ABSTRACT

DICKERSON, JEREMY GLENN. Analysis of Computing Skills and Differences Between Demographic Groups: A Basis for Curriculum Development in Computer Technology Courses at UNC-Wilmington. (Under the direction of Dr. Ted Branoff)

This study examined the entry-level computing skills of undergraduate education majors at the University of North Carolina at Wilmington during the Spring 2005 semester. This study also compared groups based on demographic categories to investigate if certain demographics were predictors of specific skills competency. This study utilized a representative convenience sample of 186 participants. The participants were pre-tested for their ability to complete 60 computer skills in the Microsoft Office Suite using an online performance test called Skills Assessment Manager by Thomson Course Technology. The data was analyzed as a whole group performance using descriptive statistics and analyzed for analysis between demographic groups using a non-parametric statistic test (the Mann Whitney U Test). The results yielded data that informed the researcher of the skills of the participants prior to taking a mandatory computer skills course. As a result, it was found that a large portion of students were able to do many of the skills before taking the mandatory skills course. It was also found that demographics were not a reliable predictor of computer skills. This study provided data that helped to inform the faculty at UNC-W that the curriculum for the computer skills course needed to be changed based on entry skills of students to reflect the abilities of students in 2005.

ANALYSIS OF COMPUTING SKILLS AND DIFFERENCES BETWEEN DEMOGRAPHIC GROUPS: A BASIS FOR CURRICULUM DEVELOPMENT IN COMPUTER TECHNOLOGY COURSES AT UNC WILMINGTON

by

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DEDICATION

This dissertation is dedicated to my daughter Ava. You are my motivation, the light in my world and I'll love you forever

BIOGRAPHY

Jeremy Dickerson was born on December 19th, 1974 in New Bern, North Carolina. He was raised on a family farm in Maysville, North Carolina, where he lived for 19 years. Jeremy Dickerson graduated from White Oak High School with his high school diploma, Coastal Carolina Community College with his A.A., The University of North Carolina at Wilmington with both his B.A. and M. Ed., and then completed his Ed. D. in Technology Education at North Carolina State University in 2005.

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CHAPTER 1

INTRODUCTION

The development of computer skills in university students has dramatically changed over the past ten years. Since the development and release of popular graphical user interfaces such as Microsoft Windows operating systems, the use of personal computing has exponentially grown. Computer use is an entrenched part of our culture. The acquisition of basic computer knowledge and skills no longer occurs just in formal educational settings, but also in homes, schools, and work environments. On the contrasting side of this discussion, there is also the fact that computer use is still not universal. There are groups of people who have not been trained, taught or exposed to computers because of different reasons, therefore creating a know or do not know culture, or a digital divide (Public Broadcasting Service, 2005). The rapid diffusion of information and communication technology in the past decade has added an important new element to the issue of educational inequality. New technologies are widely viewed as having the potential to either alleviate or exacerbate existing inequalities (Warschauer, Knobel & Stone, 2004).

Colleges that designed computer skills courses years ago are now finding that some students come into the classrooms with computer skills prior to instruction. This is believed to exist because they have had exposure to computer resources, computer instruction or both. According many studies, certain demographic groups are generally said to have more computer skills for a variety of reasons. This creates a situation in which developers of computer skills courses would need to better understand who their learners are and what abilities they have prior to providing instruction. Institutions with students of various age, race, gender, work histories, confidence levels towards computers and other demographic information should consider the differences in their learners before providing instruction so that they can develop curriculum that is appropriate in scope and sequence and driven by the learners' prior experiences. Throughout the planning process, a guiding principle should be to consider the students at every stage. It is necessary to carefully consider the students' maturity, needs, interests, abilities, and knowledge when planning instruction. Educating all students is and always has been a significant challenge. The increasing diversity of the student population and educators' recognition of the importance of considering diversity when planning and teaching has added to the complexity of this challenge (Posner and Rudnitsky, 2001).

Setting: UNC-Wilmington and The Donald R. Watson School of Education

This research took place at The University of North Carolina at Wilmington in the Donald R. Watson School of Education. UNC-Wilmington is a regional university seated in southeastern North Carolina with a student population of approximately 12,000 students. The Donald R. Watson School of Education is the largest professional school at UNC-Wilmington with approximately 1,300 undergraduate students. The Watson School of Education offers programs at the undergraduate and graduate levels. Degrees are conferred in the areas of elementary education, middle grades education, secondary education, special education, school administration, instructional technology and curriculum and instruction.

The Watson School of Education primarily serves the people living in the southeast region of North Carolina. This includes a large constituency of rural areas and military personnel from Camp Lejeune, which is located in Jacksonville, NC and about 30 miles from UNC-Wilmington. The proximity of Camp Lejeune to UNC-Wilmington is an important factor in this study because of the diversity it generates in the student population. The number of military related students attending UNC-Wilmington changes the demographics of the student population at the university to include more non-traditional students and students with a wide variety of work and life experiences.

Instructional Technology Course (EDN 303)

Upon entering the School of Education, students are typically juniors or second semester sophomores. These students may also be seniors, post-baccalaureate students, graduate students, or students returning as "licensure-only" status via a number of alternative licensure programs already possibly having an undergraduate degree. During their first semester as a student in the School of Education, students are required to take a variety of courses that are designed to help them in the advanced classes. One of the classes that all students must take early in their course of study is Education 303, titled "Instructional Technology." Education 303 (EDN 303) provides students with basic computer skills as well as methods on how to effectively integrate computer technology into teaching. EDN 303 is designed to help students develop an understanding of the principles and skills that underlie the design, production, and evaluation of instructional materials, computer generated presentations, and interactive media with particular emphasis on computer skill building and effective classroom use and integration of technology into instructional units. Students develop skills in the operation of computers with Windows XP operating system, Microsoft Excel, Microsoft Word, Microsoft PowerPoint, Microsoft FrontPage, and Microsoft Access.

EDN 303 is a course that introduces students to the concepts of computer technology builds skills by using particular computer software applications and then combines the theory and skills in the production of a product or artifact that displays the student's knowledge and skills in the areas that have been taught. Over time, the skills that have been taught have always been skills that were considered foundational and useful in many subsequent courses.

The Problem Related to Student Computer Skills Taught in EDN 303

There has been intense discussion by the faculty in the School of Education at UNC-Wilmington about the skills that have been taught in EDN 303. There were conversations and debate among the faculty concerning the design of EDN 303 and whether or not the skills that have been taught are redundant to many of the students who take the class. Some faculty members believed that “most” of the students already know the skills that are taught in EDN 303 when they come into the class, and that the skills portion of the EDN 303 curriculum should be eliminated or re-designed. This stemmed from the belief that students are now growing up with the use of computers as a part of their everyday life, and that computers are so entrenched in our society that everyone is getting experiences that develop skills such as those that are taught in EDN 303. On the other side of the discussion, some faculty members do not think that most students are coming into the class proficient with the computer technology skills that are needed for success in the School of Education. Further, they stated that EDN 303 had historically provided a solid foundation in terms of computer technology and should not be changed. This difference in thought is a discussion that had been on-going for several years since no data existed to resolve the issue. EDN 303 is a mandatory course for approximately 150 to 200 students each semester, and the delivery of this course affects the performance of these students throughout the completion of their degree programs.

For many years, the student population in the Watson School of Education had been primarily traditional students – meaning that these students came straight from high school and into college with little if any breaks in between. With the momentum of a pending teacher shortage of approximately 10,000 teachers per year (Hunt Praises North Carolina Study Shining Spotlight on Urgent Teacher Shortage, 2004) and a weakened economy that had caused many job cuts and layoffs in this region, there were increasing numbers of students who were currently being admitted into the Watson School of Education who were non-traditional, of various ages, and have differing life and work experiences. In addition, the growth of the Camp Lejeune military base has served as an area of growth for student population with the influx of prior service, retirees, and military dependents, all of whom have added to the level of demographic variation as opposed to the traditional student who is straight from high school. To meet this growing population, the Watson School of Education had acknowledged this population and its many differences through the creation of the Onslow Extension Program, designed to meet the needs of the diverse learners and non-traditional students who may be connected to the military (C. Thomas, personal communication, January 12, 2005). Non-traditional students seeking to become teachers often enter the School of Education with different knowledge, skills and attitudes than their younger classmates. The classes at the School of Education are filled with a variety of students from many different walks of life and who have vastly different skill sets. For example, a twenty-one year old student who took computer classes in high school may be sitting next to a forty-five year old student who has been a U.S. Marine and has not touched a computer in any more than a cursory manner. These types of student differences greatly affect the argument over the teaching of skills in EDN 303. The diversity of the students created a need to better understand what all of the students know about computer skills, and begs the question of what exactly any student knows concerning these skills. Does the course EDN 303 strengthen and reinforce the student skills, redundantly cover skills they already have, or both? Operational definitions for traditional and non-traditional students are addressed in this section under the "Definition of Terms" portion of this chapter.

The researcher concluded that there was a need for a study in order to analyze entry-level computer skills and differences in skills based on demographic factors that could be predictors of computer skills proficiency. The variety within the student population created a belief among the faculty that there were demographic variables that exist which may drive the differences in computer skills among the undergraduate students. If there were more known about the students and the possible connection between demographics and their computer skills, then changes could possibly be made in the course based on demographic data and/or skills assessment data.

Purpose and Objectives of this Study

The purpose of this study was to gather data on student computer skills in reference to the skills that are taught in EDN 303, analyze the data in an attempt to understand what EDN 303 students as a whole group know about specific computing skills that are taught in the course, and then attempt to explain the differences in skills through the analysis of demographic factors as indicated in the literature. This data will be used to make recommendations concerning how EDN 303 could be adapted to reflect what is known about the student population in order to better serve the students in the School of Education. In addition, this data could help other educational agencies in southeastern North Carolina such as the public school systems and Camp Lejeune military base education centers understand their student population and inform the decisions being made in reference to computer skills education.

The objectives of this study were:

1. Collect data that will inform the Watson School of Education on student computer skills fluency in the following areas: Windows XP, Microsoft Excel, Microsoft Word, Microsoft PowerPoint, Microsoft FrontPage, Microsoft Access.

2. Analyze data descriptively to determine how the students as a whole perform in terms of specific computer skills that are taught in EDN 303.

3. Analyze data using inferential methods based on selected demographics as discovered in the review of literature. Such demographic data includes age, gender, previous computer training, computer ownership, computer access, high school computer instruction, work history with the use of technology, feelings of confidence towards using computers, and experience with Microsoft Office and Windows XP in order to determine if differences in performance exist based on demographic information.

4. Make recommendations based on the data collection and analysis on how EDN 303 can be adapted in order to reflect the computer skills that students have upon entering the School of Education.

Research Questions and Null Hypotheses

The major research questions for this study were:

Research Question 1. What do students who enter EDN 303 already know in reference to many of the specific basic computer skills that are taught in that course?

In order to formulate an answer to this question, the following null hypothesis was proposed:

Research Question 1, Null Hypothesis: The sample as a whole will not have overall scores of 5 out of 10 or greater on all of the six areas of the computer skills test.

Research Question 2. Do differences in computer skills exist between groups of students in the School of Education when the students are divided into groups based on demographic factors?

In order to formulate an answer to this question, the following hypotheses were proposed:

Null Hypothesis 1. There will be no significant difference across all areas of the computer skills test between the traditional aged (22 and younger) group and the nontraditional students group (23 and higher).

Null Hypothesis 2. There will be no significant difference across all areas of computer skills between the male student group and the female student group across all seven areas of the computer skills test.

Null Hypothesis 3. There will be no significant difference across all areas of computer skills between students who state that EDN 303 is their first computer technology course in college and students who have had a computer course in college prior to EDN 303.

Null Hypothesis 4. There will be no significant difference between students who state that they have never used specific components of Microsoft Office and students who have used specific components of Microsoft Office.

Null Hypothesis 5. There will be no significant difference between students who state that they have never used Microsoft Windows XP and students who have used Microsoft Windows XP.

Null Hypothesis 6. There will be no significant difference across all areas of computer skills between students who received computer skills instruction in high school and students who did not receive computer skills instruction in high school.

Null Hypothesis 7. There will be no significant difference across all areas of computer skills between students who have had jobs involving the skills being tested and students who did not have jobs involving the use of the skills being tested.

Null Hypothesis 8. There will be no significant difference across all areas of computer skills between students who have a lack of confidence involving the use of computers and students who do not have a lack of confidence involving the use of computers.

Null Hypothesis 9. There will be no significant difference across all areas of computer skills between students who own computers and students who do not own computers.

Null Hypothesis 10. There will be no significant difference across all areas of computer skills between students between students who have regular computer access and students who do not own have regular computer access.

Significance of this Study

This study had a high level of importance because the Watson School of Education at UNC-Wilmington needed data in order to understand how to design the course EDN 303 to better serve the needs of the diverse student population that attends the school. Before this research, the School of Education had not been able to answer questions about what students' skills are upon entrance into the School of Education because of the lack of data. With the completion of this study, there exists base-line data describing the skills of all of the students and data informing the question of differences of skill ability based upon demographic information affecting computing skills that some faculty believe exists. Also, the information gleaned from this study informed the faculty in the School of Education at UNC-Wilmington about the preparation of students in terms of computing skills.

Limitations of this Study

1. A limitation of this study was that the sample in this research was only the students who were registered for EDN 303 in the Spring 2005 semester. The variation in student demographics may have been abnormally heterogeneous. The researcher believed that the best way to counteract this limitation would be to do future replication studies to gain a larger, more diverse sample of students.

2. A limitation of this study was that it used Microsoft Windows XP, Microsoft Office XP, and PC based computers as the medium for test questions. This was a limitation because there could have been students who are very versed in computer skills, but not familiar with these platforms. The computing platforms aforementioned were chosen because of their overwhelming popularity in the computing industry.

3. A limitation of this study was that it did not employ the use of a random sample. This study utilized a convenience sample. However, it was expected that since this study included all possible participants who were eligible and met the qualifications of the population of interest that this sample is representative of the population of interest at large. This limitation could be eliminated via replication during future semesters by comparing this sample to other samples. Also, this sample was compared demographically to the entire School of Education and to the entire population of students at UNC-Wilmington in terms of important demographics such as age, race and gender and was found to be similar in those categories.

4. A limitation of this study was that the study focused on a particular course at UNC-Wilmington and has little generalization to other schools that may not provide computer skills instruction.

Definition of Terms

1. Non-traditional aged students (Metcalf, 1997; Werring, 1984) are: students with a chronological age of more than 22 years. According to the UNC-Wilmington Dean of Students (Who are traditional students? 2005), non-traditional students (non-trads), sometimes referred to as "adult learners," are an extremely diverse group. Those who feel they do not fit the "traditional college student" profile may be considered "non-trads," including undergraduate students who entered college a year or more after high school graduation, are working to support themselves or their families, have dependents in their care, are married or divorced, are serving in the armed forces, or are veterans. For the purpose of this study, non-traditional students will be defined by their age; 23 and older.

2. Traditional students are considered students who have entered college directly after high school and exhibit traditional student characteristics that are typical of the population in question. These characteristics include same basic age group, similar high school educations and experiences and similar values, beliefs and norms. For the purpose of this study, traditional students will be defined by their age, 22 and younger.

