-381.

Verduin, John R., & Clark, T. A. (1991). *Distance education: The foundations of effective practice*. San Francisco, CA: Jossey-Bass.

Wade, W. (1999). Assessment in distance learning: What do students know and how do we know that they know it? *T.H.E Journal*, 27(3), 94-100.

Whalen, T., & Wright, D. (2000). *The business case for web-based training*. Norwood, MA: Artech House.

Wlodkowski, R. J. (1993). *Enhancing adult motivation to learn*. San Francisco: Jossey-Bass.

Wlodkowski, R. J. (1999). *Enhancing adult motivation to learn* (Rev. ed.). San Francisco: Jossey-Bass.

Zwyno, M. S. (2003). A contribution to the validation of score meaning for Felder-Soloman's Index of Learning Styles. Presented at the Proceedings of the 2003 American Society for Engineering Education Annual Conference & Exposition, Session 2351. Retrieved October 15, 2004, from http://ncsu.edu/felderpublic/ILSdir/zwyno_validation_study_.pdf

APPENDIX A

ILS and HDLPS Questionnaire

**Learning Styles and Students' Perceptions of Satisfaction
in Community College Web-based Learning Environments Survey**

INFORMED CONSENT FORM

Principal Investigator: David R. Shockley, Graduate Student in Adult and Community College Education

You are invited to participate in a research study. The purpose of this study is to examine students' ability to learn course outcomes when they are delivered through technology. If you are under 18 years of age, you may not participate in this study.

INFORMATION

1. You will be asked to complete one survey, which is a self-assessment of your learning style and satisfaction with web-based courses. The survey will take approximately 25 minutes to complete.

RISKS

College students who have participated in similar research in the past report feeling very little to no distress. If you are feeling uncomfortable at any point when completing the survey, you may withdraw from the study with no penalty. Please feel free to ask any questions at any time.

BENEFITS

While you will not benefit directly from this study, you will be helping to improve and possibly expand different web-based technology enhanced methods of learning.

CONFIDENTIALITY

The information in the study records will be kept strictly confidential. Data will be stored securely and will be made available only to persons conducting the study. No reference will be made in oral or written reports which could link you to the study.

CONTACT

If you have questions at any time about the study or the procedures, you may contact the researcher, principal investigator

David R. Shockley, dshockley@cccti.edu or 828-726-2722. If you feel you have not been treated according to the descriptions in this form, or your rights as a participant in research have been violated during the course of this study, you may contact Dr. Matthew Zingraff, Chair of the NCSU IRB for the Use of Human Subjects in Research Committee, Box 7514, NCSU Campus (919/513-1834) or Mr. Matthew Ronning, Assistant Vice Chancellor, Research Administration, Box 7514, NCSU Campus (919/513-2148)

PARTICIPATION

Your participation in this study is voluntary; you may decline to participate without penalty. *All participants in the study will be the subjects will be included in a drawing for one of four \$50.00 cashiers check, one per college.* If you decide to participate, you may withdraw from the study at any time without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed, your data will be returned to you or destroyed.

CONSENT

If you have read and understand the above information and agree to participate with the understanding that you may withdraw at any time without penalty, please sign and date the appropriate spaces at the bottom of the page.

Signature

Date

ILS and HDLPS Questionnaire

Instructions

To complete this survey, click on your choice of response for each question or item. Once you have completed the Section 1 of the survey, please read the directions for Section 2 before completing the survey.

SECTION 1

ILS LEARNING STYLE ASSESSMENT

1. I understand something better after I
 - (a) try it out.
 - (b) think it through.
2. I would rather be considered
 - (a) realistic.
 - (b) innovative.
3. When I think about what I did yesterday, I am most likely to get
 - (a) a picture.
 - (b) words.
4. I tend to
 - (a) understand details of a subject but may be fuzzy about its overall structure.
 - (b) understand the overall structure but may be fuzzy about details.
5. When I am learning something new, it helps me to
 - (a) talk about it.
 - (b) think about it.
6. If I were a teacher, I would rather teach a course
 - (a) that deals with facts and real life situations.
 - (b) that deals with ideas and theories.
7. I prefer to get new information in
 - (a) pictures, diagrams, graphs, or maps.
 - (b) written directions or verbal information.
8. Once I understand
 - (a) all the parts, I understand the whole thing.
 - (b) the whole thing, I see how the parts fit.
9. In a study group working on difficult material, I am more likely to
 - (a) jump in and contribute ideas.
 - (b) sit back and listen.

10. I find it easier
 - (a) to learn facts.
 - (b) to learn concepts.
11. In a book with lots of pictures and charts, I am likely to
 - (a) look over the pictures and charts carefully.
 - (b) focus on the written text.
12. When I solve math problems
 - (a) I usually work my way to the solutions one step at a time.
 - (b) I often just see the solutions but then have to struggle to figure out the steps to get to them.
13. In classes I have taken
 - (a) I have usually gotten to know many of the students.
 - (b) I have rarely gotten to know many of the students.
14. In reading nonfiction, I prefer
 - (a) something that teaches me new facts or tells me how to do something.
 - (b) something that gives me new ideas to think about.
15. I like teachers
 - (a) who put a lot of diagrams on the board.
 - (b) who spend a lot of time explaining.
16. When I'm analyzing a story or a novel
 - (a) I think of the incidents and try to put them together to figure out the themes.
 - (b) I just know what the themes are when I finish reading and then I have to go back and find the incidents that demonstrate them.
17. When I start a homework problem, I am more likely to
 - (a) start working on the solution immediately.
 - (b) try to fully understand the problem first.
18. I prefer the idea of
 - (a) certainty.
 - (b) theory.
19. I remember best
 - (a) what I see.
 - (b) what I hear.
20. It is more important to me that an instructor
 - (a) lay out the material in clear sequential steps.
 - (b) give me an overall picture and relate the material to other subjects.
21. I prefer to study
 - (a) in a study group.
 - (b) alone.

