SOCIOCULTURAL INFLUENCES ON COMPUTER ANXIETY AMONG PRESERVICE TEACHERS: AN EXPLORATORY STUDY

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SOCIOCULTURAL INFLUENCES ON COMPUTER ANXIETY AMONG PRESERVICE TEACHERS: AN EXPLORATORY STUDY

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ABSTRACT

Computer anxiety remains a significant problem despite the widespread use of technology. Computer anxiety among preservice teachers is especially problematic because it reduces the effectiveness of computer education and leads to insufficient computer skills and confidence for teachers to integrate computer technology. This study focuses on the influence of sociocultural factors on computer anxiety in a select group of preservice teachers. Literature describing the sociocultural factors influencing computer anxiety using qualitative research methodology is limited. Sociocultural theory, first advanced by Vygotsky (1978), provided a framework for developing questions that focus on how sociocultural factors influence computer anxiety. Using case study research methodology, one main research question and three sub questions were examined: How are typical preservice teachers in a Midwestern metropolitan university with computer anxiety different from those with no computer anxiety and why?, (1) How do preservice teachers with computer anxiety compare to preservice teachers with no computer anxiety in life experiences and background in relation to computer use?, (2) What is the pattern in the background and experiences of computer use between students with and without computer anxiety? and (3) What sociocultural factors influence computer anxiety?
Starting with a group of 115 preservice teachers and using criteria sampling, four cases were selected for further study, two with computer anxiety, and two with no computer anxiety. The cases were studied using interviews, field observations, and student journals. The results were reviewed for each using a map of computer learning experiences within sociocultural environment. The experiences were grouped into four clusters of sociocultural environments: home, school, peers, and others. A cross-case analysis was completed, comparing the two cases with no computer anxiety to the two cases with computer anxiety. Distinctions between the cases with no computer anxiety and the cases with computer anxiety were detailed and possible explanations provided. The study presents evidence that cases with no computer anxiety and those with computer anxiety have differences that appear to be related to differences in social resources within the sociocultural environment of computing. Further study is needed to understand how such social factors are created and maintained and their long range effect.
DEDICATION

To my parents, John Alberte and Margaret Uelmen Alberte.
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CHAPTER I

INTRODUCTION

Computer technology in schools has grown rapidly. As the number of computers in schools has increased, so has the need for educators to adjust their teaching practices to use this technology effectively. Despite these increased expectations among current teachers, the level and type of computer use in P-12 schools is below anticipated amounts (Becker, 2001; Buckenmeyer & Freitas, 2005; Kleiman, 2000, 2004; Smerdon et al., 2000). For example, recent studies revealed that 37 percent of the teachers surveyed integrated computers into the daily curriculum (CDW-G, 2006) or used computers or the Internet during class time (National Center for Education Statistics, 2002). When computers are used during class time, they are used primarily for activities such as word processing assignments, or class preparation (O'Connor, Goldberg, Bebell, & O'Dwyer, 2004). Similar problems exist when examining the educational use of the Internet. Most students use the Internet as an essential educational tool, yet many teachers have not yet reacted to the new ways students use the Internet to communicate and research (Levin, Arafeh, Lenhart, & Rainie, 2002).
Researchers have identified obstacles to computer technology use and integration as limited equipment, inadequate training, insufficient time, teaching style, and beliefs about teaching, learning, and computers (Byrom, 1998; Ertmer, 1999; Hanson & Carlson, 2005; Selwyn, 2004b). A significant factor influencing the use of computers by teachers is attitude towards computers (Baylor & Ritchie, 2001; Bitner & Bitner, 2002; Sugar, Crawley, & Fine, 2004). It is well known that attitudes toward a subject influences learning (Simonson, 1995). Research suggest that the level and effectiveness of computer technology in the classroom is significantly influenced by the computer attitude of the in-service teacher (Christensen, 2002; Ertmer, 1999; Levine & Donitsa-Schmidt, 1998; Persichitte, Caffarella, Conn, Javeri, & Ferguson-Pabst, 2003).