3. WSE – Watson School of Education

4. UNC-W – The University of North Carolina at Wilmington

5. SAM – Skills Assessment Manager (assessment software)

6. MS - Microsoft

CHAPTER 2

REVIEW OF RELATED LITERATURE

Introduction

A review of literature was performed in order to understand more about the topics surrounding this study. A review of literature was conducted in the areas of needs assessment, learner analysis, computer skills and college students, computer competencies and teacher education, predictors of computer skills and computer skills assessments. The information gleaned from this review helped shape the methodology in this study and assisted in improving the researchers' knowledge of areas that are of importance.

Needs Assessment

According to Rossett (1987), needs assessment is an umbrella term for the analysis activities trainers use to examine and understand performance problems and new technologies. Other terms for this are problem analysis, pre-training analysis and front-end analysis. According to Kaufmann (1982), the name used does not matter as much as whether or not the information needed to effectively solve problems is obtained. Kaufmann, (1982) has emphasized the importance of identifying discrepancies – or the differences between actual and optimal performance prior to launching any solutions. Gagne and Briggs (1979) urged the search for the facts and ideas which must first be learned before a given concept or principle can be acquired. Kaufman (1988) provides many insights into the needs assessment process including (a) the distinction between means and ends in terms of what organizations do, and (b) areas in which organizations have problems. Dick and Carey (1996) discuss the consideration of learners for any given situation. According to Dick and Carey, learners can be described as the target population for any instructional event, and instruction should be designed considering what is known about this population. According to Richey (1992), target population members must have already mastered certain entry behaviors associated with learning new goals prior to beginning instruction. Richey goes on to discuss how learner characteristics such as knowledge, experience and attitudes can also influence the outcome of instruction.

Keller (1987) suggests asking learners about their perceptions of relevance to the instructional goal and their confidence towards the said instruction, but never to assume that the learners find relevance in the material or have confidence in their abilities. When analyzing the learner, Gagne (1985) suggests that one asks what the student must already know so that a given task may be learned. According to Reigeluth (1999), in any given instructional situation, an instructor cannot teach the same thing to the whole class at the same time. The instructor needs to be a facilitator who can change instruction from standardization to customization, and from the focus of presenting material to a focus on making sure that each learners' needs are met. According to Campbell and Monson (1994), instructors must challenge the key assumptions of traditional instruction that assert that walking all learners through the content in the same way can be effective. This is a model for efficiency, but not effectiveness.

Mathews (2000) states that possibly the most critical element for successful planning of any major initiative, especially technology, is needs assessment. Needs assessment reinforces the value of analysis prior to action (Anglin, 1995). Anglin states that needs assessments are done when the researcher is trying to respond to a need to gather information to assist professionals in making data driven and responsive recommendations about how to solve the problem.

According to Smith and Ragan (1993), needs assessment is a systemic approach to the development of instructional interventions and should drive curriculum, shaping the design, development, implementation, and evaluation decisions. This type of assessments are used when there is a need for optimal performance and an understanding of actual performance, and are a way to help determine solutions to problems in instructional settings. Further, instructional designers conduct needs assessments to determine that there is a need for new instruction to be developed. If this step is omitted, there is a risk of developing or delivering instruction that is unnecessary or inappropriate. Instructional designers should determine the gaps between what is and what should be. (Smith & Ragan). Echoing the work of Smith and Ragan, Lan (2001) states that the role of needs assessment is to collect the information necessary to identify the strategy and action required to improve current and future practice and involves defining optimal performance, assessing actual practice and identifying the gaps separating the two.

Anglin (1995) goes on to say that needs assessments are typically conducted using some type of survey instrument. Identification of gaps between learning goals and actual learner performance may be found (Smith & Ragan, 1993). A survey is usually a device for soliciting opinions or abilities from large numbers of respondents. When properly designed and developed, surveys will yield data and findings that can be used for decision making. According to Anglin (1995), surveys can be developed with several different types of questions with items such as:

- items that ask about a perceived need
- items that ask for details of the need
- items that ask respondents to provide proof

- items that ask for feelings and motivation
- items that ask for cause(s) of the problem
- items that ask about the respondent

From this literature, there is a suggestion that needs assessment is an appropriate route for the previously stated research questions. Also, a survey instrument with items that ask respondents to provide evidence was the most effective type of instrument to use because this research needed items that would have the participants demonstrating skills.

Learner Analysis

John Dewey (1933) was one of the first educational researchers to draw national attention to the importance of including information about the learner in curricular decision making. Dewey's work was a milestone in instructional design and helped refine the concept of learner analysis. Learning is a profoundly relative process, and what students learn depends enormously on what they already know (Posner and Rudnitsky, 2001). Posner and Rudnitsky (2001) state that instructors should assess students' level of knowledge and skills and adjust instruction carefully so students are ready to learn the material. The key to instructional design is learner analysis. This element focuses on the diversity of learner characteristics. Together with task analysis and performance objectives, learner analysis determines the resources to be selected and the instructional strategies to be implemented (Leng, 2002).

According to Tsapatsoulis (2004), to conduct a complete learner analysis, you must either know or gather certain information about the target population. This information is not always readily available. Several techniques can be used to assist the search for information about the learner population. These techniques include:

• Utilizing Pretests

• Reviewing Portfolios

• Contacting Experienced Instructors

• Surveying Students

• In-Class Opportunities

• Out-of-Class Opportunities

A pretest is a criterion-referenced test designed to measure entry behaviors or prerequisite skills needed before instruction can begin, as well as those skills the designer intends to teach. It gives the instructional designer a basis for developing items or skills that need to be taught to ensure successful instruction (Tsapatsoulis, 2004).

The work of Dewey, Posner, Runitsky and Leng serve as a guide to understanding the importance of knowing the learner prior to instruction. Their work in learner analysis assists in bringing to light the capabilities of students before they receive instruction. Tsapatsoulis provides a variety of methods for gathering data about the learners before they receive instruction, including utilizing pre-tests and surveying students which helped guide the methodology of this study.

Computer Skills and College Students

Computer skills are a necessary part of work skills in today's economy and an expectation of college graduates for many employers. In a survey of over 200 companies, it was found that employers felt that employees needed more mathematical skills, organizational skills, and analytical skills, but the largest response to the survey was that 78% of the employers felt that their employees needed better computer skills (Timmons, 1996). Dickerson and Green (2004) surveyed work activities in several major companies in Britain in a longitudinal study from 1997 to 2001. They found that there was a growth of work skills in the areas of literacy, mathematics, technical knowledge, high level communication skills, customer communication skills and computer skills. They also found that computer skills utilization was the fastest growing skill set in the British workforce. According to the work of Flynn (1994), approximately 75% of business executives reported that computing skills can increase productivity, accuracy, customer service and quality. Computer technology drives almost every business and industry, from mega-corporations to small local businesses (Smith, 2001).

Drybrugh (2002), states that trial and error is the most common way that computing skills are learned in the workforce, as opposed to formal instruction. However many college students are taking computer skills courses in college and these skills are used in different academic ways. Dupin-Bryant (2004), states that prior computer training was a factor in successful completion of online courses. Many students take classes, but also have options such as computer based training while in college. Harp, Taylor and Satzinger (1998), states that research has shown that computer based training can be an effective alternative to instructor led computer training, with video-based training being perceived as less useful. A basic principle of information literacy programs is that skills needed to use computers and skills needed to find and evaluate information are two separate sets of skills (Pask, 2004). End-user computer training is strategically important as far as skill development is concerned. Failing to provide adequate computer training will increase the difficulty of finding employees with the skills required for certain positions in the future (Gattiker, 1992). Computing skills are necessary and the development of computing skills by a population can lead to increased welfare and workforce development. For example, in Philadelphia, Pennsylvania, the Commission on Technology worked with IBM and The Chamber of

Commerce to develop a city-wide computer skills training program called the International Computer Driving License (ICDL) which is a global computer skills certification program. This resulted in improved job skills and more employability for many of the citizens who participated in the program (Johnson, 2003).

Corporate leaders are putting more emphasis on recruiting individuals with an understanding of computers and information systems. In a nationwide survey of 1,481 management systems executives conducted at Cornell University, it was found that computer literacy requirements for all job levels increased dramatically over a three-year period in the early nineties, and that human resource executives found a lack of computer-literate skills in recent college graduates (Davis, 1997). As information technology tools continue their rapid rate of change, students need to understand concepts and acquire skills at a comparable rate. Various approaches have been suggested to increase the degree of information technology fluency for undergraduates, particularly non computer science majors (Dougherty, 2003).

Computer literacy courses have continued to evolve. In the early nineties, predictions were made that computer literacy courses would no longer exist by the year 2000, since students would already possess the desired skills. In addition, most students who enter computer literacy courses would already possess the skills of the students completing computer literacy courses ten years ago. However, the standard for computer literacy has shifted, and employers now desire and expect a higher level of computer competency for all employees (Edmiston & McClellend, 2001). Since the mid-nineteen nineties, many universities have tried to answer the call of business, industry and education by implementing computer literacy courses into their academic programs. An example of this is the twelve-campus Pennsylvania State University system. The PSU Royer Center for Learning and

Academic Technologies has been developed to lead the way for their colleges to change from the heavy reliance on lecture based instruction to a technology-rich learning environment. This type of environment is characterized by active, cooperative learning supported by technology so that their students can learn technology throughout their coursework (Deden, 1998). The need for computer technology has also been noted by small colleges. Miles (2004) states that when careful planning and on-going assessment take place, small liberal arts colleges can provide computer skills curriculum that supplies students with computer skills needed for their professions. Even at community colleges, computer skills are stressed in many curriculum areas. The ability to use computer technology and to evaluate electronic information has become a basic skill for community college students in both academic and occupational areas. The consistent relationships between training and computing outcomes indicates that training interventions at the university and post-secondary level, rather than at an earlier time, may be the most effective means of achieving computer skills and confidence (Bradley and Russell, 1997).

From this literature, it is evident that computer skills are a major concern for college educators and society at large. Community colleges, universities, and even major cities are putting together computer training systems so that their students or citizens can be more technologically advanced and better prepared for the workplace of the future. Computer courses are now a pervasive part of collegiate education throughout the United States.

Computer Competencies and Teacher Education Majors

Ensuring technology is used in effective ways requires knowledge, vision and leadership (Johnson, 1996). Beard (1993) noted what he called a “serious problem” for computer educators. Beard states that the positive transfer of computer skills to novel computer tasks is an underlying assumption of computer education. Yet, some evidence suggests that certain introductory computer courses produce very highly specific and non-generalized skills. Scheffler and Logan (1999) used a Delphi panel to develop a survey instrument of 67 computer competencies that educators should know and/or be able to do. The use of computers during the integration of curricula and instruction was rated the highest on the list by experts, and many computer skills are necessary before these competencies can be accomplished. Donnelly (1999), states that teacher training with computers is a problem, and 70% of the teachers surveyed by Education Week Magazine stated that computer use in the classroom is difficult for a variety of reasons. Tarleton (2001), states that training teachers how to effectively use technology in instruction is at least as critical, if not more critical than their need for adequate amounts of up-to-date software and hardware, and the majority of the schools in this research did not provide the necessary instruction.

Educational technology used to refer to radio, television, filmstrips, overhead projectors, tape recorders, video cassette recorders and the use of these items in an educational setting. It has rapidly advanced, and the term now refers to a vast array of computer based technologies such as compact discs, interactive audio and video technologies, networks, hypermedia, and telecommunications (Soska, 1994). Introductory computer literacy courses are believed to play a critical role in introducing college students to fundamental computer concepts and skills (Kim & Peterson, 1992). Ideally, students completing such courses have sufficient computer literacy for effective use of computers, plus the ability to acquire more sophisticated computer skills in subsequent courses (Kim & Keith, 1994). To ensure that all students have received similar exposure to essential computer skills and concepts, introductory courses typically assume that students have little or no relevant computer experience (Brock, Tondeur & Valcke, 1992). As computers become more and more prevalent in our society, there is an increased need for computer integration into schools and a need for teachers with computer skills.

According to Ross (2001) one way to improve the (computer) skill levels students may attain in school may hinge on improving the classroom computing skills of their school teachers. In 1995, the Office of Technology Assessment, at the request of the U.S. Congress, conducted an extensive study of technology use by K-12 teachers. They found that a substantial number of teachers reported little or no use of computers for instruction. They also stated that teachers lack models of effective integration of computers and that helping teachers use technology effectively may be the most important step to assuring that current and future investments in technology are realized (McCoy, 2000). In March 1992, The North Carolina State Department of Public Instruction issued a document called “Computer Competencies for All Educators in North Carolina Public Schools” (NCDPI, 1992). This document was a detailed plan that described the expectations of educators as pertaining to computing skills for teachers in the state of North Carolina. This model was developed to assist schools in coping with in-service training for existing and prospective personnel and for higher education provide training for teachers and other school personnel in computer skills education. These competencies were used as a guide for computer skills training until 2002 when the North Carolina State Department of Public Instruction adopted the International Society for Technology in Education standards for educators, known as The National Educational Technology Standards. The National Educational Technology Standards now serves as a guide for computer competencies for educators, students and school administrators in North Carolina. As of 2003, 47 states and the District of Columbia had adopted the International Standards for Technology in Education's National Educational Technology Standards in setting their standards for educational uses of technology that are designed for school improvement in the United States (Microsoft Press Pass, 2003).

The literature reviewed in this section helped to develop an understanding of the inclusion and necessity of technology in the field of teacher education. As evidenced by this literature, technology is an assumed part of K-12 education, and the emergence of International Standards for Technology in Education has brought clarity to the ways technology could and should be used in teacher education. Further, many states, such as North Carolina, have adopted standards for technology integration and this has facilitated the integration of technology in teacher education programs.

Predictors of Computing Skills

Jawahar (2003) states that because of the significance of end user performance to organizations, it is important to uncover factors that influence end user performance. In a study of 468 school teachers, computer use was mainly predicted by computer experience and general attitudes towards computers and their place in education. (Brock, Thomsen, & Kohl, 1992).

There has been a large amount of research in the area of computer skills and the possible predictors of computer skills. As the need for technically skillful people has increased in the workforce, much research has been done in order to understand who or what groups in our society have computer technology skills and why. In the review of literature, many demographic variables are mentioned as predictors of computer skills fluency. The historical pattern in the search for predictors of computer learning potential has been involved with the search for good explanatory or independent variables. Some variables that have been cited to influence computer skills are demographic variables (Evans & Simkin, 1989). Undeniably, the literature is rich with many demographic factors, but several factors resonate repeatedly in the literature in terms of their connections to computer skills fluency. These factors are age, gender, ownership or access, experience and confidence.

AGE

According to Chaffin and Harlow (2005) motivation is a central issue of adult learners and their acquisition of computer skills. They state that the motivation of younger adults is markedly different from older adults, who need more overt application of the skill to a future task. Impending retirement, along with age, can sometimes explain why older workers are often less skillful in computer use than prime-aged workers (Friedberg, 2003). Other points concerning adults and computer skills are that many adults grew up and were educated during a time in which computers were not a part of their lives or schooling. Many of these adults were introduced to using computers much later in life, therefore, they often have less experience with computers. Also, due to the aging process, adults' cognitive and psychomotor abilities become slower with age, making their learning of computer skills possibly not as efficient as if they were learning computer skills when they were younger Chaffin and Harlow (2005).