22. I am more likely to be considered
- (a) careful about the details of my work.
 - (b) creative about how to do my work.
23. When I get directions to a new place, I prefer
- (a) a map.
 - (b) written instructions.
24. I learn
- (a) at a fairly regular pace. If I study hard, I'll "get it."
 - (b) in fits and starts. I'll be totally confused and then suddenly it all "clicks."
25. I would rather first
- (a) try things out.
 - (b) think about how I'm going to do it.
26. When I am reading for enjoyment, I like writers to
- (a) clearly say what they mean.
 - (b) say things in creative, interesting ways.
27. When I see a diagram or sketch in class, I am most likely to remember
- (a) the picture.
 - (b) what the instructor said about it.
28. When considering a body of information, I am more likely to
- (a) focus on details and miss the big picture.
 - (b) try to understand the big picture before getting into the details.
29. I more easily remember
- (a) something I have done.
 - (b) something I have thought a lot about.
30. When I have to perform a task, I prefer to
- (a) master one way of doing it.
 - (b) come up with new ways of doing it.
31. When someone is showing me data, I prefer
- (a) charts or graphs.
 - (b) text summarizing the results.
32. When writing a paper, I am more likely to
- (a) work on (think about or write) the beginning of the paper and progress forward.
 - (b) work on (think about or write) different parts of the paper and then order them.
33. When I have to work on a group project, I first want to
- (a) have "group brainstorming" where everyone contributes ideas.
 - (b) brainstorm individually and then come together as a group to compare ideas.

34. I consider it higher praise to call someone
- (a) sensible.
 - (b) imaginative.
35. When I meet people at a party, I am more likely to remember
- (a) what they looked like.
 - (b) what they said about themselves.
36. When I am learning a new subject, I prefer to
- (a) stay focused on that subject, learning as much about it as I can.
 - (b) try to make connections between that subject and related subjects.
37. I am more likely to be considered
- (a) outgoing.
 - (b) reserved.
38. I prefer courses that emphasize
- (a) concrete material (facts, data).
 - (b) abstract material (concepts, theories).
39. For entertainment, I would rather
- (a) watch television.
 - (b) read a book.
40. Some teachers start their lectures with an outline of what they will cover. Such outlines are
- (a) somewhat helpful to me.
 - (b) very helpful to me.
41. The idea of doing homework in groups, with one grade for the entire group,
- (a) appeals to me.
 - (b) does not appeal to me.
42. When I am doing long calculations,
- (a) I tend to repeat all my steps and check my work carefully.
 - (b) I find checking my work tiresome and have to force myself to do it.
43. I tend to picture places I have been
- (a) easily and fairly accurately.
 - (b) with difficulty and without much detail.
44. When solving problems in a group, I would be more likely to
- (a) think of the steps in the solution process.
 - (b) think of possible consequences or applications of the solution in a wide range of areas.

SECTION 2: HDLPS: PERCEPTIONS OF SATISFACTION

Instructions: To complete this survey, select your choice of response for each question or item. Several items will request that you rate perceptions about the statement on a scale with each end of the scale labeled. Pick the number along the continuum that represents how strongly you disagree or agree with the statement

Which of the following best describes your experience with computers?

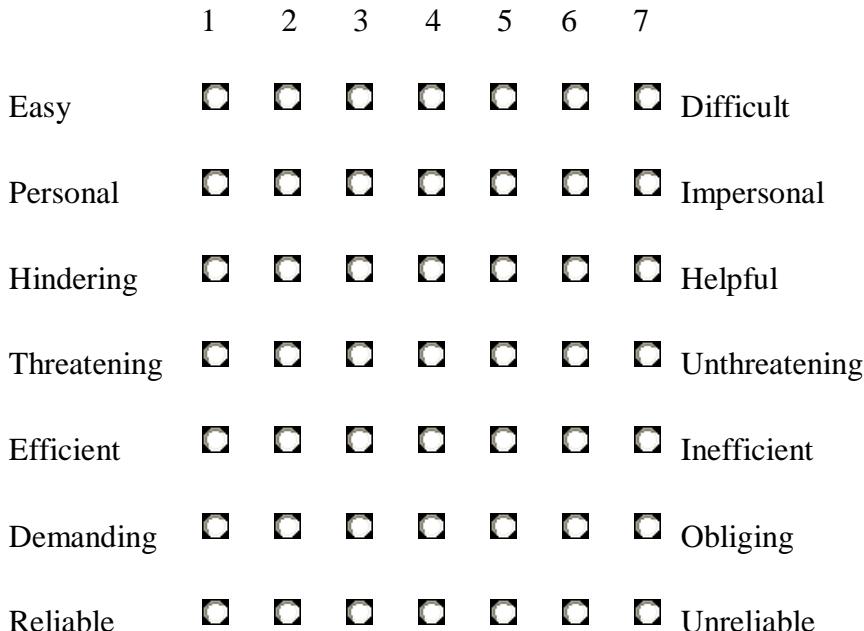
- I am a novice: seldom or never use computers.
- I occasionally use computers.
- I frequently use a computer at home.
- Use of computers is central to my professional work.
- Use of computers is central to my studies.

Which of the following best describes your experience with the World Wide Web?