Some suggest that the new teachers graduating from schools today will be better equipped to handle technology in the classroom because they are more experienced with technology and are less likely to view technology suspiciously (Dickson, 2000; Fisher, 2000). Brought up in the digital age, these novice teachers are expected to be comfortable with rapid changes common with computer technology (Ceyhan, 2006; Pierson & McLachlan, 2004). However, research indicates that preservice teachers are not necessarily more frequent users of technology in the classroom and may not be ready to integrate computer technology into classrooms (Ertmer, Conklin, & Lewandowski, 2003; Laffey & Espinosa, 2004; Wang, Ertmer, & Newby, 2004). Computer anxiety is one of the significant factors inhibiting the amount and level of computer technology used.
by preservice and novice teachers in the classroom (Benson, 2001; Laffey & Musser, 1998; Wilson, 1999). By understanding and addressing computer anxiety among teacher candidates, the level and type of computer use in the classroom may be improved (Larner & Timberlake, 1995; Russell & Bradley, 1996).

Computer anxiety remains a significant problem among the general population (Todman & Day, 2006; Todman & Drysdale, 2004). Computer anxiety is a feeling of unease or apprehension an individual experiences in anticipation of, or while using computer technology, that is disproportionate to the threat the technology presents (Gerard, Sleeth, & Pearce, 1996; Selwyn, 1997b) resulting in the, “avoidance of computers...; excessive caution with computers; negative remarks about computers; and attempts to cut short the necessary use of computers” (Bozionelos, 2001, p. 214). Individuals with negative, anxious feelings avoid computers (Brosnan, 1998a; Compeau & Higgins, 1995; Rosen, Sears, & Weil, 1987), have high levels of cognitive interference (Smith & Caputi, 2001), and have poorer computer performance (Desai, 2001; Kleyn-Kennedy, 2006). It is estimated that in the United States approximately 28 percent of undergraduates have computer anxiety, with 6 to 8 percent having severe computer anxiety (Todman & Drysdale, 2004). Computer anxiety in education may impede the integration of computer technology in the classroom by hampering learning and undermining the confidence necessary to successfully integrate computer technology successfully in classrooms today (Gabriel & MacDonald, 1996; Hakkinen, 1994; Kohrman, 2003; Milbrath & Kinzie, 2000;

Computer anxiety may be problematic for preservice P-12 teachers since teacher preparation programs expect students to integrate technology in their coursework and after graduation. Although standards from the federal and state governments, and organizations such as the International Society of Technology Educators (ISTE), and the National Council for Accreditation of Teacher Education (NCATE) emphasize the importance of computer technology training for preservice teachers, educators continue to be less likely to use computers than most other professional categories of occupations (Paprzycki & Vidakovic, 1994; Snyder, Tan, & Hoffman, 2004). If computer technology is to be integrated in the classroom effectively, factors contributing to the origins and continuance of computer anxiety within the preservice teacher population need to be investigated and addressed.

Research on the origin and influences on computer anxiety have produced theoretical models showing a relationship between computer anxiety and computer experience (Todman & Drysdale, 2004; Todman & Monaghan, 1994), self-efficacy (Beckers & Schmidt, 2001; Brosnan, 1998a), socio-economic background (Bozionelos, 2004), demographic and other variables (Beckers & Schmidt, 2001, 2003). These studies offer insights into the complex relationship of organizational, technology, and individual factors (see Sun & Zhang, 2006, p. 65). However, researchers have noted that such models are incomplete. In their
review of forty-two research experiments, Sun & Zhang (2006) concluded that research is needed to look at other issues to find the answers to users’ technology acceptance and adopt different methodologies for research. They suggest that future research needs to consider the influence of culture on user technology acceptance. Since previous quantitative studies have not sufficiently explained differences in user acceptance of technology, they recommend using qualitative methodology.

Few studies have empirically examined cultural issues associated with user technology acceptance. The mechanisms through which the culture exerts its influence are still unclear (e.g., Straub et al, 1997). Therefore, future research may focus on “how” questions by identifying the major cultural dimensions and their corresponding relationships with user technology acceptance. [italics added].

From a methodological perspective, studies of user acceptance may need a methodological shift in order to gain richer understanding of less studied factors. So far, almost all the prior studies use quantitative research methodology and usually from a positivist perspective. Qualitative methodology, especially from an interpretive perspective, however, is informative and may be another useful alternative that can give researchers new insights [italics added] (Sun & Zhang, 2006, p. 73).