Adults and younger learners are very different for many reasons. In a study by Bishop-Clark & Lynch (1992), older, nontraditional students learn differently and have different perceptions about learning than their younger counterparts. Nontraditional learners are more internally motivated and tend to see their professors or teachers as peers, and not mentors. Adult learners, once an anomaly in higher education, now make up approximately 40% of the students enrolled as undergraduates on a national level (Bishop-Clark & Lynch, 1992). Due to the nature of their lives, older students are rarely involved in the college environment in the same way as younger students, due to families, full-time jobs, and competing demands on their time (Graham & Donaldson, 1999). Traditional aged and nontraditional aged college students have differences that affect their abilities. Significant differences have been found between traditional and nontraditional students in the following categories: academics, peer and social relations, family and social networks, autonomy and responsibility (Dill & Henley, 1998). These factors, coupled with the aging process, create a contrast between adult or nontraditional learners and traditional learners in terms of their acquisition of computer skills in college classes.

Studies show that many adults make less elective use of computers than younger learners. This is suspected to be due in large part because adults may have poorer attitudes towards computers and their usefulness than their younger counterparts (Kelley, Morrell & Park, 1999). Many older adults did not grow up with the computer revolution, and are less likely to have owned a computer or to have used one for many years during their adulthood. Some adults also believe that computers can be damaging to personal relationships because of the lack of face-to-face contact (Roach, 2004). Findings from most of the studies that have been conducted on computer use and older adults demonstrate that there are age related differences in the acquisition and performance of computer procedures (Echt, Morrell & Park, 1998). Most results suggest that older adults require more time than younger adults to acquire computer skills (Charness, Schuman, & Boritz, 1992).

Kluth (2004) makes a strong argument that we can better understand what students know about computers based on age. He uses age as a condition to develop strata of computer literacy and defines computer users by their age and categorizes their ability to use computers – even giving each level their own specific name. He states that there are three distinct strata of computer users;

1. Analogues – 70% of world's population of computer users. Usually in their forties and beyond. Often afraid and/or mystified by technology & feel inadequate with little more than cursory knowledge and skills.
2. Digital immigrants – 15% - "Thirty-Somethings" who adopted computer technology as young adults.
3. Digital natives - 15% - teenagers and young adults who have never known and can not imagine life without computer technology.

According to Smith and Necessary (1996), a study on traditional aged and nontraditional aged students yielded that nontraditional students reported feeling inadequate about computer use but scored as well or better than younger traditional students. Klein & Knupfer (1993) state that re-entry (nontraditional) students outperformed the traditional students on computer knowledge questions, but nontraditional and traditional students did equally well on computer skills. This report is seemingly contradicted by later studies by Senter & Senter (1998) and Kluth (2004) who state that nontraditional students were less likely to be computer literate and usually need more specialized services such as tutoring.

The research of Sweaney, Manley, Meeks, and Valente (2001), suggests that even though younger students are more apt to have grown up with computers, we should not assume that traditional students are computer literate. They make a case for the development and use of instruments to provide data about student skills. According to Sweeney, Manley, Meeks, and Valente (2001), it is easy to assume that most students have been exposed to computers and various software applications upon their arrival to college. Because of the widespread use of computers in many homes and schools, most educators conclude that students come to them with adequate computer skills. Even though newer generations of undergraduate students may be entering college with computer skills learned in high school, we should not assume that all students have had widespread exposure to computers and their applications as primary and secondary students. O'Hanlon (2002) supports the notion of non-assumption, stating that college administrators must not assume student competence, but rather should systemically assess incoming students in reference to computer technology.

GENDER

According to Rothschild (2000), more young females must get basic experience with computers or they may always be a slight step behind young males, which may burden them as an adult. Young females need to be encouraged at an early age to use computers and to not be dissuaded by cultural biases as found in advertising and the gaming industry. Computers and technology at large have changed skill requirements and the conditions of work, de-emphasizing physical skill – which should favor women (Weinberg, 2000). The worldwide concern about the gender gap in information technology and the lack of women participating in computer science has attributed to the different cultural influences to which boys and girls are subject (Lee, 2002). Smith and Necessary (1996) note that, regarding gender, a number of studies have reported that males have more positive attitudes towards computers than females. This could be accounted for because of the possibility that there is a cultural basis for a gender gap in the field of computer science which is perpetuated by male centered activities at an early age. This impact starts to affect children when they first come into contact with software games which have mostly been designed for males (Huang, Ring, Toich, & Torres, 1998). In addition, males also tend to be encouraged to work or play with computers in classrooms more than females in schools. According to Lee (2002), active consideration and management of the classroom environment is needed to ensure young females access to computer equipment.

There are many cultural factors contributing to the lack of female confidence and ability with computers. Albright (2000) notes gender discrimination, the lack of role models, and less experience for females as children are all factors that can perpetuate a difference in computer skills between males and females. Mathews (2000) performed a study in which a needs assessment was conducted in a school system. One of the objectives of the study was to find predictors of computer use. This study found that males were more highly rated in computer literacy and had greater confidence about their skills with computer technology. Other studies also show that a larger percentage of males have access to a computer, use the Internet, and rate their computer skills as excellent. Males also tend to score higher than females on general technology use tests and have more years of experience with computers (Dryburgh, 2002). The American Association of University Women Educational Foundation (AAUW, 1994) reported gender differences in the use of information technology from synthesized results of over 1000 studies, labeling technology as the "new boys club" as males are taught to use computers very differently than females throughout society.

RACE, OWNERSHIP AND ACCESS

There is a large amount of literature on the possible connection between race and computer skills. In a study focusing on race, ethnicity and computer literacy, Stanley (2003) states that Latinos and African Americans are less likely to own and use computers than Caucasians and Asians, leading to less computer literate Latinos and African Americans. Supporting that research, Hawkins and Paris (1997) state that African American students enter the university setting with fewer "InfoTechnology" skills than their Caucasian student peers. Hawkins and Paris purport that institutional factors may be responsible for the lack of skills because of the lack of computers in the schools in African American communities. It is possible to extrapolate from this racial aspect of the literature other factors that could be considered in the analysis. Such factors include computer ownership and exposure to computers in school, and the fact that race is a descriptor of another problem; computer ownership and access.

According to Pearson (2001), data from the Department of Commerce, Educational Testing Service, and other sources show that minority students are not only least likely to have access to computers at home, but also are the least likely to gain access at school. In addition, the Educational Testing Service found that the more students a K-12 school has belonging to a minority or low socioeconomic group, the higher the ratio of students to computers, peaking at 32:1. This is more than 7 times the recommended ratio, implying that poor minority students lacking access to computers at home are also not being given equitable access at school (Pearson, 2001). It is widely believed that the current deficit in African American computer ownership and access to computers and the lowered economic prospect of those without computer skills will resonate in the black communities for generations to come (Editor, African Americans as the Have-Nots of the Information Age, 1998). Further, an emphasis on remedial or vocational uses of new technology by low socio-economic status or African American and Hispanic students and more academic uses of technology by high socio-economic status or Caucasian and Asian students have been found by Warschauer, Knobel & Stone (2004).

EXPERIENCE AND CONFIDENCE

In a study on self-efficacy and computer skills, Smith & Necessary (1996) found that pre-training participants to have improved self-efficacy helped to improve success in the acquisition of computer skills with participants with physical disabilities. One could argue that this same analysis of low self-efficacy and the improvement of computing skills could be transferred to a larger population. According to Gos (1996), approximately one third of all college students suffer from some type of technophobia – and this condition is largely due to the lack of specific experience. Smith & Necessary (1996), stated that students who have more computer related experience score better on a survey of computer literacy than students with less experience. Prior learning experiences have been shown to be important, independent determinants of both computer competence and computer anxiety (Bradley & Russell, 1997). In a survey conducted by UCLA in 2001, 77.8 percent of undergraduate women and 79.5 percent of men were using computers regularly just prior to their enrollment as first year students (Bradley & Russell, 1997). Even though these numbers are very close in range, first year undergraduate women were only half as likely as first year undergraduate men to assess their computer skills as "above average" with only 23.2 percent of women claiming to have high regard for their computer skills compared to 46.4 percent of the men. This strengthens Smith & Necessary (1996) who noted that regarding gender, a number of studies have reported that males have more positive attitudes towards computers.

In a study by Karsten & Roth (1998) data suggests that it is the relevance, not the quantity, of computer experience students bring to class that is most significantly related to computer dependent course performance. This study indicated that a student may have a large amount of experience using computers, but that experience would not prove to be applicable to scenarios that are different or do not relate to their experience.

From this literature, it is reasonable to believe that demographics can play a part in computer literacy. Gender, age, access and previous training experiences all play a pivotal part in the development of computer skills fluency. The presence of such demographics in any class or group of students can change the impact of the computer skills curriculum that is being delivered. The researcher felt that this literature creates a rationale for comparing computer skills between demographic groups to see if differences do exist in the sample used in this study.

Computer Skills Assessment

Computers play a key role in education, and the question of computer literacy is more crucial than ever. Computer technology is integrated in education at many levels and students from kindergarten to graduate school are often using computer technology in their classes. According to Lan (2001) sufficient technology skills and knowledge is necessary to carry out the pedagogical mission and to participate in technology facilitated instructional activities. This section discusses some of the literature surrounding what is known about college students and computer skills assessment with focus on demographics, as well as other factors that pertain to assessing computer skills in college students.

In a study conducted at the University of Wisconsin, computer skills of incoming freshmen were assessed. Information about the students' computer skills was obtained through the use of a questionnaire. Further, more information was gathered about the amount and type of students' previous computer experience, the source of the experience, and their attitudes toward using computers. Demographic information such as age, gender, and major was collected (Smith & Furst-Bowen, 1993). This data was used to inform the faculty at the University of Wisconsin about the skills and experience that their incoming freshmen had and how they could better design learning experiences that would assist their students in their development of computing skills. This supports Parham (2003) who states that through the analysis of individual student computer skills, one can expand conclusions about the students' performance over time. In another study of computer skills, Yang, Shu, Ming-Sheng & Chia-Ling (2004) state that among five software programs frequently used, subjects were most knowledgeable about MS Word, and least knowledgeable about PowerPoint. This study found that computer use at work, computer training, job position, educational level and age all affected the variance in computer competence concerning the computer skills which were tested. These factors assisted the development of the demographic questionnaire that was utilized in this study.

According to Urban-Lurian & Weinshank (1999), computer literacy requires performance based assessment. Literacy does not consist of abstract knowledge alone. The literate user is able to accomplish various tasks in the same context. Thus, the best assessment requires the learner to demonstrate literacy in an authentic manner. In a study of computer skills by Mattheos, Schittek, Nattestad & Shanley (2005), a task orientated questionnaire was designed aiming to quickly assess competence with the use of computers. The questionnaire consisted of distinct computer related skills, representing various competencies in educational computer use.

Based on this, the researcher examined technology-based computer skills assessment tools that would allow skill demonstration via performance. In doing this, the researcher inspected several types of assessment software that would allow for performance-based assessment of the specific skills that were in the interest of this research.

Summary of Literature

After reviewing literature on needs assessment, learner analysis, computer skills of college students, computer competencies and education majors, and predictors of computer literacy, there are several important factors that shaped this research. First, needs assessment literature provided a theoretical foundation supporting the conducting of this research because of the need to understand actual performance in order to facilitate optimal performance. The literature supported and suggested the use of surveys with items that require students to provide proof in order to determine their validity. The literature concerning learner analysis discusses the importance of analyzing the learner and that learner analysis includes the consideration of many demographic factors.

When reviewing literature concerning computer skills and college students, the literature suggests that there is a demand for college students to have computer skills in order to meet the needs of the modern work force. More specifically, there is also a need for the integration of technology in education, thereby creating a need for education majors to be skillful in the use of technology. This is evidenced by the adoption of National Educational Technology Standards for teachers by states such as North Carolina. The literature on predictors of computer skills is widely varied. These studies chronicle a range of predictors of computer skills from many different studies. Predictors of computer fluency from the literature included:

1. Male performance are generally better than female with computer skills.
2. People with a higher sense of confidence towards computer use generally perform better than people with less confidence.

3. People who own computers are generally more skillful with computers than non-owners.

4. People who have regular access to computers generally perform better than people who do not have regular access to computers.

All of these factors will be used in the framework of this study as a means of analyzing students' performance on specific computer skills.

In addition, the research also discusses the factor of race, but the research indicated that race can be a less informative measure as a predictor of computer skills, and that a more accurate factor is regular computer access. Access can be a more precise indicator than race in terms of computer use, because students can acquire computer skills on computers provided in other places, such as schools, libraries, and community centers regardless of race.

The literature points out the processes of needs assessment and surveys as a means to better understand learners and their abilities and as a way to help solve certain instructional problems. This assists in developing a route for methodology and data collection via survey development.

The literature review also provided an opportunity for this research to add another study to the collective body of information on the use of demographic factors to explain differences in computer skills. Based on the literature, the researcher adopted and developed a skills demonstration instrument, a series of demographic questions for a demographic survey, and a means of data collection and analysis to inform the research questions.

CHAPTER 3

METHODOLOGY

Introduction

The review of literature led the researcher to conclude that there is a body of work that supports the explanation of differences in computer skills through the analysis of demographic data. Based on the literature, there are several areas that best assisted in the explanation of computer skills, and these areas needed to be investigated in the data collection and analysis process. Also, according to the literature, the use of an assessment instrument to collect data on computer skills is most accurately performed with the use of a demonstration-based skills assessment tool.

This chapter describes the methodology used in developing and conducting a study which collected information about demographics and computer skills and the process of analysis used to attempt to explain the differences in computer skills through analysis of demographics and skills test scores. This chapter also describes the development of a demographic questionnaire, a computer skills assessment tool, and the process of analysis that was conducted in this study.

Purpose and Objectives of this Study

The purpose of this study was to gather data on student computer skills that were taught in EDN 303, then analyze the data to attempt to discover what most students enter the course already knowing about the skills taught in EDN 303. Secondly, this research attempted to explain the differences in skills through the analysis demographic factors as indicated in the literature. This data was used to make recommendations on how EDN 303 could be adapted and redesigned to reflect what is known about the student population in order to better serve the students who are in the School of Education. The objectives of this study were:

1. Collect data that inform the Watson School of Education on student computer skills fluency in the following areas; Windows XP, Microsoft Excel, Microsoft Word, Microsoft PowerPoint, Microsoft FrontPage and Microsoft Access.

2. Analyze data descriptively to determine how the students as a whole group performed on specific computer skills.

3. Analyze data using inferential methods after stratification into groups based on selected demographic factors that were discovered in the review of literature. Such demographics included age, gender, previous computer training, high school computer instruction, work history with the use of the specified skills, feelings of confidence towards using computers, and familiarity of Microsoft Office and Windows XP.

4. Make recommendations based on the data collection and analysis on how EDN 303 can be adapted in order to reflect the computer skills that students have upon entering the School of Education.