- I am a novice: seldom if ever use the World Wide Web.
- I occasionally surf the World Wide Web.
- I frequently surf the World Wide Web at home.
- Use of the World Wide Web is central to my professional work.
- Use of the World Wide Web is central to my studies.

For each of the following pairs of words, on a scale of 1 to 7 please indicate the response that is closest to your CURRENT FEELINGS ABOUT USING COMPUTERS. For instance, for the first pair of words, if you feel computers in general are "completely stimulating" to use and not at all "dull", check "1"; "4" means that you are undecided or think that they are equally likely to be stimulating or dull; "3" means you feel that they are slightly more stimulating than dull, etc.

For each of the following pairs of words, on a scale of 1 to 7 please indicate the response that is closest to your CURRENT FEELINGS ABOUT THE WORLD WIDE WEB. For instance, for the first pair of words, if you feel that the World Wide Web in general is "completely stimulating" to use and not at all "dull", check "1"; "4" means that you are undecided or think that they are equally likely to be stimulating or dull; "3" means you feel that they are slightly more stimulating than dull, etc.



Course Participation

Which of the following learning activities were included as part of your course?

Check all that apply

- Live online chat discussions
- Web-based small group collaborative projects
- Bulletin board/conference discussions
- Student development list of supplemental web sites (bibliography)
- Student home pages
- Web-based reading assignments
- None of the above
- Other _____

In which of the following learning activities was participation required as part of your grade?

Check all that apply

- Live online chat discussions
- Web-based small group collaborative projects
- Bulletin board/conference discussions
- Student development list of supplemental web sites (bibliography)
- Student home pages
- Web-based reading assignments
- None of the above
- Other _____

On a scale of 1 to 7 indicate how strongly you agree or disagree. (1= Strongly Disagree; 7 = Strongly Agree)

QUESTION							
	Strongly Disagree		Strongly Agree				
	1	2	3	4	5	6	7
28. I spent too much time surfing the Web instead of studying.	<input type="radio"/>						
29. I would recommend taking a web-based course to friends or associates.	<input type="radio"/>						
30. I found learning online to be very frustrating.	<input type="radio"/>						
31. This course contributed to my educational, professional or personal development.	<input type="radio"/>						
32. This was one of the best courses that I have taken.	<input type="radio"/>						
33. The pace of the course was just about right for me.	<input type="radio"/>						
34. Overall, I was very satisfied with this web-based learning experience.	<input type="radio"/>						

What one or two things did you like BEST about your web-based course?

What one or two things did you like LEAST about your web-based course?

If you feel that any of the following items invade your privacy, you are free to decline to answer them.

I am: Female Male

My age at my last birthday:

- 18-24
- 25-34
- 35-44
- 45-54
- 55 or older

How many web-based courses have you previously taken?

- None
- One
- Two or more

Estimate how much time you spent **EACH WEEK** on this course including all online and offline activities associated with the course?

- Less than one hour
- 1 – 2 hours
- 3 – 5 hours
- 6 – 9 hours
- 10 – 12 hours
- 13 or more hours

I am enrolled in web-based courses at:

- Caldwell Community College
- Catawba Valley Community College
- Western Piedmont Community College
- Wilkes Community College

APPENDIX B**ILS Scoring Sheet**

ILS SCORING SHEET

1. Put "1"s in the appropriate spaces in the table below (e.g. if you answered "a" to Question 3, put a "1" in Column A by Question 3).
 2. Total the columns and write the totals in the indicated spaces.
 3. For each of the four scales, subtract the smaller total from the larger one. Write the difference (1 to 11) and the letter (a or b) for which the total was larger on the bottom line.
- For example, if under "ACT/REF" you had 4 "a" and 7 "b" responses, you would write "3b" on the bottom line under that heading..
4. On the next page, mark "X"s above your scores on each of the four scales.

ACT/REF			SNS/INT			VIS/VRB			SEQ/GLO		
Q	a	b	Q	a	b	Q	a	b	Q	a	b
1	—	—	2	—	—	3	—	—	4	—	—
5	—	—	6	—	—	7	—	—	8	—	—
9	—	—	10	—	—	11	—	—	12	—	—
13	—	—	14	—	—	15	—	—	16	—	—
17	—	—	18	—	—	19	—	—	20	—	—
21	—	—	22	—	—	23	—	—	24	—	—
25	—	—	26	—	—	27	—	—	28	—	—
29	—	—	30	—	—	31	—	—	32	—	—
33	—	—	34	—	—	35	—	—	36	—	—
37	—	—	38	—	—	39	—	—	40	—	—
41	—	—	42	—	—	43	—	—	44	—	—
Total (sum X's in each column)											
ACT/REF			SNS/INT			VIS/VRB			SEQ/GLO		
a	b		a	b		a	b		a	b	
—	—	—	—	—	—	—	—	—	—	—	—
(Larger – Smaller) + Letter of Larger (see below*)											
—	—	—	—	—	—	—	—	—	—	—	—

*Example: If you totaled 3 for a and 8 for b, you would enter 5b in the space below.

Transfer your scores to the ILS report form by placing X's at the appropriate locations on the four scales.

ILS REPORT FORM

ACT _____ **REF** _____

11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b
-----	----	----	----	----	----	----	----	----	----	----	-----

SEN _____ **INT** _____

11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b
-----	----	----	----	----	----	----	----	----	----	----	-----

VIS _____ **VRB** _____

11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b
-----	----	----	----	----	----	----	----	----	----	----	-----

SEQ _____ **GLO** _____

11a	9a	7a	5a	3a	1a	1b	3b	5b	7b	9b	11b
-----	----	----	----	----	----	----	----	----	----	----	-----

If your score on a scale is 1-3, you are fairly well balanced on the two dimensions of that scale.