Selwyn (2003) suggests a “sociology of technology” (p. 100) where individuals with computer anxiety and other people who do not use technology, are studied in the context of their social groups, within the social structure, as well as the cognitive and affective factors influencing their relationship with technology. By studying social and cultural factors influencing computer anxiety, it may be possible to have a deeper understanding of their influence and subsequently improve preservice teacher education and the professional
development of teachers. It is from this perspective that this study focuses on the problem of computer anxiety and the possible sociocultural factors influencing the differences between preservice teachers with computer anxiety and those without computer anxiety.

Statement of the Problem

Computer anxiety among preservice teachers is a problem because it reduces the effectiveness of computer education, decreases the amount and level of computer use, and leads preservice teachers to have insufficient computer skills and confidence to integrate computer technology (Ayersman, 1996; Carey, Chisholm, & Irwin, 2002; Kohrman, 2003; Persichitte et al., 2003; Rosen & Weil, 1995b). This study examines the influence of social and cultural factors on computer anxiety in a select group of preservice teachers. The following initial research question was considered.

How is a typical preservice teacher in a Midwestern metropolitan university with computer anxiety different from those without computer anxiety?

Three additional sub questions were considered for this study.

1. How do preservice teachers with computer anxiety compare to preservice teachers with no computer anxiety in life experiences and background in relation to computer use?
2. What is the pattern in the background and experiences of computer use between students with and without computer anxiety?

3. What sociocultural factors influence computer anxiety?

Theoretical Framework of the Study

The theoretical frameworks for the study are sociocultural theory and adult learning. Sociocultural theory is based on, “the concept that human activities take place in cultural contexts, are mediated by language and other symbolic systems, and can be best understood when investigated in their historical development” (John-Steiner & Mahn, 1996, p. 191). Jarvis (1992), an adult education theorist, explains, “the process of learning is located at the interface of people’s biography and the sociocultural milieu in which they live for it is at this intersection that experiences occur” (p. 17). Therefore, in order to understand beliefs and ideas of the learner, it is necessary to analyze the past and present social and cultural environment of the individual. As Palincsar (1998) states,

…thought, learning, and knowledge are not just influenced by social factors but are social phenomena. For this perspective, cognition is a collaboration process (Rogoff, 1998), thought is internalized discourse, and the purpose of inquiry regarding cognitive development is to examine the transformation of socially shared activities into internalized processes (Palincsar, 1998, pp. 350-351).

Sociocultural theory focuses on the environment or activity rather than the individual. The internal construction of reality is the result of social interaction with adults, tools, and more capable peers. The movement goes from the social
world to the individual, rather than reverse (Bonk & Kim, 1998; Vygotsky, 1978). As Bonk (1998) explains, “society does not exist inside one’s head, but, instead, the mind is distributed out into society” (p. 69) and “extends beyond the skin” (Wertsch, Tulviste, & Hagstrom, 1993, p. 337). The learning takes place both inside and outside of the classroom, in real-life situations, from interaction with peers, parents, and other significant people. Wertsch (1991) proposes that such social cognition and other forms of human mental functioning are socially situated and found in two forms. The first is the social interaction found in small groups or dyads, such as adult-child interaction, child-child interaction, adult-adult interaction, or some combination of these. As such, sociocultural-based classroom pedagogical strategies use interactive, supportive approaches such as peer collaboration, teacher-as-coach/mentor, and joint knowledge construction (Bonk & Kim, 1998). The second is through the social institutions and other culturally defined settings. Bonk and Kim (1998) suggests sociocultural theory can be extended to adult learning as well. Techniques such as problem-based learning (Savery & Duffy, 1995), mentoring, collaboration, and critical reflectivity, using both traditional and electronic delivery methods, have been used effectively in adult education (Bonk & Cunningham, 1998; Bonk & Kim, 1998; Fidishun, 2000; Hill & van Aalst, 2001).
Educational Significance of the Study