Research Questions and Null Hypotheses

The major research questions for this study were:

Research Question 1. What do students who enter EDN 303 already know in reference to many of the specific basic computer skills that are taught in that course?

In order to formulate an answer to this question, the following null hypothesis was proposed:

Research Question 1, Null Hypothesis: The sample as a whole will not have overall scores of 5 out of 10 or greater on all of the six areas of the computer skills test.

Research Question 2. Do differences in computer skills exist between groups of students in the School of Education when the students are divided into groups based on demographic factors?

In order to formulate an answer to this question, the following hypotheses were proposed:

Null Hypothesis 1. There will be no significant difference between the traditional aged (22 and younger) group and the nontraditional students group (23 and higher) across all areas of the computer skills test.

Null Hypothesis 2. There will be no significant difference across all areas of computer skills between the male student group and the female student group across all seven areas of the computer skills test.

Null Hypothesis 3. There will be no significant difference across all areas of computer skills between students who state that EDN 303 is their first computer technology course in college and students who have had a computer course in college prior to EDN 303.

Null Hypothesis 4. There will be no significant difference between students who state that they have never used specific components of Microsoft Office and students who have used specific components of Microsoft Office.

Null Hypothesis 5. There will be no significant difference between students who state that they have never used Microsoft Windows XP and students who have used Microsoft Windows XP.

Null Hypothesis 6. There will be no significant difference across all areas of computer skills between students who received computer skills instruction in high school and students who did not receive computer skills instruction in high school.

Null Hypothesis 7. There will be no significant difference across all areas of computer skills between students who have had jobs involving the skills being tested and students who did not have jobs involving the use of the skills being tested.

Null Hypothesis 8. There will be no significant difference across all areas of computer skills between students who have a lack of confidence involving the use of computers and students who do not have a lack of confidence involving the use of computers.

Null Hypothesis 9. There will be no significant difference across all areas of computer skills between students who own computers and students who do not own computers.

Null Hypothesis 10. There will be no significant difference across all areas of computer skills between students between students who have regular computer access and students who do not own have regular computer access.

Research Design

This study was an observational and comparative study with a survey design that used a computer skills competency test and demographic questionnaire to collect data. This study employed a web-based assessment instrument from which data was collected and analyzed concerning computer skills of undergraduate education majors prior to receiving instruction in EDN 303. A survey design provides a quantitative or numeric description of some fraction of the population (the sample) through the data collection process of asking questions (Creswell, 1994). By collecting this data, the researcher was able to generalize the findings from a sample of responses to a population so that inferences could be made about the computer skills and possible demographic predictors of the population. This survey was cross-sectional, meaning that the data was collected at one point in time.

Instrumentation

O'Hanlon (2002) points to the caution that must be used in the development of computer skills proficiency tests. O'Hanlon discusses how self reporting is often inflated and cannot be used as reliably as demonstration of skills. This study employed a web-based assessment tool that was developed to test computer skills in several different categories by demonstration rather than self reporting. The assessment tool used in this research was developed, maintained and marketed by Thomson Course Technology and was called Skills Assessment Manager (SAM). This assessment tool had a test bank of items and allowed the test developers to choose items that best measured the particular skills in question or write their own items. In order to diminish bias and to promote validity and reliability, the researcher had professors and instructors of instructional technology from the School of Education choose the items that were used in the evaluation instrument. These experts (listed in Appendix E) designed the assessment tool during a six hour session on November 29, 2004. The panel of expert faculty chose the items as a group, building consensus about each item and chose items that would be representative of the skills most important to each skill area that are taught in all sections of EDN 303. The experts reviewed questions from the software test bank, and the items chosen were representative of the skills that are taught in each skill area during EDN 303. The experts chose ten items from each section, ranging from simplest to most difficult. This created a test containing sixty items, with the realization that testing every single skill was not feasible and would probably offer little additional value in evaluating skills relevant to this course. An employee from Thomson Course Technology was present to assist with technical issues during the selection of the items and the creation of the specific test that will be used during the assessment. After the instrument was designed and developed, the team performed 2 pilot tests, one with a graduate student and one with a professor, to ensure smooth operation of the instrument. The test worked well in both pilot tests. The instrument was designed to take approximately one hour in length, and took 36 and 45 minutes respectively in each of the pilot tests.

Skills assessment software is widely used in information technology courses throughout higher education. Skills assessment software can be used as a learning tool and for standardization of skills among large groups of students. There are many different brands of skills assessment software packages available. Examples that were examined by the researcher are SkillSoft by SkillSoft Corporation, Skillcheck by Prentice Hall Incorporated, and Skills Assessment Manager by Thomson Course Technology. The researcher also carefully considered individually assessing subjects via one-on-one observation, but came to the conclusion that this method would be too time consuming given the large number of subjects (186) utilized in this research. After review, Skills Assessment Manager software was selected by the researcher. The researcher made personal contact with several users of this software from other educational institutions and asked for their opinions and experiences using the software in order to provide some expert validity before using this software. Below is input from instructors from four other institutions concerning the use of Skills Assessment Manager (SAM) by Thomson Course Technology.

Patrick McKay, Instructor of Information Technology, performs computer skills assessments at West Nebraska Community College where SAM software has been used for this process since 1999. McKay stated that SAM is an effective tool in assessing student skills required for graduation (P. McKay, personal communication, October 25, 2004). SAM is also used at Valley City State University, where Kerry Gregoryk, Instructor of Business and Information Technology, used SAM for four years. Gregoryk (K. Gregoryk, personal communication, October 26, 2004) stated that SAM has allowed her department to assess skills of students, then accurately monitor and gauge progress throughout the semester. At West Texas A & M University, Professor Ron Mashburn has used SAM to meet their technology assessment needs. Both the University and the Texas Higher Education Coordinating Board requires that all students demonstrate proficiency in using applications such as word processing, spreadsheets, presentation software, operating systems, e-mail and browsers. Professor Mashburn has been able to use SAM for assessment of student skills, stating that SAM has been extremely valuable in the logistics of giving and grading skills-based examinations (R. Mashburn, personal communication, October 25, 2004).

Microsoft Office was the software that was used as the context for the skills that were tested. Microsoft Office is the most widely used software platform in the world in terms of the skills that were being taught, making it the primary choice for use in EDN 303 and subsequently, the testing instrument.

The computing skills of interest to this research fell into several primary categories – desktop publishing, electronic spreadsheets, database manipulation, basic web page development, electronic presentations and Windows XP operating systems. The specific software titles that were included in this assessment are Microsoft Windows XP, Microsoft Word, Microsoft Excel, Microsoft PowerPoint, Microsoft Access and Microsoft FrontPage.

One advantage of this tool was that this assessment was not self reporting in which students simply state either yes or no to questions whether or not they possess these skills. Rather, the students demonstrated specifically how they accomplished each task. The test questions were designed for the students to demonstrate their skills in the areas of specific computer software taught in EDN 303. There were six software areas, and ten questions in each area, ranging from easiest to most difficult as chosen by the team of experts who teach EDN 303. During the review of literature it was found that many of the studies had evaluation instruments that were not demonstration based, but had students answer yes/no or rate themselves on a numeric scale on their own proficiency. This assessment allowed for skill demonstration which is a more accurate measurement and adds to the validity and reliability of the instrument and research. In order to take the assessment, students logged on to the Thomson Course Technology website, entered a code, their name and choose the test that had been created for them by the test development team at UNC-W. The testing procedure cost $12.00 per student, and the cost for this license for all of the students was paid by a grant received by the researcher as a part of a grant that the Watson School of Education had received in 2004.

Demographic data was collected and used in the analysis of the testing data. The demographic factors affecting computer proficiency found in the review of literature were:

1. Age
2. Gender
3. Whether EDN 303 was the first computer skills course they had taken in college
4. Experience with specific software titles
5. Whether they had taken computer technology courses in high school
6. Whether they owned a computer
7. Whether they had access to a computer
8. Whether they used computers at their jobs
9. Level of confidence towards using computers

(Specific questions asked are included on the demographic questionnaire located in Appendix A.)

Population & Sample

The population in this research was all of the undergraduate students who were in the Watson School of Education at UNC-W. All students are required to take EDN 303 and to use computer technology skills while in the School of Education. The entire undergraduate education major population for spring 2005 in the School of Education was 1,395 including students who have taken EDN 303 and those who have not taken EDN 303 (C. Thomas, personal communication, April 4, 2004). Of this population, all of the students enrolled in the course during the Spring 2005 semester in sections that met live and on campus took the assessment unless they objected to being a participant. Students read and signed an Institutional Review Board approved consent form (see Appendix B).

Individuals targeted for the study were enrolled in live, on-campus sections of EDN 303 during the Spring 2005 semester at UNC-W because they were accessible and were in a controllable testing environment. There were 186 participants in this study. This convenience sample was similar to the population in age, gender and race, and because of the likeness of this sample to the population, it was considered to be a representative sample. The subjects were not randomly selected, which was a limitation of the study as noted in Chapter 1.

Kerlinger (1979) indicated that non experimental research is significant and important in spite of its limitations. This non experimental study was important to conduct because of the lack of information on the population in question at UNC-W. Conclusions based on non experimental data are more difficult to draw according to Kerlinger (1979); however, it is pointed out in said literature that the lesser control of the effects of the independent variables and of the research situation is sometimes compensated by greater realism and stronger effects.

The areas of measurement were based on the software skills taught in the EDN 303 course and demographic predictors as discussed in the literature. This sample yielded an N that was robust and satisfactory for statistical purposes.

Statistical Information and Methods

The independent variables for this study were the demographic factors: Below are the factors, their coding, and their level of measurement.

1. Age, (age). Exact values between 10 & 99 were collected – Interval

2. Gender, (gen). Males 1, Females 2 - Nominal

3. Race, (race). Caucasian 1, African American 2, Hispanic 3, Asian 4, Other 5 - Nominal

4. EDN 303 as first computer course (edn3031). Yes 1, No 2 - Nominal

5. Received instruction on computer technology in high school (hs). Yes 1, No 2. - Nominal

6. Have used Microsoft Office products before, (msw, mse, mspp, msa, msfp). Yes 1, No 2. - Nominal

7. Have used Microsoft Windows XP, (xp). - Yes 1, No 2. - Nominal

8. They own their own computer, (own). - Yes 1, No 2. - Nominal

9. They have regular access to a computer, (ac). - Yes 1, No 2. - Nominal

10. Have used computers in occupational settings, (work). - Yes 1, No 2. - Nominal

12. Feel confident about using computers, (conf). - Yes 1, No 2. - Nominal

The dependent variables for this study are the seven skill areas that were assessed: Below are the factors, their coding, and their level of measurement.

1. Score on Microsoft Word, (word). Exact values between 0 & 10 - Interval
2. Score on Microsoft PowerPoint, (ppt). Exact values between 0 & 10 - Interval
3. Score on Microsoft Excel, (exc). Exact values between 0 & 10 - Interval
4. Score on Microsoft Access, (acc). Exact values between 0 & 10 - Interval
5. Score on Microsoft FrontPage, (fp). Exact values between 0 & 10 - Interval
6. Score on Microsoft Windows XP, (xpscore) Exact values between 0 & 10 – Interval

Once the data was collected, a frequency distribution was performed on all independent variables to describe the sample. There was also a frequency distribution on all of the scores for the entire sample to describe the scores as a whole across each dependent variable (skill area). The researcher also obtained the means, medians, modes, standard deviations, minimums and maximums of each dependent variable on the entire sample.

To perform inferential statistics, the researcher performed Mann Whitney U tests on each demographic factor as related to each of the six skill assessment areas to analyze mean differences. Due to the fact that this was not a randomized sample, the researcher deemed it more appropriate to use non-parametric statistics. The Mann Whitney U test is one of the more popular nonparametric tests (Roscoe, 1975). It is a suitable alternative to the t-test for two independent samples when the assumptions underlying the t-test cannot be met. This test is "almost as powerful as the t-test (about 95 percent relative power with typical research samples) and does not require homogeneity of variance nor normality of distribution" (Roscoe, 1975, pg 236). According to Popham and Sirotnik, (1992) the test can be employed with little loss in power. This test is based on the notion that if scores of two similar groups are ranked together, there will be considerable intermingling of rankings for the two groups. If the groups are different, however, most of the superior group's rankings will be higher than those of the inferior group. The value of U is calculated by concentrating on the lower ranked group and counting the number of ranks of the high group that fall below the lower ranked group. The Mann Whitney U test is equivalent to the Wilcoxon 2-sample or Kruskal Wallis k-sample tests, and again, "is a suitable non-parametric equivalent to the t-test" (Roscoe, 1975, pg 236).

Data Collection Procedure

Every student registered to take EDN 303 live and on campus at UNC-W took the skills test on the first day of class in the Spring 2005 semester. The test was administered on the first day of classes to avoid data pollution through instruction during EDN 303. Students who participated in the study provided demographic data at the end of the skills assessment. Every class met in the same computer lab and used the same computers during different class times and on different days of the week (M/W classes and T/TH classes). Each instructor assisted the researcher in delivering and proctoring the test. In addition to the instructor of each section and the researcher, a graduate research assistant from the Watson School of Education was also present to assist with any potential problems and to help with proctoring. After each student took the test, their scores were recorded in a database located on a secure server owned by Thomson Course Technology, located in Boston, Massachusetts that was password and firewall protected. The data was available to the researcher for queries, reports and analysis through the Thomson Course Technology website interface using the "administrator" log in section for access. This data was exportable to Microsoft Excel, SPSS and SAS software programs for analysis. The researcher exported the data to SPSS for statistical computation. The researcher entered the corresponding demographic information into SPSS with the imported scores of the skills test to complete the data analysis.

Data Analysis

Data was analyzed using SPSS statistical analysis software. Descriptive analysis, frequency distributions and Mann Whitney U tests were performed using SPSS 11.01. Significance was measured at an α of .05.

Summary

The researcher determined that there was a body of literature supporting the use of demographic data to assist the explanation of differences in computer skills. The researcher developed a skills assessment and a series of demographic questions that aimed at the collection of necessary data. The researcher determined a target population, a sampling method (convenience sampling, with the assumption that the sample was representative of the larger population) and suitable statistical methods (means, medians, modes, standard deviations, variance, minimums and maximums, frequency distributions and Mann Whitney U tests) that allowed the researcher to analyze the skills assessment scores in terms of demographics and computer skills as a whole group. This created the ability to assess the computer skills of students prior to taking EDN 303, and if certain demographics allow the researcher to explain the differences in computer skills through the analysis of corresponding demographics.

CHAPTER 4

FINDINGS AND PRESENTATION OF DATA

This chapter is divided into three sections;

1. Demographic Description of the Participants
2. Description of Whole Sample Scores
3. Analysis Between Groups

The first section (Demographic Description of the Participants) presents the demographic data on the participants. This section presents the variables, then the frequency and percent of the total number of participants (N).

The second section (Description of Whole Sample Scores) is a description of scores per topic area. This section presents scores of the entire group (186 participants). It describes the performance of the group as a whole on the areas that were tested using means, medians, modes, standard deviations, variance, minimums and maximums. This section also includes frequency tables which describe the number of correct responses per skill for the total sample. This analysis was conducted in order to understand how the entire group performed on the skills test.