If your score on a scale is 5 or 7, you have a moderate preference for one dimension of the scale and will learn more easily in a teaching environment which favors that dimension.

If your score on a scale is 9 or 11, you have a very strong preference for one dimension of the scale. You may have real difficulty learning in an environment which does not support that preference.

See "Learning Styles and Strategies" by Richard Felder and Barbara Solomon for explanations of your preferences on the individual scales.

APPENDIX C

Null Hypotheses Research Questions

Research Question 1: What are the associations between learning styles and the perceptions of satisfaction with computers among community college students enrolled in web-based courses?

Null Hypotheses:

H_{1a} : There is no association between the Active-Reflective learning style dimension and the perceptions of computers being stimulating among community college students enrolled in web-based courses.

H_{1b} : There is no association between the Active-Reflective learning style dimension and the perceptions of computers being fun among community college students enrolled in web-based courses.

H_{1c} : There is no association between the Active-Reflective learning style dimension and the perceptions of computers being easy among community college students enrolled in web-based courses.

H_{1d} : There is no association between the Active-Reflective learning style dimension and the perceptions of computers being personal among community college students enrolled in web-based courses.

H_{1e} : There is no association between the Active-Reflective learning style dimension and the perceptions of computers being hindering among community college students enrolled in web-based courses.

H_{1f} : There is no association between the Active-Reflective learning style dimension and the perceptions of computers being threatening among community college students enrolled in web-based courses.

H_{1g} : There is no association between the Active-Reflective learning style dimension and the perceptions of computers being efficient among community college students enrolled in web-based courses.

H_{1h} : There is no association between the Active-Reflective learning style dimension and the perceptions of computers being demanding among community college students enrolled in web-based courses.

H_{1i} : There is no association between the Active-Reflective learning style dimension and the perceptions of computers being reliable among community college students enrolled in web-based courses.

H_{1j} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of computers being stimulating among community college students enrolled in web-based courses.

H_{1k} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of computers being fun among community college students enrolled in web-based courses.

H_{1l} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of computers being easy among community college students enrolled in web-based courses.

H_{1m} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of computers being personal among community college students enrolled in web-based courses.

H_{1n} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of computers being hindering among community college students enrolled in web-based courses.

H_{1o} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of computers being threatening among community college students enrolled in web-based courses.

H_{1p} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of computers being efficient among community college students enrolled in web-based courses.

H_{1q} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of computers being demanding among community college students enrolled in web-based courses.

H_{1r} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of computers being reliable among community college students enrolled in web-based courses.

H_{1s} : There is no association between the Verbal/Visual learning style dimension and the perceptions of computers being stimulating among community college students enrolled in web-based courses.

H_{1t} : There is no association between the Verbal/Visual learning style dimension and the perceptions of computers being fun among community college students enrolled in web-based courses.

H_{1u} : There is no association between the Verbal/Visual learning style dimension and the perceptions of computers being easy among community college students enrolled in web-based courses.

H_{1v} : There is no association between the Verbal/Visual learning style dimension and the perceptions of computers being personal among community college students enrolled in web-based courses.

H_{1w} : There is no association between the Verbal/Visual learning style dimension and the perceptions of computers being hindering among community college students enrolled in web-based courses.

H_{1x} : There is no association between the Verbal/Visual learning style dimension and the perceptions of computers being threatening among community college students enrolled in web-based courses.

H_{1y} : There is no association between the Verbal/Visual learning style dimension and the perceptions of computers being efficient among community college students enrolled in web-based courses.

H_{1z} : There is no association between the Verbal/Visual learning style dimension and the perceptions of computers being demanding among community college students enrolled in web-based courses.

H_{1aa} : There is no association between the Verbal/Visual learning style dimension and the perceptions of computers being reliable among community college students enrolled in web-based courses.

H_{1bb} : There is no association between the Sequential-Global learning style dimension and the perceptions of computers being stimulating among community college students enrolled in web-based courses.

H_{1cc} : There is no association between the Sequential-Global learning style dimension and the perceptions of computers being fun among community college students enrolled in web-based courses.

H_{1dd} : There is no association between the Sequential-Global learning style dimension and the perceptions of computers being easy among community college students enrolled in web-based courses.

H_{1ee} : There is no association between the Sequential-Global learning style dimension and the perceptions of computers being personal among community college students enrolled in web-based courses.

H_{1ff} : There is no association between the Sequential-Global learning style dimension and the perceptions of computers being hindering among community college students enrolled in web-based courses.

H_{1gg} : There is no association between the Sequential-Global learning style dimension and the perceptions of computers being threatening among community college students enrolled in web-based courses.

H_{1hh} : There is no association between the Sequential-Global learning style dimension and the perceptions of computers being efficient among community college students enrolled in web-based courses.

H_{1ij} : There is no association between the Sequential-Global learning style dimension and the perceptions of computers being demanding among community college students enrolled in web-based courses.

H_{1jj} : There is no association between the Sequential-Global learning style dimension and the perceptions of computers being reliable among community college students enrolled in web-based courses.

Research Question 2: What are the associations between learning styles and the perceptions of satisfaction with the World Wide Web among community college students enrolled in web-based courses?

Null Hypotheses:

H_{2a} : There is no association between the Active-Reflective learning style dimension and the perceptions of the World Wide Web being stimulating among community college students enrolled in web-based courses.

H_{2b} : There is no association between the Active-Reflective learning style dimension and the perceptions of the World Wide Web being fun among community college students enrolled in web-based courses.