Computer technology provides both opportunities and challenges. Computer technology makes possible new teaching and learning techniques and opportunities that help students to work independently and collaboratively. An infinite amount of resources for research on the Internet or other databases, communication using email, online chats and instant messages are widely available and commonly used (Kostakos, O'Neill, Little, & Sillence, 2005; Lenhart, Madden, & Hitlin, 2005). For many teachers these technologies have been an opportunity for new creative teaching approaches. However, for some, the adjustment has not been easy. When an educator is anxious about using technology, it is unlikely that the educator will be able to learn how to use the available computer resources and apply in a meaningful way (Ertmer, Lehman, Hee Park, Cramer, & Grove, 2003; Jones, 2004; Rosen & Weil, 1995b). Computer anxiety reduces the integration of computer technology in education. Often when resources such as hardware, software, and support are available, the attitudes, and beliefs of the teacher prevent the use of these resources (Bai & Ertmer, 2004; Ertmer, Ottenbreit-Leftwich, & York, 2005; Kadijevich, 2006).

As an exploratory case study, the results help further the understanding of the sociocultural factors and life experiences that may contribute to computer anxiety within a selected group of preservice teachers. Participants were selected from a population of preservice teacher education candidates enrolled in four sections of an educational psychology course. Participating students completed a
questionnaire asking for demographic and computer experience information including name, gender, computer experience, computer learning, computer ownership, support, and other relevant information. Levels of computer anxiety were measured using the Computer Anxiety Rating Scale - Form C (CARS-C) and Computer Thoughts Survey - Form C (CTS-C) (Rosen & Weil, 2000). From those students willing to participate and by completing the questionnaire and assessments, a group of students was selected using a criterion sample. The criteria were based on the student demographic profile for the College of Education (female and 21 to 27 years old). Students meeting this set of criteria and willing to participate, were placed in the second level group and divided into two subgroups, those with computer anxiety, and those with no computer anxiety. The criteria for these subgroups are the results of the CARS-C and CTS-C as specified by the scoring manual (Rosen & Weil, 2000). A purposeful interview sample was used to select two students from the two computer anxiety subgroups of having computer anxiety and no computer anxiety for further study using the case method. By identifying those within this group who are more likely to have computer anxiety, possible sociocultural and life experience influences on preservice teacher computer anxiety can be investigated further (Ertmer, Conklin et al., 2003; Gunter, 2001; Pelton & Pelton, 1996; Rovai & Childress, 2002).
Operational Definition of Terms

*Attitude* - The way an individual feels about and is inclined toward some object (Eagly & Chaiken, 1993).

*Computer anxiety* – Computer anxiety is a feeling of unease or apprehension an individual experiences in anticipation of or while using computer technology that is disproportionate to the threat the technology presents resulting in computer avoidance, excessive caution with computers, negative remarks about computers; and minimizing the use of computers and related technology (Gerard et al., 1996; Selwyn, 1997b).

*Computer experience* – The entirety of externally observable, direct or indirect human-computer interaction that is completed over time. Direct experience includes an individual’s previous and/or current usage of computer technologies and can be divided into three measurable components: amount of computer use, opportunity to use computers, and diversity of experience. Indirect experience is the source or medium through which the information or knowledge about computers is acquired (Smith, Caputi, Crittenden, Jayasuriya, & Rawstorne, 1999).

*Computer self-efficacy* – The measure of an individual’s confidence in the ability to use a computer in a variety of situations and applications (Compeau & Higgins, 1995; Marakas, Yi, & Johnson, 1998).
Computer technology – Equipment, software, and communication channels associated with computers, networks, peripherals, and other computer-based devices and their use by individuals and within organizations (Snyder, 2007).

Preservice teacher – Individuals enrolled in and admitted to a teacher education program (Cochran-Smith & Zeichner, 2005).

Self-efficacy – The measure of an individual’s confidence in mastering a new skill or challenge (Bandura, 1997).

Zone of Proximal Development (ZPD) – A term created by Vygotsky (1978) as the distance between an individual’s actual developmental level as determined by independent problem solving and the higher level of potential development as determined by problem solving under the guidance of, or in collaboration with, adults or more capable peers (Daniels, 1996).
CHAPTER II

STUDY CONTEXT

National and State Preservice Teachers and Technology Requirements

Preservice teachers today are expected to graduate from college with the knowledge and capabilities to integrate computer technology into classroom instruction. Current preservice teachers must meet complete specific computer technology requirements before they can graduate or be licensed to teach. These requirements are based on the National Educational Technology Standards for Teachers (NETS•T) developed by the Accreditation and Professional Standards Committee of the International Society for Technology in Education (ISTE) (International Society for Technology in Education, 2000; Twomey, Shamburg, & Zieger, 2006). ISTE is the professional education organization responsible for recommending guidelines for accreditation to the National Council for Accreditation of Teacher Education (NCATE).