The third section (Analysis Between Groups) presents data derived from testing for differences between groups. Mann Whitney U tests were performed in order to test the research hypotheses. Mann Whitney U tests were performed using SPSS version 11.01 on the groups based on the research hypotheses. The Mann Whitney U test is based on the notion that if scores of two similar groups are ranked together, there will be considerable intermingling of rankings for the two groups. If the groups are different, most of the superior group's rankings will be higher than those of the inferior group. The value of U is computed by concentrating on the lower ranked group and counting the number of ranks of the high group that fall below the lower ranked group. The Mann Whitney U test is equivalent to the Wilcoxon 2-sample or Kruskal Wallis k-sample tests, and is a suitable non-parametric equivalent to the t-test (Roscoe, 1975). Significance was measured at an α of .05.

Demographic Description of the Participants

Table 4.1 shows demographic data comparing the sample to other larger populations that would be of interest to this study. This table shows how the sample used in this study is demographically similar to the population of the School of Education and to UNC-W in terms of age, race and gender. This assists in validating the sample as a representative of a larger population based on School of Education and UNC-W institutional data.

Table 4.1– Demographics of the Participants as Related to Larger Populations (N=186)

Demographic	Sample Frequency	Sample Percent	School of Education Percent	UNC-W Percent
Age				
22 and Younger (Traditional)	130	69	75	77
23 and Older	56	31	25	23
Gender				
Male	39	21	20	31
Female	147	79	80	69
Race				
Caucasian	173	93	95	88
African Descent	7	4	2	5
Other	6	3	3	7

Table 4.2 provides data on the participants in the study by age, gender, race, student status, if EDN 303 was their first computer course in college, if they had computer classes in high school, if they own a computer, if they have regular access to a computer, if they have used computers in occupational settings, and if they feel confident about using computers.

Table 4.2 – Demographics of the Participants (N=186)

Demographic	Frequency	Percent
Age		
22 and Younger (Traditional)	130	69.9
23 and Older	56	30.1
Gender		
Male	39	21
Female	147	79
Race		
Caucasian	173	93
African Descent	7	3.8
Other	6	3.2
EDN 303 as 1st Computer Class in College		
Yes	104	55.9
No	82	44.1
Had Computer Classes in High School		
Yes	133	71.5
No	53	28.5
Own a Computer		
Yes	180	96.8
No	6	3.2
Have Regular Access to a Computer		
Yes	185	99.5
No	1	0.5
Use Computers in Occupational Settings		
Yes	120	64.5
No	66	35.5
Feel Confident about Computer Skills		
Yes	158	84.9
No	28	15.1
Student Status		
Sophomore	65	34.9
Junior	92	49.5
Senior	6	3.2
Graduate Student	1	0.5
Alternative Licensure	21	11.3

There were over twice as many traditional aged students as nontraditional aged students. Over 30% of the sample was 23 years old or older. This is slightly under the numbers in the literature (approximately 40%) but still large enough for statistical computation. There were basically three times as many females as males (147:39). Roughly half (49.5%) of the participants were juniors, 34.9% were sophomores and the remainder was made up of seniors, graduate students, licensure only, and non-degree seeking students. There were 173 Caucasians out of the 186 participants. The literature did not state that race is a reliable predictor of computing skills, therefore this heavily skewed number did not affect statistical manipulation, as race was not used to calculate significant differences. Roughly 56% of the participants stated that EDN 303 was their first computer course in college. Around 70% of the participants stated that they had received computer instruction in high school, which almost exactly matches the percentage of traditional aged students in the study. Approximately 97% of the participants own a computer, and 99.5 % of the participants have regular access to a computer. About 65% of the participants felt confident about their computer skills, while 35% stated that they did not feel confident about their computer skills.

Description of Whole Sample Scores

Research Question 1. What do students who enter EDN 303 already know in reference to many of the specific basic computer skills that are taught in that course?

In order to formulate an answer to this question, the following null hypothesis was proposed:

Research Question 1, Null Hypothesis: The sample as a whole will not have overall scores of 5 out of 10 or greater on all of the six areas of the computer skills test.

In order to test this hypothesis, the researcher collected and analyzed data, then calculated descriptive statistics for the sample as a whole group, including means, medians, modes, standard deviations, variances, minimums and maximums. In addition, the researcher used frequency tables to illustrate the distribution of the scores of each tested area for the entire sample.

Table 4.3 provides a description of the data for the performance across all sections of the test for the entire sample.

Table 4.3 –Overall Group Performance Data: N=186

	Mean	Median	Mode	St. Deviation	Variance	Minimum	Maximum
Access	6.3817	7	7	1.99174	3.96702	0	10
Excel	2.9892	3	3	1.98913	3.95664	0	10
FrontPage	5	5	6	2.16108	4.67027	0	10
PowerPoint	6.5753	7	8	2.32198	5.3916	0	10
Windows XP	8.1882	9	9	2.30911	5.33197	0	10
Word	5.8656	6	6	2.00221	4.00886	0	10

The data in Table 4.3 indicate that students performed best in Windows XP and worst in Excel.

Tables 4.4 through 4.9 display the number of correct items per tested area. Table 4.4 presents data on Access scores in terms of frequency and percent.

Table 4.4 Access frequency table

Number of Correct Answers out of Possible 10	Frequency	Percent	Cumulative Percent
0	4	2.2	2.2
1	1	.5	2.7
2	2	1.1	3.8
3	11	5.9	9.7
4	13	7.0	16.7
5	15	8.1	24.7
6	37	19.9	44.6
7	48	25.8	70.4
8	34	18.3	88.7
9	18	9.7	98.4
10	3	1.6	100.0
Total	186	100.0	

According to the data in Table 4.4, 75.3 percent of the total N scored at least a 6/10 correct or greater on MS Access items.

Table 4.5 presents data on Excel scores in terms of frequency and percent.

Table 4.5 Excel frequency table

Number of Correct Answers out of Possible 10	Frequency	Percent	Cumulative Percent
0	13	7.0	7.0
1	35	18.8	25.8
2	35	18.8	44.6
3	40	21.5	66.1
4	27	14.5	80.6
5	11	5.9	86.6
6	13	7.0	93.5
7	8	4.3	97.8
8	3	1.6	99.5
9	0	0	99.5
10	1	.5	100.0
Total	186	100.0	

According to the data in Table 4.5, 80.6 percent of the total N scored 4/10 or less correct on MS Excel items.

Table 4.6 presents data on FrontPage scores in terms of frequency and percent.

Table 4.6 FrontPage frequency table

Number of Correct Answers out of Possible 10	Frequency	Percent	Cumulative Percent
0	14	7.5	7.5
1	1	.5	8.1
2	11	5.9	14.0
3	14	7.5	21.5
4	19	10.2	31.7
5	36	19.4	51.1
6	47	25.3	76.3
7	28	15.1	91.4
8	13	7.0	98.4
9	3	1.6	100.0
10	0	0	100.0
Total	186	100.0	

According to the data in Table 4.6, 68.3 percent of the total N scored at least a 5/10 correct or greater on MS FrontPage items.

Table 4.7 presents data on PowerPoint scores in terms of frequency and percent.

Table 4.7 PowerPoint frequency table

Number of Correct Answers out of Possible 10	Frequency	Percent	Cumulative Percent
0	3	1.6	1.6
1	5	2.7	4.3
2	6	3.2	7.5
3	6	3.2	10.8
4	8	4.3	15.1
5	23	12.4	27.4
6	33	17.7	45.2
7	26	14.0	59.1
8	36	19.4	78.5
9	27	14.5	93.0
10	13	7.0	100.0
Total	186	100.0	

According to the data in Table 4.7, 85 percent of the total N scored at least a 5/10 correct or greater on MS PowerPoint items.

Table 4.8 presents data on Windows XP scores in terms of frequency and percent.

Table 4.8 Windows XP frequency table

Number of Correct Answers out of Possible 10	Frequency	Percent	Cumulative Percent
0	9	4.8	4.8
1	0	0	4.8
2	1	.5	5.4
3	1	.5	5.9
4	2	1.1	7.0
5	2	1.1	8.1
6	6	3.2	11.3
7	18	9.7	21.0
8	36	19.4	40.3
9	60	32.3	72.6
10	51	27.4	100.0
Total	186	100.0	

According to the data in Table 4.8, 88.8 percent of the total N scored at least a 7/10 correct or greater on MS Windows XP items.

Table 4.9 presents data on Word scores in terms of frequency and percent.

Table 4.9 Word frequency table

Number of Correct Answers out of Possible 10	Frequency	Percent	Cumulative Percent
0	1	.5	.5
1	3	1.6	2.2
2	8	4.3	6.5
3	11	5.9	12.4
4	22	11.8	24.2
5	31	16.7	40.9
6	33	17.7	58.6
7	33	17.7	76.3
8	31	16.7	93.0
9	11	5.9	98.9
10	2	1.1	100.0
Total	186	100.0	

According to the data in Table 4.9, 75.3 percent of the total N scored at least a 5/10 correct or greater on MS Word items.

<u>Analysis Between Groups</u>

Research Question 2. Do differences in computer skills exist between groups of students in the School of Education when the students are divided into groups based on demographic factors?

Null Hypothesis 1. There will be no significant difference between the traditional aged (22 and younger) group and the nontraditional students group (23 and higher) across all areas of the computer skills test. Significance was analyzed with an α of .05

Table 4.10 presents the data from the analysis between traditional and non-traditional students.

Table 4.10 – Analysis between traditional and non-traditional students across all areas of the test

Software	Traditional vs. Nontraditional	N	Raw Mean	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Sig. 2-tailed
Access	22 & younger	130	6.56	98.28	12776.0			
	23 & older	56	5.94	82.41	4615.0			
	Total	186	6.38			3019.0	-1.875	.061
Excel	22 & younger	130	2.99	93.99	12219.0			
	23 & older	56	2.98	92.36	5172.0			
	Total	186	2.98			3576.0	-.193	.847
FrontPage	22 & younger	130	5.33	100.22	13028.50			
	23 & older	56	4.23	77.90	4362.50			
	Total	186	5.0			2766.5	-2.632	.008*
PowerPoint	22 & younger	130	6.78	97.44	12667.50			
	23 & older	56	6.08	84.35	4723.50			
	Total	186	6.57			3127.50	-1.538	.124
Windows XP	22 & younger	130	8.51	100.27	13035.0			
	23 & older	56	7.42	77.79	4356.0			
	Total	186	8.18			2760.0	-2.698	.007*
Word	22 & younger	130	6.03	98.57	12814.50			
	23 & older	56	5.46	81.72	4576.50			
	Total	186	5.86			2980.50	-1.980	.048*

*Significant at an α of .05

According to the data in Table 4.10, there was a significant difference between students 22 and younger vs. students 23 and older in 3 of the 6 categories, with students 22 and younger significantly outperforming the older group in Word, Windows XP and FrontPage. Significance was analyzed with an α of .05.

Null Hypothesis 2. There will be no significant difference across all areas of computer skills between the male student group and the female student group across all six areas of the computer skills test.

Table 4.11 presents the data from the analysis between male and female students.

Table 4.11 - Analysis between male and female students across all areas of the test

Software	Gender	N	Raw Mean	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Sig. 2-tailed
Access	Males	39	5.97	85.10	3319.00			
	Females	147	6.48	95.73	14072.00			
	Total	186	6.38			2539.000	-1.114	.265
Excel	Males	39	2.58	82.15	3204.00			
	Females	147	3.09	96.51	14187.00			
	Total	186	2.98			2424.000	-1.501	.133
FrontPage	Males	39	4.28	78.17	3048.50			
	Females	147	5.19	97.57	14342.50			
	Total	186	5.00			2268.500	-2.031	.042*
PowerPoint	Males	39	5.69	74.01	2886.50			
	Females	147	6.80	98.67	14504.50			
	Total	186	6.57			2106.500	-2.570	.010*
Windows XP	Males	39	7.56	83.74	3266.00			
	Females	147	8.35	96.09	14125.00			
	Total	186	8.18			2486.000	-1.315	.189
Word	Males	39	5.28	76.06	2966.50			
	Females	147	6.02	98.13	14424.50			
	Total	186	5.86			2186.500	-2.301	.021*

*Significant at an α of .05

According to the data in Table 4.11, there were significant differences between groups based on gender in 3 of the 6 categories, with females significantly outperforming males in Word, PowerPoint and FrontPage. Significance was analyzed with an α of .05. The analysis indicated a significant difference between 3 of the 6 groups, and therefore did not support the hypothesis.

Null Hypothesis 3. There will be no significant difference across all areas of computer skills between students who state that EDN 303 is their first computer technology course in college and students who have had a computer course in college prior to EDN 303.

Table 4.12 presents the data from the analysis between students who have had previous computer skills courses in college and those who did not have such courses before EDN 303.

Table 4.12 - Analysis between students who have had previous computer skills courses in college and those who did not have such courses before EDN 303

Software	If Students Had Taken a Previous Computer Skills Course	N	Raw Mean	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Sig. 2-tailed
Access	Had no previous course	104	6.22	89.74	9333.00			
	Had previous course	82	6.58	98.27	8058.00			
	Total	186	6.38			3873.0	-1.091	.275
Excel	Had no previous course	104	2.71	86.24	8969.00			
	Had previous course	82	3.34	102.71	8422.00			
	Total	186	2.98			3509.0	-2.100	.036*
FrontPage	Had no previous course	104	5.17	96.84	10071.50			
	Had previous course	82	4.78	89.26	7319.50			
	Total	186	5.00			3916.5	-.967	.333
PowerPoint	Had no previous course	104	6.41	90.21	9382.00			
	Had previous course	82	6.78	97.67	8009.00			
	Total	186	6.57			3922.0	-.948	.343
Windows XP	Had no previous course	104	8.29	97.40	10130.00			
	Had previous course	82	8.04	88.55	7261.00			
	Total	186	8.18			3858.0	-1.150	.250
Word	Had no previous course	104	5.64	88.19	9171.50			
	Had previous course	82	6.14	100.24	8219.50			
	Total	186	5.86			3711.5	-1.533	.125

*Significant at an α of .05

According to the data in Table 4.12, there was a significant difference between the students who had a computer skills course in college outperforming those who had not in 1 of the 6 categories (Excel). Significance was analyzed with an α of .05. The analysis indicated a significant difference between 1 of the 6 groups, and therefore did not support the hypothesis.

Table 4.13 presents the data from the analysis between students who stated that they have had experience using specific software and those who did not have experience using specific software.