H_{2c} : There is no association between the Active-Reflective learning style dimension and the perceptions of the World Wide Web being easy among community college students enrolled in web-based courses.

H_{2d} : There is no association between the Active-Reflective learning style dimension and the perceptions of the World Wide Web being personal among community college students enrolled in web-based courses.

H_{2e}: There is no association between the Active-Reflective learning style dimension and the perceptions of the World Wide Web being hindering among community college students enrolled in web-based courses.

H_{2f}: There is no association between the Active-Reflective learning style dimension and the perceptions of the World Wide Web being threatening among community college students enrolled in web-based courses.

H_{2g}: There is no association between the Active-Reflective learning style dimension and the perceptions of the World Wide Web being efficient among community college students enrolled in web-based courses.

H_{2h}: There is no association between the Active-Reflective learning style dimension and the perceptions of the World Wide Web being demanding among community college students enrolled in web-based courses.

H_{2i}: There is no association between the Active-Reflective learning style dimension and the perceptions of the World Wide Web being reliable among community college students enrolled in web-based courses.

H_{2j}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of the World Wide Web being stimulating among community college students enrolled in web-based courses.

H_{2k}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of the World Wide Web being fun among community college students enrolled in web-based courses.

H_{2l}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of the World Wide Web being easy among community college students enrolled in web-based courses.

H_{2m}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of the World Wide Web being personal among community college students enrolled in web-based courses.

H_{2n}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of the World Wide Web being hindering among community college students enrolled in web-based courses.

H_{2o}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of the World Wide Web being threatening among community college students enrolled in web-based courses.

H_{2p}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of the World Wide Web being efficient among community college students enrolled in web-based courses.

H_{2q}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of the World Wide Web being demanding among community college students enrolled in web-based courses.

H_{2r}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of the World Wide Web being reliable among community college students enrolled in web-based courses.

H_{2s}: There is no association between the Verbal/Visual learning style dimension and the perceptions of the World Wide Web being stimulating among community college students enrolled in web-based courses.

H_{2t}: There is no association between the Verbal/Visual learning style dimension and the perceptions of the World Wide Web being fun among community college students enrolled in web-based courses.

H_{2u}: There is no association between the Verbal/Visual learning style dimension and the perceptions of the World Wide Web being easy among community college students enrolled in web-based courses.

H_{2v}: There is no association between the Verbal/Visual learning style dimension and the perceptions of the World Wide Web being personal among community college students enrolled in web-based courses.

H_{2w}: There is no association between the Verbal/Visual learning style dimension and the perceptions of the World Wide Web being hindering among community college students enrolled in web-based courses.

H_{2x}: There is no association between the Verbal/Visual learning style dimension and the perceptions of the World Wide Web being threatening among community college students enrolled in web-based courses.

H_{2y}: There is no association between the Verbal/Visual learning style dimension and the perceptions of the World Wide Web being efficient among community college students enrolled in web-based courses.

H_{2z}: There is no association between the Verbal/Visual learning style dimension and the perceptions of the World Wide Web being demanding among community college students enrolled in web-based courses.

H_{2aa}: There is no association between the Verbal/Visual learning style dimension and the perceptions of the World Wide Web being reliable among community college students enrolled in web-based courses.

H_{2bb}: There is no association between the Sequential-Global learning style dimension and the perceptions of the World Wide Web being stimulating among community college students enrolled in web-based courses.

H_{2cc}: There is no association between the Sequential-Global learning style dimension and the perceptions of the World Wide Web being fun among community college students enrolled in web-based courses.

H_{2dd}: There is no association between the Sequential-Global learning style dimension and the perceptions of the World Wide Web being easy among community college students enrolled in web-based courses.

H_{2ee}: There is no association between the Sequential-Global learning style dimension and the perceptions of the World Wide Web being personal among community college students enrolled in web-based courses.

H_{2ff}: There is no association between the Sequential-Global learning style dimension and the perceptions of the World Wide Web being hindering among community college students enrolled in web-based courses.

H_{2gg} : There is no association between the Sequential-Global learning style dimension and the perceptions of the World Wide Web being threatening among community college students enrolled in web-based courses.

H_{2hh} : There is no association between the Sequential-Global learning style dimension and the perceptions of the World Wide Web being efficient among community college students enrolled in web-based courses.

H_{2ii} : There is no association between the Sequential-Global learning style dimension and the perceptions of the World Wide Web being demanding among community college students enrolled in web-based courses.

H_{2jj} : There is no association between the Sequential-Global learning style dimension and the perceptions of the World Wide Web being reliable among community college students enrolled in web-based courses.

Research Question 3: What are the associations between learning styles and the perceptions of satisfaction with the level of interaction among community college students enrolled in web-based courses?

Null Hypotheses:

H_{3a} : There is no association between the Active-Reflective learning style dimension and the perceptions of online discussions among community college students enrolled in web-based courses.

H_{3b} : There is no association between the Active-Reflective learning style dimension and the perceptions of online discussion sessions among community college students enrolled in web-based courses.

H_{3c}: There is no association between the Active-Reflective learning style dimension and the perceptions of bulletin boards among community college students enrolled in web-based courses.

H_{3d}: There is no association between the Active-Reflective learning style dimension and the perceptions of web conference discussions among community college students enrolled in web-based courses.

H_{3e}: There is no association between the Active-Reflective learning style dimension and the perceptions of chat rooms among community college students enrolled in web-based courses.

H_{3f}: There is no association between the Active-Reflective learning style dimension and the perceptions of live chats among community college students enrolled in web-based courses.

H_{3g}: There is no association between the Active-Reflective learning style dimension and the perceptions of online group activities among community college students enrolled in web-based courses.