The focus of the National Educational Technology Standards is to set standards for educational uses of technology to improve schools and teaching (Roblyer, 2003). The technology requirements for preservice teachers are part of the National Educational Technology Standards (NETS) Project, which includes
technology standards for students, teachers, and administrators (Roblyer, 2000, 2003). First published in 1998, the National Educational Technology Standards are sponsored by the International Society for Technology in Education (ISTE). The development was funded by NASA in cooperation and consultation with the U.S. Department of Education and the Milikin Foundation (International Society for Technology in Education, 2000; Roblyer, 2000). The teacher standards are currently under review and revised standards will be released in June 2008 (International Society for Technology in Education, 2008).

Since the initial publication of the standards in the late 1990s, the National Educational Technology Standards have continued to be integrated into national and state educational curriculum standards. State curriculum and certification requirements have also been adjusted to the NETS standards. Forty-eight states, including Ohio, have directly adopted from, aligned with, or have been guided by the NETS standards (International Society for Technology in Education, 2004; Roblyer, 2003). Appendix A shows a chart displaying the shared characteristics between the Ohio Technology Academic Content Standards for K-12 and the National Education Technology Standards (NETS). In addition, No Child Left Behind (NCLB), Title II, Part D, Subparts 1 and 2, requires the use of technology in schools to enhance student achievement and learning. Additional goals for NCLB are to help students become computer literate by the end of eighth grade and assure that teachers are able to integrate technology into the curriculum to improve student learning (Ohio Department of Education, 2006). Certification
and licensure requirements have also changed to require computer technology skills. For example, the Ohio Standards for the Teaching Profession, Standard #4 requires teachers to be able to, “use resources effectively, including technology, to enhance student learning.”

Preservice teachers need to be prepared to meet these expectations as they graduate and become beginning teachers (Laffey & Espinosa, 2004). The National Council for the Accreditation of Teacher Education (NCATE), the certification organization for teacher preparation programs at universities and colleges, requires a demonstration of commitment to technology as one of the accrediting standards. These standards can be met by showing evidence that students completing the curriculum have met the NETS Standard for Teachers (Roblyer, 2003).

The Midwestern University College of Education used in this study requires specific courses that help preservice teachers learn the information needed to integrate computers in the classroom. Before admission to the College of Education, students are required to demonstrate basic computer literacy. This requirement can be met by providing evidence of completing one of the following courses with a grade of “B” or better:

- Fundamental Educational Computer Skills
- Software Fundamentals
- Descriptive Computer Science
- Computer Applications in Family & Consumer Sciences
- Technologies of Music Education (2 credits)

Students can also demonstrate basic computer literacy by passing a computer skills test. Those students who miss five or more items on the test fail the assessment. Students are permitted to retake the assessment once. Those who do not qualify are required to successfully complete one of the above listed computer courses, including Fundamental Educational Computing Skills, with a “C” or better.

Students attending the Midwestern University College of Education must apply for admission into the College of Education and must meet both college and departmental admission requirements. For example, Early Childhood Education majors must complete between 32 and 36 credit hours of departmentally required coursework with a 2.50 GPA and an overall GPA of 2.50. Figure 1 illustrates the steps for admission into the College of Education, the College core courses, and professional preparation courses using Early Childhood Education majors as an example.
Figure 1. The sequence and requirements for a College of Education and admission to a major, using the example of an Early Childhood Education major.
After admission into the College of Education and a major, students take a sequence of required courses for both the major and the College of Education. The Educational Core courses are required for all Education majors. Included in the Educational Core Courses is Educational Technology. Course goals and objectives of Educational Technology are aligned with the Interstate New Teacher Assessment and Support Consortium (INTASC) model standards, Ohio Standards for the Teaching Profession, plus the ISTE standards for teacher candidates. Students completing the course are expected to have computer technology competencies to use and integrate such technologies in the classroom.