Table 4.13 – Analysis between students who stated that they have had experience using specific software and those who did not have experience using specific software

Software	Whether or not they had experience	N	Raw Mean	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Sig. 2-tailed
Word	Had Experience	184	5.85	93.33	17172			
	No Experience	2	6.50	109.5	219			
	Total	186	6.38			152	-0.427	0.669
Excel	Had Experience	133	3.30	101.9	13552.5			
	No Experience	53	2.20	72.42	3838.5			
	Total	186	2.98			2407.5	-3.417	.001*
PowerPoint	Had Experience	164	6.86	98.25	16113			
	No Experience	22	4.40	58.09	1278			
	Total	186	6.57			1025	-3.32	.001*
Access	Had Experience	56	6.71	102.01	5712.5			
	No Experience	130	6.23	89.83	11678.5			
	Total	186	6.38			3163.5	-1.439	0.15
FrontPage	Had Experience	17	6.23	124.24	2112			
	No Experience	169	4.87	90.41	15279			
	Total	186	5.00			914	-2.506	.012*
Windows XP	Had Experience	143	8.32	98.03	14018.5			
	No Experience	43	7.72	78.43	3372.5			
	Total	186	8.18			2426.5	-2.162	.031*

*Significant at an α of .05

Null Hypothesis 4. There will be no significant difference across all areas of computer skills between students who state that they have never used specific components of Microsoft Office and students who have used specific components of Microsoft Office. Significance was analyzed with an α of .05.

According to the data in Table 4.13, there was a significant difference between students who had experience with PowerPoint and students who did not have experience with

PowerPoint, with students having experience significantly outperforming those who did not. There was a significant difference between students who had experience with Excel and students who did not, with students who did have experience significantly outperforming those who did not. There was insufficient data to accurately compare means between students with experience using Word and those who did not, with the number of students without experience using Word equaling 2 (184:2). There was not a significant difference between students who had experience with Access and students who did not with students who did have experience outperforming those who did not. There was a significant difference between students who had experience with FrontPage and students who did not, with students who did have experience significantly outperforming those who did not. Significance for all of these analyses were analyzed with an α of .05. The analysis indicated a significant difference between 3 of the 5 groups (excluding Windows XP which is tested in hypothesis 5), and therefore did not support the hypothesis.

Null Hypothesis 5. There will be no significant difference between students who state that they have never used Microsoft Windows XP and students who have used Microsoft Windows XP. Significance was analyzed with an α of .05.

According to the data in Table 4.13, there were not significant differences between students who had experience with Windows XP and students who did not. Students who did have experience outperformed those who did not. Significance was analyzed with an α of .05. The analysis indicated a significant difference between groups, and therefore did support the null hypothesis.

Null Hypothesis 6. There will be no significant difference across all areas of computer skills between students who received computer skills instruction in high school and students who did not receive computer skills instruction in high school. Table 4.14 presents the data from the analysis between students who had computer skills courses in high school and those who did not have such courses in high school.

Table 4.14 – Analysis of differences between students who had computer skills courses in high school and those who did not have such courses in high school

Software	Whether or not they had a high school computer class	N	Raw Mean	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Sig. 2-tailed
Access	Had HS Course	133	6.53	96.94	12893.00			
	Did not have HS Course	53	6.00	84.87	4498.00			
	Total	186	6.38			3067.000	-1.404	.160
Excel	Had HS Course	133	3.21	99.42	13222.50			
	Did not have HS Course	53	2.43	78.65	4168.50			
	Total	186	2.98			2737.500	-2.408	.016*
FrontPage	Had HS Course	133	5.15	95.96	12763.00			
	Did not have HS Course	53	4.60	87.32	4628.00			
	Total	186	5.00			3197.000	-1.003	.316
PowerPoint	Had HS Course	133	6.77	96.79	12872.50			
	Did not have HS Course	53	6.07	85.25	4518.50			
	Total	186	6.57			3087.500	-1.333	.183
Windows XP	Had HS Course	133	8.48	98.12	13049.50			
	Did not have HS Course	53	7.45	81.92	4341.50			
	Total	186	8.18			2910.500	-1.913	.056
Word	Had HS Course	133	6.01	97.42	12956.50			
	Did not have HS Course	53	5.49	83.67	4434.50			
	Total	186	5.86			3003.500	-1.590	.112

*Significant at an α of .05

According to the data in Table 4.14, there were significant differences in 1 of the 6 areas between students who had taken computer technology courses in high school and students who did not. Students who had taken computer technology courses in high school significantly outperformed those who did not only in the area of Excel. Significance was analyzed with an α of .05. The analysis indicated a significant difference between 1 of the 6 groups, and therefore did not support the hypothesis.

Null Hypothesis 7. There will be no significant difference across all areas of computer skills between students who have had jobs involving the skills being tested and students who did not have jobs involving the use of the skills being tested.

Table 4.15 presents the data from the analysis between students who have used computers in jobs and those who did not use computers in their jobs.

Table 4.15 – Analysis of differences between students who have used computers in jobs and those who did not use computers in their jobs

Software	Use at job/not	N	Raw Mean	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Sig. 2-tailed
Access	Use at job	120	6.29	91.41	10969.00			
	Do not use at job	66	6.54	97.30	6422.00			
	Total	186	6.38			3709.000	-.727	.467
Excel	Use at job	120	3.15	97.49	11699.00			
	Do not use at job	66	2.69	86.24	5692.00			
	Total	186	2.98			3481.000	-1.382	.167
FrontPage	Use at job	120	4.80	87.79	10534.50			
	Do not use at job	66	5.36	103.89	6856.50			
	Total	186	5.00			3274.500	-1.980	.048*
PowerPoint	Use at job	120	6.60	93.46	11215.50			
	Do not use at job	66	6.51	93.57	6175.50			
	Total	186	6.57			3955.500	-.013	.990
Windows XP	Use at job	120	8.01	87.72	10526.50			
	Do not use at job	66	8.50	104.01	6864.50			
	Total	186	8.18			3266.500	-2.039	.041*
Word	Use at job	120	6.00	96.60	11592.50			
	Do not use at job	66	5.62	87.86	5798.50			
	Total	186	5.86			3587.500	-1.072	.284

*Significant at an α of .05

According to the data in Table 4.15, there was not a significant difference in 2 of the 6 areas of the test between students who use computers in their work and students who did not. Students who did not use computers in their jobs significantly outperformed those who did in the areas of Windows XP and FrontPage. Significance was analyzed with an α of .05. The analysis indicated a significant difference between 2 of the 6 groups, and therefore did not support the hypothesis.

Null Hypothesis 8. There will be no significant difference across all areas of computer skills between students who have a lack of confidence involving the use of computers and students who do not have a lack of confidence involving the use of computers.

Table 4.16 presents the data from the analysis between students who stated that they had a high level of confidence and those who did not have confidence level in their use of technology.

Table 4.16 – Analysis of differences between students who stated that they had a high level of confidence and those who did not have confidence level in their use of technology

Software	Do/do not have confidence in technology skills	N	Raw Mean	Mean Rank	Sum of Ranks	Mann-Whitney U	Z	Sig. 2-tailed
Access	Have confidence	158	6.44	94.97	15005.00			
	Do not have confidence	28	6.03	85.21	2386.00			
	Total	186	6.38			1980.000	-.899	.369
Excel	Have confidence	158	3.12	96.79	15293.00			
	Do not have confidence	28	2.21	74.93	2098.00			
	Total	186	2.98			1692.000	-2.008	.045*
FrontPage	Have confidence	158	5.06	95.36	15066.50			
	Do not have confidence	28	4.60	83.02	2324.50			
	Total	186	5.00			1918.500	-1.135	.257
PowerPoint	Have confidence	158	6.83	99.12	15660.50			
	Do not have confidence	28	5.10	61.80	1730.50			
	Total	186	6.57			1324.500	-3.416	.001*
Windows XP	Have confidence	158	8.22	94.15	14876.00			
	Do not have confidence	28	8.00	89.82	2515.00			
	Total	186	8.18			2109.000	-.405	.685
Word	Have confidence	158	5.96	96.48	15244.00			
	Do not have confidence	28	5.28	76.68	2147.00			
	Total	186	5.86			1741.000	-1.814	.070

*Significant at an α of .05

According to the data in Table 4.16, there were significant differences in 2 of the 6 tested areas between students who had a strong sense of confidence and students who did not. Students who did have a strong sense of confidence significantly outperformed those who did not in the areas of PowerPoint and Excel. Significance was analyzed with an α of .05. The analysis indicated a significant difference between 2 of the 6 groups, and therefore did not support the hypothesis.

Null Hypothesis 9. There will be no significant difference across all areas of computer skills between students who own computers and students who do not own computers.

According to the data in Table 4.2, there were not sufficient data for this analysis. The number of non computer owners (6) was too small for statistical calculations (180:6).

Null Hypothesis 10. There will be no significant difference across all areas of computer skills between students between students who have regular computer access and students who do not own have regular computer access.

According to the data in Table 4.2, there were not sufficient data for this analysis. The number of students without regular computer access (1) was too small for statistical calculations (185:1).

Table 4.17 summarizes the findings of significant differences between groups across the six tested areas.

Table 4.17: Summary of significant differences between demographic groups (α of .05)

Software Area ↓	Demographic Category: Gender	Experience/Not	Traditional/Non Traditional	Confident/Not Confident	Use at Work/Not	Computer Classes in College/Not	Computer Classes in HS/Not	Computer Ownership/Not and Computer Access/Not
Word	**Significant Difference**	Insufficient Data	**Significant Difference**	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	Insufficient Data
Excel	No Significant Difference	**Significant Difference**	No Significant Difference	**Significant Difference**	No Significant Difference	**Significant Difference**	**Significant Difference**	Insufficient Data
Power-Point	**Significant Difference**	**Significant Difference**	No Significant Difference	**Significant Difference**	No Significant Difference	No Significant Difference	No Significant Difference	Insufficient Data
Front-Page	**Significant Difference**	**Significant Difference**	**Significant Difference**	No Significant Difference	**Significant Difference**	No Significant Difference	No Significant Difference	Insufficient Data
Access	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	No Significant Difference	Insufficient Data
Windows XP	No Significant Difference	**Significant Difference**	**Significant Difference**	No Significant Difference	**Significant Difference**	No Significant Difference	No Significant Difference	Insufficient Data

As per the table, no demographic category had significant differences across all six tested areas. It should be noted that there were significant differences between students who stated that they had experience and those that did not in 4 of 5 tested areas, with not enough data present in the Word category due to the fact that 184 out of 186 participants stated that they had experience with Word. Significance was analyzed with an α of .05.

Summary

This chapter presented data which provided a demographic description of the participants, description of whole sample scores across all six tested performance areas, and data from an inferential analysis between groups based on specific demographics.

When analyzing the data using inferential statistics between groups based on specific demographics, several significant differences were detected. There were significant differences between groups in many of the tested situations. However, there were no cases where there were significant differences between groups across all six tested areas; rather, significant differences were found in multiple tested areas across the different demographic categories as per Table 4.17. When the data was analyzed based on experience with specific software categories (Word, PowerPoint, etc.), significant differences were found in 4 of 5 categories, with 1 category containing insufficient data for statistical analysis.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Introduction

The purpose of this study was to gather data on student computer skills that are taught in EDN 303 and analyze the data to attempt to discover what most students enter the course already knowing about the skills taught in EDN 303. Secondly, this research attempted to explain the differences in skills through the analysis of demographic factors as indicated in the literature. This data will be used to make recommendations concerning how EDN 303 could be adapted and redesigned to reflect what is known about the student population in order to better serve the students who are in the School of Education. The objectives of this study were:

1. Collect data to inform the Watson School of Education on student computer skills fluency in the following areas: Windows XP, Microsoft Excel, Microsoft Word, Microsoft PowerPoint, Microsoft FrontPage and Microsoft Access.
2. Analyze data descriptively to determine how the students as a whole perform on specific computer skills.
3. Analyze data using inferential methods after stratification into subgroups based on selected demographics as discovered in the review of literature. Such demographics included age, gender, college computer classes previously taken, high school computer courses previously taken, work history with the use of the specified skills, feelings of confidence towards using computers, and familiarity of Microsoft Office and Windows XP.
4. Make recommendations based on the data collection and analysis on how EDN 303 can

be adapted in order to reflect the computer skills that students have upon entering the School of Education.

This attempt at finding out more about the computer skills of undergraduate education majors upon entry to EDN 303 and explaining the differences in computer skills of these students enables the School of Education at UNC-W to better understand what students know before receiving instruction. This research provides a pathway for the improvement of instruction allowing EDN 303 to be redesigned in the future in terms of the scope and sequence of the curriculum.

Statement of the Problem

There had been intense discussion by the faculty in the School of Education at UNC-Wilmington about the skills that are being taught in EDN 303. There were conversations and debate among the faculty concerning the design of EDN 303 and whether or not the skills that were being taught are redundant to the students who take the class. Some faculty members assumed that "most" of the students already know the skills that are taught in EDN 303 when they come into the class, and that the skills part of the EDN 303 curriculum should be eliminated or re-designed. This assumption stemmed from the belief that students are now growing up with the use of computers as a part of their everyday life, and that computers are so entrenched in our society that everyone is receiving experiences that develop skills such as those that are taught in EDN 303. On the other side of the debate, faculty members did not think that most students are coming into the class proficient with the computer technology skills that are needed for success in the School of Education. These debates have been on-going for many years without a defensible answer because of the lack of data.

Historically, the student population in the Watson School of Education has been primarily traditional students – meaning that these students came directly from high school and into college with little if any breaks in between. With the momentum of a pending teacher shortage and a weakened economy that has caused many job cuts and layoffs in this region, there are students who are now being admitted into the Watson School of Education who are non-traditional, are of various ages, and have differing life experiences and work experiences. In addition, the growth of the Camp Lejeune military base has served as an area of growth for student population with the influx of prior service, retirees, and military dependents, all of which have a high level of demographic variation as opposed to the traditional student who is straight from high school. Non-traditional students seeking to become teachers often come into the School of Education with very different sets of knowledge, skills and attitudes than their younger colleagues. The classes at the School of Education are filled with a variety of students from many different walks of life and who have vastly different skill sets. The diversity of the students creates a need to better understand what all of the students know about computer skills, and begs the question of what exactly any student knows concerning those skills. Does the course EDN 303 strengthen or reinforce students' skills, redundantly cover skills they already have, or both?

Major Research Questions

The major research questions for this study are:

Research Question 1. What do students who enter EDN 303 already know in reference to many of the specific basic computer skills that are taught in that course?

Research Question 2. Do differences in computer skills exist between groups of students in the School of Education when the students are divided into groups based on demographic factors?

Procedures

This study was an observational study with a survey design that used a performance-based computer skills competency test and demographic questionnaire to collect data. This assessment employed a web-based assessment instrument from which data could be collected and analyzed concerning computer skills of undergraduate education majors prior to receiving instruction in EDN 303. A survey design was chosen because surveys provide a quantitative or numeric description of some fraction of the population – the sample – through the data collection process of asking questions (Creswell, 1994). By collecting this data, the researcher was able to generalize the findings from a sample of responses to a population (all of the students who are in the School of Education at UNC-Wilmington) so that inferences could be made about the computer skills and possible demographic predictors of the population. This survey was cross-sectional, meaning that the data was collected at one point in time.