H_{3h}: There is no association between the Active-Reflective learning style dimension and the perceptions of collaborative activities among community college students enrolled in web-based courses.

H_{3i}: There is no association between the Active-Reflective learning style dimension and the perceptions of resource web sites among community college students enrolled in web-based courses.

H_{3j}: There is no association between the Active-Reflective learning style dimension and the perceptions of student home pages among community college students enrolled in web-based courses.

H_{3k}: There is no association between the Active-Reflective learning style dimension and the perceptions of social interaction among community college students enrolled in web-based courses.

H_{3l}: There is no association between the Active-Reflective learning style dimension and the perceptions of online lecture notes among community college students enrolled in web-based courses.

H_{3m}: There is no association between the Active-Reflective learning style dimension and the perceptions of computer conferencing among community college students enrolled in web-based courses.

H_{3n}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of online discussions among community college students enrolled in web-based courses.

H_{3o}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of online discussion sessions among community college students enrolled in web-based courses.

H_{3p}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of bulletin boards among community college students enrolled in web-based courses.

H_{3q}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of web conference discussions among community college students enrolled in web-based courses.

H_{3r}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of chat rooms among community college students enrolled in web-based courses.

H_{3s}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of live chats among community college students enrolled in web-based courses.

H_{3t}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of group activities among community college students enrolled in web-based courses.

H_{3u}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of collaborative activities among community college students enrolled in web-based courses.

H_{3v}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of resource web sites among community college students enrolled in web-based courses.

H_{3w}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of student home pages among community college students enrolled in web-based courses.

H_{3x}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of social interaction among community college students enrolled in web-based courses.

H_{3y}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of online lecture notes among community college students enrolled in web-based courses.

H_{3z}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of computer conferencing among community college students enrolled in web-based courses.

H_{3aa}: There is no association between the Verbal/Visual learning style dimension and the perceptions of online discussions among community college students enrolled in web-based courses.

H_{3bb}: There is no association between the Verbal/Visual learning style dimension and the perceptions of online discussion sessions among community college students enrolled in web-based courses.

H_{3cc}: There is no association between the Verbal/Visual learning style dimension and the perceptions of bulletin boards among community college students enrolled in web-based courses.

H_{3dd}: There is no association between the Verbal/Visual learning style dimension and the perceptions of web conference discussions among community college students enrolled in web-based courses.

H_{3ee} : There is no association between the Verbal/Visual learning style dimension and the perceptions of chat rooms among community college students enrolled in web-based courses.

H_{3ff} : There is no association between the Verbal/Visual learning style dimension and the perceptions of live chats among community college students enrolled in web-based courses.

H_{3gg} : There is no association between the Verbal/Visual learning style dimension and the perceptions of collaborative activities among community college students enrolled in web-based courses.

H_{3hh} : There is no association between the Verbal/Visual learning style dimension and the perceptions of group activities among community college students enrolled in web-based courses.

H_{3ii} : There is no association between the Verbal/Visual learning style dimension and the perceptions of resource web sites among community college students enrolled in web-based courses.

H_{3jj} : There is no association between the Verbal/Visual learning style dimension and the perceptions of student home pages among community college students enrolled in web-based courses.

H_{3kk} : There is no association between the Verbal/Visual learning style dimension and the perceptions of social interaction among community college students enrolled in web-based courses.

H_{3ll} : There is no association between the Verbal/Visual learning style dimension and the perceptions of online lecture notes among community college students enrolled in web-based courses.

H_{3mm} : There is no association between the Verbal/Visual learning style dimension and the perceptions of computer conferencing among community college students enrolled in web-based courses.

H_{3nn} : There is no association between the Sequential-Global learning style dimension and the perceptions of online discussions among community college students enrolled in web-based courses.

H_{3oo} : There is no association between the Sequential-Global learning style dimension and the perceptions of online discussion sessions among community college students enrolled in web-based courses.

H_{3pp} : There is no association between the Sequential-Global learning style dimension and the perceptions of bulletin boards among community college students enrolled in web-based courses.

H_{3qq} : There is no association between the Sequential-Global learning style dimension and the perceptions of web conference discussions among community college students enrolled in web-based courses.

H_{3rr} : There is no association between the Sequential-Global learning style dimension and the perceptions of chat rooms among community college students enrolled in web-based courses.

H_{3ss} : There is no association between the Sequential-Global learning style dimension and the perceptions of live chats among community college students enrolled in web-based courses.

H_{3tt} : There is no association between the Sequential-Global learning style dimension and the perceptions of collaborative activities among community college students enrolled in web-based courses.

H_{3uu} : There is no association between the Sequential-Global learning style dimension and the perceptions of group activities among community college students enrolled in web-based courses.

H_{3vv} : There is no association between the Sequential-Global learning style dimension and the perceptions of resource web sites among community college students enrolled in web-based courses.

H_{3ww} : There is no association between the Sequential-Global learning style dimension and the perceptions of student home pages among community college students enrolled in web-based courses.

H_{3xx} : There is no association between the Sequential-Global learning style dimension and the perceptions of social interaction among community college students enrolled in web-based courses.

H_{3yy} : There is no association between the Sequential-Global learning style dimension and the perceptions of online lecture notes among community college students enrolled in web-based courses.

H_{3zz} : There is no association between the Sequential-Global learning style dimension and the perceptions of computer conferencing among community college students enrolled in web-based courses.

Research Question 4: What are the associations between learning styles and the perceptions of satisfaction with instructor feedback among community college students enrolled in web-based courses?

Null Hypotheses:

H_{4a} : There is no association between the Active-Reflective learning style dimension and the perceptions of timely instructor email access among community college students enrolled in web-based courses.

H_{4b} : There is no association between the Active-Reflective learning style dimension and the perceptions of instructor email connection among community college students enrolled in web-based courses.

H_{4c} : There is no association between the Active-Reflective learning style dimension and the perceptions of 24 hour instructor feedback among community college students enrolled in web-based courses.

H_{4d} : There is no association between the Active-Reflective learning style dimension and the perceptions of motivation among community college students enrolled in web-based courses.

H_{4e} : There is no association between the Active-Reflective learning style dimension and the perceptions of delay in instructor feedbacks among community college students enrolled in web-based courses.

H_{4f}: There is no association between the Active-Reflective learning style dimension and the perceptions of frequently asked questions among community college students enrolled in web-based courses.

H_{4g}: There is no association between the Active-Reflective learning style dimension and the perceptions of returned assignments among community college students enrolled in web-based courses.

H_{4h}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of timely instructor email access among community college students enrolled in web-based courses.

H_{4i}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of instructor email access connection among community college students enrolled in web-based courses.

H_{4j}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of 24 hour instructor feedback among community college students enrolled in web-based courses.

H_{4k}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of motivation among community college students enrolled in web-based courses.

H_{4l}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of delay in instructor feedbacks among community college students enrolled in web-based courses.

H_{4m}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of frequently asked questions among community college students enrolled in web-based courses.

H_{4n}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of returned assignments among community college students enrolled in web-based courses.

H_{4o}: There is no association between the Verbal/Visual learning style dimension and the perceptions of timely instructor email access among community college students enrolled in web-based courses.

H_{4p}: There is no association between the Verbal/Visual learning style dimension and the perceptions of instructor email access connection among community college students enrolled in web-based courses.

H_{4q}: There is no association between the Verbal/Visual learning style dimension and the perceptions of 24 hour instructor feedback among community college students enrolled in web-based courses.

H_{4r}: There is no association between the Verbal/Visual learning style dimension and the perceptions of motivation among community college students enrolled in web-based courses.

H_{4s}: There is no association between the Verbal/Visual learning style dimension and the perceptions of delay in instructor feedbacks among community college students enrolled in web-based courses.

H_{4t}: There is no association between the Verbal/Visual learning style dimension and the perceptions of frequently asked questions among community college students enrolled in web-based courses.

H_{4u}: There is no association between the Verbal/Visual learning style dimension and the perceptions of returned assignments among community college students enrolled in web-based courses.

H_{4v}: There is no association between the Sequential-Global learning style dimension and the perceptions of timely instructor email access among community college students enrolled in web-based courses.

H_{4w}: There is no association between the Sequential-Global learning style dimension and the perceptions of instructor email access connection among community college students enrolled in web-based courses.

H_{4x}: There is no association between the Sequential-Global learning style dimension and the perceptions of 24 hour instructor feedback among community college students enrolled in web-based courses.

H_{4y}: There is no association between the Sequential-Global learning style dimension and the perceptions of motivation among community college students enrolled in web-based courses.

H_{4z}: There is no association between the Sequential-Global learning style dimension and the perceptions of delay in instructor feedbacks among community college students enrolled in web-based courses.

H_{4aa}: There is no association between the Sequential-Global learning style dimension and the perceptions of frequently asked questions among community college students enrolled in web-based courses.

H_{4bb}: There is no association between the Sequential-Global learning style dimension and the perceptions of returned assignments among community college students enrolled in web-based courses.

Research Question 5: What are the associations between learning styles and the perceptions of overall satisfaction among community college students enrolled in web-based courses?

Null Hypotheses:

H_{5a}: There is no association between the Active-Reflective learning style dimension and the perceptions of convenience among community college students enrolled in web-based courses.

H_{5b}: There is no association between the Active-Reflective learning style dimension and the perceptions of boring among community college students enrolled in web-based courses.

H_{5c}: There is no association between the Active-Reflective learning style dimension and the perceptions of procrastination among community college students enrolled in web-based courses.

H_{5d}: There is no association between the Active-Reflective learning style dimension and the perceptions of enrolling in another course among community college students enrolled in web-based courses.

H_{5e}: There is no association between the Active-Reflective learning style dimension and the perceptions of face-to-face instruction among community college students enrolled in web-based courses.

H_{5f}: There is no association between the Active-Reflective learning style dimension and the perceptions professional skills of community college students enrolled in web-based courses.

H_{5g}: There is no association between the Active-Reflective learning style dimension and the perceptions among technical problems of community college students enrolled in web-based courses.

H_{5h}: There is no association between the Active-Reflective learning style dimension and the perceptions among studying of community college students enrolled in web-based courses.

H_{5i}: There is no association between the Active-Reflective learning style dimension and the perceptions of peer recommendation among community college students enrolled in web-based courses.

H_{5j}: There is no association between the Active-Reflective learning style dimension and the perceptions of frustration among community college students enrolled in web-based courses.

H_{5k}: There is no association between the Active-Reflective learning style dimension and the perceptions of professional development among community college students enrolled in web-based courses.

H_{5l} : There is no association between the Active-Reflective learning style dimension and the perceptions of best courses among community college students enrolled in web-based courses.

H_{5m} : There is no association between the Active-Reflective learning style dimension and the perceptions of course pace among community college students enrolled in web-based courses.

H_{5n} : There is no association between the Active-Reflective learning style dimension and the perceptions of overall satisfaction among community college students enrolled in web-based courses.

H_{5o} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of convenience among community college students enrolled in web-based courses.