Instrumentation

O'Hanlon (2002) discussed how self reporting is often inflated and cannot be used as reliably as demonstration of skills. This study employed a web-based assessment tool that was developed to test computer skills in several different categories by demonstration rather than self reporting. The assessment tool used in this research was created, maintained and marketed by Thomson Course Technology and is called Skills Assessment Manager (SAM). This assessment tool contained a test bank of items and allowed the researcher to choose items that best measure the particular skills in question or write his own items. In order to diminish bias and promote validity and reliability, the researcher had professors and instructors of instructional technology from the School of Education at UNC-Wilmington choose the items that were in the evaluation instrument. These experts (listed in Appendix E) designed the assessment tool during a six hour session. The panel of expert faculty chose the items as a group, building consensus about each item and chose items that would be representative of the skills most important to each skill area that are taught in all sections of EDN 303. The experts reviewed questions from the software test bank which were categorized by software title. The experts chose ten items from each section, ranging from simplest to most difficult. This created a test containing sixty items. After the instrument was designed and developed, the researcher performed 2 pilot tests to ensure smooth operation of the instrument.

Microsoft Office and Windows XP were the software that were used as the context for the skills that were tested. The computing skills of interest to this research fell into several primary categories – MS Word, MS Excel, MS PowerPoint, MS Access, MS FrontPage and Windows XP operating system. Instead of simple self-reporting, the test questions were designed for the students to demonstrate their skills in the areas of specific computer software taught in EDN 303. There were six software areas, and ten questions in each area, ranging from easiest to most difficult as chosen by the team of experts who teach EDN 303. The testing procedure cost $12.00 per student, and the cost for this license for all of the students was paid by a grant received by the researcher as a part of a grant that the Watson School of Education had received in 2004.

Demographic data was collected and used in the analysis of the test data, including:

1. Age
2. Gender

3. If previous computer courses had been taken in college
4. Experience with specific software
5. If previous computer courses had been taken in high school
6. If they owned a computer
7. If they have regular access to a computer
8. If they use computers at their jobs
9. Level of confidence towards using computers

Population and Sample

The population in this research was all of the undergraduate students who are in the Watson School of Education at UNC-W. The sample consisted of all students who took the course in Spring 2005 in sections that met live and on campus took the assessment unless they objected. Students read and signed an Institutional Review Board approved consent form which is located Appendix B. Individuals targeted for the study were accessible and were in a controllable testing environment. The final group contained 186 participants.

Considering the population, this was a convenience sample because it was not randomized, and due to the nature of this research was the best sample possible because of its large N and diverse characteristics. This sample was similar to the population in age, gender and race, and because of the likeness of this sample to the population it was considered to be a representative sample. It was noted that the subjects were not randomly selected, which is a limitation of the study. Because the sample was not randomized, the researcher used non-parametric statistical methods which permit more flexibility in satisfying assumptions with little loss of statistical power.

The researcher obtained the means, medians, modes, standard deviations, variance, minimums and maximums of each dependent variable on the entire sample. To perform inferential statistics, the researcher performed Mann Whitney U tests on each demographic factor as related to each of the six skill assessment areas to analyze statistical differences.

Analyses

Research Question 1. What do students who enter EDN 303 already know in reference to many of the specific basic computer skills that are taught in that course?

Research Question 1, Null Hypothesis: The sample as a whole will not have overall scores of 5 out of 10 or greater on all of the six areas of the computer skills test.

In order to test this hypothesis, the researcher collected and analyzed data, then calculated descriptive statistics for the sample as a whole group, including means, medians, modes, standard deviations, variance, minimums and maximums. In addition, the researcher used frequency tables to illustrate the distribution of the scores of each tested area for the entire sample.

As a whole group, the entire sample scored a 5 out of 10 or higher on the mean score all of the tested computer skill areas except Excel. This data indicated that the entire sample scored 5 or more items out of 10 correctly in 5 out of the 6 tested computer skill areas (see Table 4.3 for the data). Further, the frequency tables shown in Tables 4.4 through 4.9 go on to verify exactly how much of the total sample percent scored a 5 out of 10 or higher on all of the six tested performance areas.

Table 5.1 summarizes the Percent of total sample scoring 5 out of 10 or greater on areas of test and raw means across software areas.

Table 5.1 – Summary of Tables 4.3 through 4.9. Percent of total sample scoring 5 out of 10 or greater on areas of test and raw means across software areas

Software Title	Percent of total sample scoring 5/10 or greater	Raw mean of total sample in software areas
Access	83.40%	6.3817
Excel	18.30%	2.9892*
FrontPage	87.70%	5.0
PowerPoint	91.30%	6.5753
Windows XP	93.20%	8.1882
Word	75.30%	5.8656

* Not 5/10 or greater

This finding documents that with the exception of Excel (18.3%), the vast majority (75.3% - 93.2%) of all students in the sample entered EDN 303 knowing at least 5 out of 10 of the computer skills that are taught in the areas of Access, Excel, FrontPage, PowerPoint, Windows XP and Word. This data does not support null hypothesis 1 for research question 1.

Research Question 2. Do differences in computer skills exist between groups of students in the School of Education when the students are divided into groups based on demographic factors?

Null Hypothesis 1. There will be no significant difference between the traditional aged (22 and younger) group and the nontraditional students group (23 and higher) across all areas of the computer skills test.

The data collected to test this hypothesis was partitioned on the premise that traditional aged students are 22 and younger and non traditional aged students are 23 and older as per the definitions used at UNC-W. In order to compare the mean scores of these groups across all six performance areas, the researcher used a Mann Whitney U statistical test. Significance was analyzed with an α of .05. There was a significant difference between the groups of students 22 and younger vs. the students 23 and older in the categories of Windows XP (.008) and FrontPage (.004), with students 22 and younger group significantly outperforming the students 23 and older group (see Table 4.10 for the data). This data does not support hypothesis 1 of research question 2.

Null Hypothesis 2. There will be no significant difference across all areas of computer skills between the male student group and the female student group across all seven areas of the computer skills test.

The data collected to test this hypothesis was analyzed on the premise that there are generally differences in computing skills based on gender, and that males are often found to be more skillful in the use of computers because of greater exposure to computers, science and mathematics in school. There was a significant difference between groups based on gender in the categories of FrontPage (.042), PowerPoint (.010) and Word (.021), (see Table 4.11) with females significantly outperforming males in Word, PowerPoint and FrontPage. It should be noted that the female group had an apparent higher (but not significantly different) mean rank in all test categories which is contradictory to the literature, and keeping with the analysis of significant differences, this data does not support hypothesis 2 of research question 2.

Null Hypothesis 3. There will be no significant difference across all areas of computer skills between students who state that EDN 303 is their first computer technology course in college and students who have had a computer course in college prior to EDN 303.

The data collected to test this hypothesis was partitioned on the premise that according to the literature, there are usually differences in computing skills based on students who have had previous computer skills training, with this hypothesis focusing on students who had taken a computer course prior to EDN 303. There was a significant difference between groups having or not having had a previous computer skills course in college, with the students who have had a computer skills course in college outperforming those who had not in the category of Excel (.036) (see Table 4.12). Significant differences were found in only 1 of the 6 categories, this data does not support hypothesis 3 of research question 2.

Null Hypothesis 4. There will be no significant difference across all areas of computer skills between students who state that they have never used specific components of Microsoft Office and students who have used specific components of Microsoft Office.

Null Hypothesis 5. There will be no significant difference across all areas of computer skills between students who state that they have never used Microsoft Windows XP and students who have used Microsoft Windows XP.

These hypotheses focused on specific experiences with specific software, where participants who stated that they had experience with specific software were compared to students who stated that they did not have experience with specific software. In testing this hypothesis, groups who had experience were compared to those who did not have experience with specific software (Access, Excel, FrontPage, PowerPoint, Windows XP, and Word). There was a significant difference between groups based on having or not having specific experience with certain software. Significant differences between groups were found in the areas of Excel (.001), PowerPoint (.001), FrontPage (.012) and Windows XP (.031), with no significant difference between groups on Access (.150) (see data in Table 4.13). There was insufficient data for necessary computation on Word because 184 of the 186 participants stated that they had experience with Word. Based on this data, since significant differences were found in only 4 of the 6 categories, this data does not support hypothesis 4 of research question 2. However, it should be noted that 4 out of 6 categories was the highest amount of significant differences found in any demographic category.

Null Hypothesis 6. There will be no significant difference across all areas of computer skills between students who received computer skills instruction in high school and students who did not receive computer skills instruction in high school.

The data collected to test this hypothesis was partitioned on the premise that according to the literature, there are differences in computing skills based on students who have had previous computer skills training, in this case, the previous computer training in question was high school computer classes. The participants who had taken computer courses in high school were compared to participants who had not taken computer classes in high school across all 6 categories of computer skills. There was not a significant differences across all areas between students who had taken computer technology courses in high school and students who did not. Excel was the only area that showed a significant difference (.016). Based on this data, since significant differences were found in only 1 of the 6 categories, this data does not support research hypothesis 6 of research question 2.

Null Hypothesis 7. There will be no significant difference across all areas of computer skills between students who have had jobs involving the skills being tested and students who did not have jobs involving the use of the skills being tested.

There were not significant differences across all areas of the test between students who use computers in their work and students who did not. Students who did not use computers in their work significantly outperformed those who did in the areas of Windows XP (.041), and FrontPage (.048). Based on this data, since significant differences were found in only 2 out of 6 categories, this data does not support hypothesis 7 of research question 2.

Null Hypothesis 8. There will be no significant difference across all areas of computer skills between students who have a lack of confidence involving the use of computers and students who do not have a lack of confidence involving the use of computers.

There were not significant differences across all areas of the test between students who had a strong level of confidence and students who did not. However, students who did have confidence significantly outperformed those who did not in the areas of PowerPoint (.001) and Excel (.045). Based on this data, since significant differences were found in only 2 out of 6 categories, this data does not support hypothesis 8 of research question 2.

Null Hypothesis 9. There will be no significant difference across all areas of computer skills between students who own computers and students who do not own computers.

There were not sufficient data for this analysis. The number of students without regular computer access (6) was too small for statistical calculations (180:6).

Null Hypothesis 10. There will be no significant difference across all areas of computer skills between students between students who have regular computer access and students who do not own have regular computer access.

There were not sufficient data for this analysis. The number of students without regular computer access (1) was too small for statistical calculations (185:1).

Conclusions and Discussion

Computer Skills Assessment – In the design and development of this research, the review of related literature indicated that there were several ways to assess computer skills of research participants. Methods that were mentioned in the literature included self reporting of skill proficiency by participants and demonstration of skills by participants. The literature also noted that self reporting was not as reliable of a measurement technique as actual demonstration. For these reasons, the researcher used a demonstration based assessment tool to determine the skills proficiency of the participants. As opposed to watching and recording the participant's performance individually, the researcher was able to adopt a tool that allowed the participants to be given skills questions. The students then performed the skill and had the score recorded automatically. The assessment tool that was used (Skills Assessment Manager, Thomson Course Technology) allowed the researcher to accurately measure skills of a larger population and have the data immediately ready to be exported and analyzed via a centralized web-based interface. This contributed to the study in an innovative and accurate manner. The researcher believes that the implementation of such an assessment tool is an asset to other researchers and educators who need to be able to assess participant performance in areas such as Microsoft Word, Microsoft Excel, Microsoft Access, Microsoft FrontPage, Microsoft PowerPoint and Microsoft Windows XP. Since there are skill assessments in these areas in many school systems, and are requirements of many state systems (such as North Carolina – NC 8th grade computer skills test), the researcher felt that this research helped validate the use of advanced technologies such as said instrument in a manner that could contribute to a larger audience and assist with improvements in education and training which include the measurement of skills in the aforementioned products.

Learner Analysis – This research explored the role of analyzing the learner prior to instruction. There is a large amount of literature in the fields of technology education, instructional technology, curriculum and instruction, instructional supervision and assessment and measurement which strongly encourage the use of pre-assessment prior to the design and development of instruction. This study capitalizes on this concept and sought to understand the computer skill competencies of the sample prior to instruction. During this study, the researcher discovered that the participants (students) knew much more than expected about the computer skills in question. As a whole group, the sample performed very well across all six sections of the skills test, having a mean score of 5 out of 10 or greater in 5 of the 6 different tested areas. This equates to having the majority of participants already proficient in 50% - 90% of the computer skills in 5 out of 6 skill categories that are covered in EDN 303. In a class that is 50% computer skills and 50% theory-based instruction, this translates into a large amount of wasted instructional time for the majority of students. For students who are not in the majority and who are not proficient in said computer skills, learner analysis may aid in developing an individualized training plan so that these students could receive specialized training in the areas where they are not proficient, while the students who know the skills are able to move on to other assignments. This example of learner analysis greatly improves the ability to know more about the participants and would allow for more specific curricular development. The implementation of such analysis could assist many other types of instruction, particularly technical education, where computer and other technology-based skills are a part of the curriculum. The researcher would recommend that learner analysis be adopted as a regular part of the design and delivery of EDN 303 at the School of Education at UNC-W with the results of the analysis integrated as a separate lab section for specified computer skills instruction.

The Role of Demographics on Computer Skills – This study analyzed the effect of certain demographics on the proficiency of computer skills. After analyzing computer skills based on demographic grouping, the researcher found no pattern in computer proficiency across all of the selected computer skills performance areas. The closest match between demographics and skills was the relationship between experience with specific software skills and the computer skill areas, with 4 out of 6 areas having significant differences between those with experience and those without experience. Overall, across all of the demographic analysis, there was inconclusive evidence that belonging to any particular group permitted the assumption that any group should have more or less computer skills proficiency than the other. This was especially important and central to this research because of the anecdotal opinions of many of the faculty at UNC-W. Prior to this study, there was a circulating idea that "because the students are young, then they have a lot of computer skills". This thinking was not supported by this study. In fact, the analysis indicated that demographic factors should not be used in making assumptions about computer skills of students, as this research did not indicate any significant differences across all areas of the software that was tested. The significant differences that were detected did not follow any particular pattern or trend. This lack of significant differences between groups across all software areas leads the researcher to believe that in this situation, demographics are not reliable predictors of computer skills fluency. One of the most important results of this study is the fact that there was no strong evidence suggesting that demographics are related to computer skills proficiency – which is contrary to much of the literature surrounding the topic. This research suggests that educators rely on actual assessment data, not membership in specific groups, as a basis for making decisions about curriculum and the design and development of computer skills courses.

Implications for Teaching Courses which include Computer Skills – This research explored the analysis of learners in terms of computer skills within the context of a college course which has a large computer skills component. Through the process of reviewing literature, adopting and designing a web-based assessment tool, collecting data on representative subjects, and analyzing data through statistical methods, the researcher has been able to learn a large amount about the students who take EDN 303 and the design, development and delivery of EDN 303. For many years, the curriculum for EDN 303 was static. With this research, the instructors and professors at UNC-W have evidence that many of the computer skills that are taught in EDN 303 are known prior to instruction. The reasons for the skills proficiency is unclear, as this research compared groups based on demographics and found no conclusive evidence that would lead to making decisions about student skills and demographics. However, the data suggests that many of the skills being taught in EDN 303 are known by many of the students (see Tables 4.3 through 4.9) prior to instruction and should not necessarily be "re-taught" to all of the students in all of the classes, rather we should try to pre-test for technology skills that will be taught during our classes. This would be valuable because it would allow each instructor to know exactly what each student knows prior to instruction and allow the opportunity for individualization of instruction as opposed to a one size fits all approach.

This research suggests the dismissal of the claims that because a student is young, or male, or has taken other computer classes in college or high school that he/she is proficient with certain computer skills. Rather, this research does suggest that curricular decisions concerning the instruction of computer skills be done in a formal systemic manner which provides current, accurate measures of student skills prior to instruction. The researcher believes that the data in this study suggests that educators, trainers and researchers who teach courses that are heavy in computer skills should not rely on making assumptions about students, but rather collect data that represents demonstrated skills of the students. This research also suggests the usefulness of having demonstration based computer skills data on students. It also suggests how this data can lead to improved instructional decision making. The researcher believes that pre-testing before skills instruction has the potential of being helpful to any technology course that includes skills-based instruction, and allows the instructor to understand the student before teaching begins.

Recommendations for Further Research – As a result of this study, the researcher believes that there are many computer skills that are being taught in EDN 303 that are already known by a large portion of the students taking the class for a myriad of reasons. In light of this information, the researcher believes that as a follow-up to this study the curriculum in EDN 303 should be adapted to include a pre-test on student computer skills. If there were a pre-test in each section of the course, instructors could gather skill data on all of the students and make instructional plans according to the data. This use of assessment data could increase the effectiveness of the course and provide a means of differentiating instruction within each section. With data such as this available, the curriculum could be redesigned in a suitable manner that serves the needs of all students. If such a pre-test were to be implemented, the researcher believes that the next step in this research would be to re-assess EDN 303 under the new model using the pre-test data. The researcher believes that EDN 303 would then be suitable for research that would gather information on course effectiveness and usefulness of knowledge and skills taught for use in more advanced educational methods courses as well as effectiveness and usefulness of knowledge and skills taught for use when the students enter their student-teaching internship and during their formal teaching careers. Further, the research should be replicated on future similar samples, and then conducted in areas of study other than education as well as at other institutions so that the results can be analyzed for trends and compared for similarities and differences.

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APPENDIX A
Survey Questionnaire

Survey Questionnaire
EDN 303

Instructions: Please answer the following questions by either filling in the appropriate blanks or by circling the appropriate answer. All information will be held confidential.

Name:_______________

Age:_________________

Gender: Male Female

Race: Caucasian African Descent Hispanic Asian Other_____________

Student Status: Junior Senior Graduate Student Licensure Only
Other_____________

Are you a community college transfer student? Yes No

Is EDN 303 your first computer course in college? Yes No

Have you received instruction on computer technology in high school? Yes No

Have you received instruction on computer technology in community college? Yes No

Do you have experience with the following Microsoft products?
Word Yes No

Excel Yes No

PowerPoint Yes No

FrontPage Yes No

Access Yes No

Windows XP Yes No

Do you own your own computer? Yes No

Do you have regular access to a computer? Yes No

Have you used computers in occupational settings? Yes No

Do you generally feel confident in using computers? Yes No

APPENDIX B

UNC-W Consent Form

Informed Consent Form: Consent to Participate in a Research Study

<u>Analysis of Computing Skills in Education Majors</u>

What Is The Research About?
You are being invited to take part in a research study about **<u>Computing Skills</u>**. If you take part in this study, you will be one of about 150-175 people to do so.
Who Is Doing The Study?
The person in charge of this study is Jeremy Dickerson (*PI*) of the University of North Carolina at Wilmington.
What Is The Purpose Of This Study?
Describe the purpose of the study.
By doing this study we hope to learn more about the computing skills of education majors prior to taking EDN303.
Where Is The Study Going To Take Place And How Long Will It Last?
The research procedures will be conducted at UNCW during EDN 303 class time.
What Will I Be Asked To Do?
You will be asked to demonstrate your skills and proficiency in MS Office products.
Are There Reasons Why I Should Not Take Part In This Study?
No
What Are The Possible Risks And Discomforts?
No
Will I Benefit From Taking Part In This Study?
You will not get any personal benefit from taking part in this study.
Do I Have To Take Part In This Study?
If you decide to take part in the study, it should be because you really want to volunteer. There will be no penalty and you will not lose any benefits or rights you would normally have if you choose not to volunteer. You will not be treated differently by anyone if you choose not to participate in the study. You can stop at any time during the study and still keep the benefits and rights you had before volunteering.
What Will It Cost Me To Participate?
There are no costs associated with taking part in this study.
Will I Receive Any Payment Or Reward For Taking Part In This Study?
You will not receive any payment or reward for taking part in this study.
Who Will See The Information I Give?
Your information will be combined with information from other people taking part in the study. When we write up the study to share it with other researchers, we will write about the combined information. You will not be identified in these written materials.
This study is anonymous. That means that no one, not even members of the research team, will know that the information you gave came from you.
Can My Taking Part In The Study End Early?
If you decide to take part in the study you still have the right to decide at any time that you no longer want to continue. There will be no penalty and no loss of benefits or rights if you stop participating in the study. You will not be treated differently by anyone if you decide to stop participating in the study.
What Happens If I Get Hurt Or Sick During The Study?
Nothing
What If I Have Questions?
Before you decide whether or not to participate in the study, please ask any questions that come to mind now. Later, if you have questions about the study, you can contact the investigator, Jeremy Dickerson (*PI*) at 962-7248 (*phone number*). If you have any questions about your rights as a research participant, contact Dr. Candace Gauthier, Chair of the UNCW Institutional Review Board, at 910-962-3558.
What Else Do I Need To Know?
Nothing
Research Participant Statement and Signature

I understand that my participation in this research study is entirely voluntary. I may refuse to participate without penalty or loss of benefits. I may also stop participating at any time without penalty or loss of benefits. I have received a copy of this consent form to take home with me.

__________________________________ ________________
Signature of person consenting to take part in the study — Date

____
Printed name of person consenting to take part in the study

__________________________________ ________________
Name of person providing information to the participant — Date

APPENDIX C
NCSU IRB Form

North Carolina State University
Institutional Review Board for the Use of Human Subjects in Research
SUBMISSION FOR NEW STUDIES

Title of Project: *Design and development of a web-based skills assessment tool for the analysis of computing skills in education majors at UNCW*

Principal Investigator: *Jeremy Dickeron* Department: *Technology Education*

Source of Funding (required information): *UNCW School of Education*

Campus Address (box number): *None*

Email: *dickersonj@uncw.edu* Phone: *910-962-7248* Fax:

Rank: ☐ Faculty

☒ Student: ☐ Undergraduate ☐ Masters; or ☒ PhD

☐ Other:

If rank is not faculty (i.e. student or other), provide the name of the faculty sponsor overseeing the research: *Ted Branoff and Jim Haynie*

Faculty Sponsor's email: *Ted_Branoff@ncsu.edu* Campus Box: Phone: *919-515-1747*

Investigator Statement of Responsibility

"As the Principal Investigator, my signature testifies that I have read and understood the University Policy and Procedures for the Use of Human Subjects in Research. I assure the Committee that all procedures performed under this project will be conducted exactly as outlined in the Proposal Narrative and that any modification to this protocol will be submitted to the Committee in the form of an amendment for approval prior to implementation."

______________________________________ ________________
Principal Investigator's Signature* Date

Faculty Sponsor Statement of Responsibility

"As the Faculty Sponsor, my signature testifies that I have reviewed this application thoroughly and will oversee the research in its entirety. I hereby acknowledge my role as principal investigator of record."

______________________________________ ________________
Faculty Sponsor's Signature* Date

*electronic submissions to the IRB are considered signed via an electronic signature

PLEASE COMPLETE IN DUPLICATE AND DELIVER TO:
Institutional Review Board, Box 7514, NCSU Campus (lower level of Leazar Hall)

****

For IRB office Use Only

Review Received: ☐ Administrative ☐ Expedited ☐ Full Board

Review Decision: ☐ Approve ☐ Approve with Modifications ☐ Table ☐ Disapprove

Reviewer__________________ Signature______________________________________Date __________ _______

North Carolina State University
Institutional Review Board for the Use of Human Subjects in Research
PROPOSAL NARRATIVE

If at any time you have questions or difficulties while completing IRB forms, please feel free to contact Deb Paxton at debra_paxton@ncsu.edu or 919-515-4514.

In your narrative, please address each of the questions below. Keep in mind that the more details that you provide, the easier an IRB reviewer will be able to understand your research and reach a prompt decision.

A. INTRODUCTION

1. In lay language, please briefly describe your research, its purpose, procedures, and expected contribution to its field or to the general population.
This research will collect and analyze data on computing skills of education majors at UNCW. This research will focus on possible differences between traditional and non-traditional students' skills. The results of this research will allow the school of education at UNCW to redesign curriculum of their computer skills course so that it can be more effective.

2. If this is student research, indicate whether it's for a course, thesis, or dissertation.
dissertation

B. SUBJECT POPULATION

1. How many subjects will be involved in the research?
about 150

2. Describe how subjects will be recruited. If flyers, advertisements, or recruitment letters will be used, please attach copies of those documents.
Students will be given the skills assessment during the 1st week of their computer skills course.

3. List specific eligibility requirements for subjects, describe screening procedures, and justify criteria that will exclude otherwise acceptable subjects.
no screening.

4. Explain and justify and sampling procedures that exclude specific populations.
no exclusion

5. Disclose any relationship between researcher and subjects, such as teacher/student or employer/employee.
no relationship

6. Check any vulnerable populations that you will intentionally include in the study:
   - ☐ Minors (under the age of 18) – if you will involve minors in your study, you must make provisions for parental consent and minor assent to the research
   - ☐ Pregnant women
   - ☐ Persons with mental, psychiatric, or emotional disabilities
   - ☐ Persons with physical disabilities
   - ☐ Elderly
   - ☐ Students from a class taught by the Principal Investigator
   - ☐ Prisoners
   - ☐ Other vulnerable populations:

   If any of the above are used, justify the necessity for doing so. Please indicate the approximate age range of minors to be involved.

C. PROCEDURES TO BE FOLLOWED

1. In lay language, describe completely and with good detail all the procedures involving human subjects that will be followed during the course of the study. Provide sufficient detail so the committee is able to adequately review the research.
   The subjects will be asked to log-on to a website and demonstrate their ability to perform specific computing skills.

2. How much time will be required of each subject?
   1 hr

D. POTENTIAL RISKS

1. State the potential risks from the research (psychological, social, financial, legal, physical, or otherwise). State how you plan to minimize these risks.
   none

2. Will there be a request for information that if accidentally made public could embarrass the subjects or reasonably place them at risk of criminal, social, or professional harm?
   no

3. Could any of the study procedures or information collected produce stress, anxiety, or psychological harm? If yes, please justify the need for such procedures or information, and describe methods you will take to minimize the harm a subject encounters (e.g. you will provide or arrange for psychological counseling for those subjects who experience distress due to your study).
   no

4. Describe methods for protecting your subjects' confidentiality. How will data be recorded and stored? Will any identifiers be collected? If so, how and why? If you will collect identifiers, will you destroy the link between subject identity and data at some point? If you are collecting audio or video recordings, do you plan to destroy the recordings after the research is complete?

   Students names will not be taken. The only identifiers will be general demographic data that will include items such as age, gender, and questions concerning computer related experience. The identifing information will be collected and stored in a locked filing cabinet..

5. If your research will be reported in a case study format, how will you protect individual subjects' responses/information?
   N/A

6. Is there any deception of subjects in this study? If yes, please describe the deception, justify it, and provide a debriefing procedure.
   No

E. POTENTIAL BENEFITS

Please address benefits expected from the research. Please note that this does not include compensation for participation, in any form. Specifically, what, if any, direct benefit is to be gained by the subject? If no direct benefit is expected, but indirect benefit may be expected (i.e. to general society), please explain.
none

F. COMPENSATION

Explain compensation that subjects will receive for participating in the study, as well as provisions for the withdrawal of a subject prior to completion of the study.
none

1. If class credit will be offered for participation, list the amount given and alternate ways to earn the same amount of credit.
   NA

G. COLLABORATORS

If you anticipate that additional investigators (other than those listed on the cover page) may be involved in the research, list them here indicating their institution, department and phone number.
NA

H. ADDITIONAL INFORMATION

1. If a questionnaire, survey, or interview instrument is to be used, attach a copy to this proposal

2. Attach to this document a copy of the informed consent document that you will use

3. If your study involves minors, attach a copy of the parental permission and child assent documents that you will use.

4. Please provide any additional materials or information that may aid the IRB in making its decision.
   The students will be taking an online skills test. This test is still in development - but is a simple test that asks only for students to demonstrate skills in MS OFFICE. The items will be representative of skills taught in EDN 303 at UNCW School of Education.

APPENDIX D
Test Items per Software Area

List of Computer Skills Test Topics

Microsoft Word

1. Copy and pasting text
2. Using spell check
3. Changing line spacing
4. Adding page borders
5. Formatting 3 columns
6. Changing page margins
7. Inserting tables
8. Inserting clipart
9. Inserting word art
10. Inserting hyperlinks

Microsoft Excel

1. Inserting rows
2. Filling right/filling down
3. Formatting cells as numbers with specific decimal places
4. Resizing columns with exact text fit
5. Setting exact print area
6. Inserting new worksheet in specific areas of the workbook
7. Creating formulas
8. Using functions
9. Placing function and formula data in specific cells
10. Creating charts with spreadsheet data

Microsoft PowerPoint

1. Applying templates
2. Displaying the side show in slideshow view
3. Adding new slides
4. Inserting images
5. Creating and inserting text boxes
6. Applying specific animation schemes
7. Adding and removing slide transitions
8. Adding action buttons
9. Printing handouts with set number of slides per page
10. Advancing the slide show from within specific points in a presentation

Microsoft Access

1. Creating a new Access database and saving with a specific file name
2. Locating and opening a specific database
3. Editing database information
4. Opening specific tables in a given database
5. Setting Primary Key fields
6. Using the query wizard
7. Adding new records within a given table
8. Using the sort command with specific detail on a given data set
9. Using the filter command with specific detail on a given data set
10. Create a report using a report wizard on a given data set

Microsoft Windows XP

1. Locating the My Computer Icon and using the right-click button
2. Selecting specific programs via the programs listing
3. Switching between multiple programs in different windows
4. Minimizing, restoring and closing windows
5. Increasing the width and height of windows
6. Saving documents in specific locations
7. Saving documents as different file formats
8. Adding / removing items from the task bar
9. Creating/deleting new folders
10. Moving files from desktop to other specified Windows locations

APPENDIX E

List of Professors who Selected Test Items

List of Professors and Instructors who chose Items for Performance Skills Test

Dr. Jennifer Summerville, Ph.D.
Associate Professor
Watson School of Education
UNC-Wilmington

Dr. Arnold Murdock, Ed.D.
Assistant Professor
Watson School of Education
UNC-Wilmington

Dr. Dennis Kubasko Ph.D.
Assistant Professor
Watson School of Education
UNC-Wilmington

Dr. Angelia Reid-Griffin Ph.D.
Assistant Professor
Watson School of Education
UNC-Wilmington

Mr. Jeff Ertzberger, M.S.
Lecturer
Watson School of Education
UNC-Wilmington

Mr. Eric Pfirman, M.S.A. (In progress)
Graduate Assistant
Watson School of Education
UNC-Wilmington

APPENDIX F
Sample Screen Shot of Test Interface

Screen Shot of Sample Question