H_{5p} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of boring among community college students enrolled in web-based courses.

H_{5q} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of procrastination among community college students enrolled in web-based courses.

H_{5r} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of enrolling in another course among community college students enrolled in web-based courses.

H_{5s}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of face-to-face instruction among community college students enrolled in web-based courses.

H_{5t}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of professional skills among community college students enrolled in web-based courses.

H_{5u}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of technical problems among community college students enrolled in web-based courses.

H_{5v}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of studying among community college students enrolled in web-based courses.

H_{5w}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of peer recommendation among community college students enrolled in web-based courses.

H_{5x}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of frustration among community college students enrolled in web-based courses.

H_{5y}: There is no association between the Sensing-Intuitive learning style dimension and the perceptions of professional development among community college students enrolled in web-based courses.

H_{5z} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of best courses among community college students enrolled in web-based courses.

H_{5aa} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of course pace among community college students enrolled in web-based courses.

H_{5bb} : There is no association between the Sensing-Intuitive learning style dimension and the perceptions of overall satisfaction among community college students enrolled in web-based courses.

H_{5cc} : There is no association between the Verbal/Visual learning style dimension and the perceptions of convenience among community college students enrolled in web-based courses.

H_{5dd} : There is no association between the Verbal/Visual learning style dimension and the perceptions of boring among community college students enrolled in web-based courses.

H_{5ee} : There is no association between the Verbal/Visual learning style dimension and the perceptions of procrastination among community college students enrolled in web-based courses.

H_{5ff} : There is no association between the Verbal/Visual learning style dimension and the perceptions of enrolling in another course among community college students enrolled in web-based courses.

H_{5gg} : There is no association between the Verbal/Visual learning style dimension and the perceptions of face-to-face instruction among community college students enrolled in web-based courses.

H_{5hh} : There is no association between the Verbal/Visual learning style dimension and the perceptions of professional skills among community college students enrolled in web-based courses.

H_{5ii} : There is no association between the Verbal/Visual learning style dimension and the perceptions of technical problems among community college students enrolled in web-based courses.

H_{5jj} : There is no association between the Verbal/Visual learning style dimension and the perceptions of studying among community college students enrolled in web-based courses.

H_{5kk} : There is no association between the Verbal/Visual learning style dimension and the perceptions of peer recommendation among community college students enrolled in web-based courses.

H_{5ll} : There is no association between the Verbal/Visual learning style dimension and the perceptions of frustration among community college students enrolled in web-based courses.

H_{5mm} : There is no association between the Verbal/Visual learning style dimension and the perceptions of professional development among community college students enrolled in web-based courses.

H_{5nn} : There is no association between the Verbal/Visual learning style dimension and the perceptions of best courses among community college students enrolled in web-based courses.

H_{5oo} : There is no association between the Verbal/Visual learning style dimension and the perceptions of course pace among community college students enrolled in web-based courses.

H_{5pp} : There is no association between the Verbal/Visual learning style dimension and the perceptions of overall satisfaction among community college students enrolled in web-based courses.

H_{5qq} : There is no association between the Sequential-Global learning style dimension and the perceptions of convenience among community college students enrolled in web-based courses.

H_{5rr} : There is no association between the Sequential-Global learning style dimension and the perceptions of boring among community college students enrolled in web-based courses.

H_{5ss} : There is no association between the Sequential-Global learning style dimension and the perceptions of procrastination among community college students enrolled in web-based courses.

H_{5tt} : There is no association between the Sequential-Global learning style dimension and the perceptions of enrolling in another course among community college students enrolled in web-based courses.

H_{5uu} : There is no association between the Sequential-Global learning style dimension and the perceptions of face-to-face instruction among community college students enrolled in web-based courses.

H_{5vv} : There is no association between the Sequential-Global learning style dimension and the perceptions of professional skills among community college students enrolled in web-based courses.

H_{5ww} : There is no association between the Sequential-Global learning style dimension and the perceptions of technical problems among community college students enrolled in web-based courses.

H_{5xx} : There is no association between the Sequential-Global learning style dimension and the perceptions of studying among community college students enrolled in web-based courses.

H_{5yy} : There is no association between the Sequential-Global learning style dimension and the perceptions of peer recommendation among community college students enrolled in web-based courses.

H_{5zz} : There is no association between the Sequential-Global learning style dimension and the perceptions of frustration among community college students enrolled in web-based courses.

H_{5aaa} : There is no association between the Sequential-Global learning style dimension and the perceptions of professional development among community college students enrolled in web-based courses.

H_{5bbb} : There is no association between the Sequential-Global learning style dimension and the perceptions of best courses among community college students enrolled in web-based courses.

H_{5ccc} : There is no association between the Sequential-Global learning style dimension and the perceptions of course pace among community college students enrolled in web-based courses.

H_{5ddd} : There is no association between the Sequential-Global learning style dimension and the perceptions of overall satisfaction among community college students enrolled in web-based courses.

APPENDIX D

Permission to use HDLPS

Hello David --

You have my permission to use sections of my questionnaire as a part of your survey instrument provided you credit the source. I would also ask that since I do not know what part of the survey you would like to use that you also credit Roxanne Hiltz as well since she developed the original survey that served as the basis for mine.

In case you are interested, I have an article coming out on my study in the next issue of the Journal of Continuing Higher Education. It should be published in early 2005 as the Winter edition.

One suggestion: control for gender and course of study/discipline. If you do, you will build on my study even though mine was focused on graduate level courses. It would be interesting to see if you find similar findings at the community college level.

Good luck with your study. I would be interested in knowing what you learned when you finish it.

Regards,
Marsha

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