Students enrolled in the preservice teacher education program at the Midwestern University are expected to use and apply computer technology as they progress through the curriculum. Computer applications such as Microsoft Word for word processing, Microsoft PowerPoint for presentations and Internet browsers to locate educational resources are all expected to be part of a student’s knowledge base. Specialized computer applications are also integrated into higher level classes. A significant number of classes in the College of Education use a learning management system (LMS) such as WebCT or Desire2Learn, to deliver curriculum resources, communications, and support. Since assignments and tests may be delivered and turned in using the learning management system, students must know how to use this environment. In addition, starting in Fall 2007, students are expected to create and maintain an electronic portfolio containing designated assignments most often completed as part of a course,
clinical experience, or field experience. Submission of the portfolio is required for acceptance before student teaching and prior to program completion.

Students participating in the study were enrolled in four sections of an educational core course called Educational Psychology. It is one of the first education classes newly admitted preservice teachers are required to take after admission into a teacher education major in the College of Education. Students are unlikely to have previously taken Educational Technology. However, simultaneous enrollment is allowed. By studying students early in the preservice education curriculum, there should be a wider range in the levels of computer anxiety since experience has been shown in some studies to be a contributing factor in reducing computer anxiety (Rovai & Childress, 2002).

Overview of the Educational Psychology Course

The Educational Psychology course rationale, as described in the approved syllabus for Fall 2006, “...focuses on the developmental influences and characteristics of learners (stages of cognitive, moral, social, and physical development, intellectual abilities), the psychological principles pertaining to learning and the learning process, and motivation strategies for helping students become self-regulated learners.” The class meets twice a week for one hour and forty-five minutes over fifteen weeks. Students study a wide range of topics including the physical development of children and adolescents, cognitive development and the learning theories of Piaget and Vygotsky, development of
intelligence and the implications for classroom teaching, language development and literacy, personal and social development, development of prosocial behaviors and moral reasoning within our modern society, and the characteristics of children with special needs and how to address these needs. Instructional methods include cooperative learning, problem-solving tasks, videotapes, lectures, model problem solving, case studies, and field and clinical experiences. Students also participate in “technology literacy activities” (page 7 of syllabus) such as using the Internet and communicating with email. Each student completes 10 hours of field experience and 15 hours of clinical experience within scheduled class time, with the entire class at the field site at one time. Students complete field experience reports linking classroom concepts with field observations. All students are required to access online course materials using the learning management system for assignments and graded assignments. End of course grades are posted on the university-wide student access computer system.

While the course content was not directly relevant to the study, topics taught in Educational Psychology may influence the study as the semester continues. In addition, scheduled field experiences may cause scheduling conflicts later in the semester. Therefore, it was more efficacious to schedule the study in the first half of the semester when students were available and course content is more neutral.
CHAPTER III

REVIEW OF THE LITERATURE

Introduction

Students enrolling in education programs today are expected to graduate knowing how to integrate technology throughout the educational process. Computer anxiety is a barrier to the ability, skill, and competence needed to meet this goal. This exploratory study focuses on computer anxiety and the possible sociocultural factors influencing the differences between preservice teachers with computer anxiety and those without computer anxiety. Research was conducted through interviews, field observations, and participant daily journals where participants describe the learning environment in relation to the sociocultural environment.

This review of literature links computer anxiety in preservice teacher students with sociocultural theory and adult learning theory. The review is divided into three sections. Section one reviews the literature about computer anxiety and the instruments used to measure computer anxiety for this study, the Computer Anxiety Rating Scale Form C (CARS-C) and Computer Thoughts Survey (Form-C). Section two reviews the theoretical framework for this study,
sociocultural theory and adult learning theory. The final section summarizes the review of literature and establishes connections between these sections and the research questions of this study.

Computer Anxiety

Research regarding computer anxiety appeared as computers became commonplace in business and education in the late 1970s and early 1980s. A significant number of the potential computer users did not or would not utilize computer systems (Weil, Rosen, & Wugalter, 1990). Terms such as “computerphobia” (Jay, 1981), “cyberphobia” (Russell & Bradley, 1996), and “technophobia” (Brosnan, 1998c) were created to describe negative reactions to computers. Chua, Chen, & Wong (1999) in a meta-analysis of computer anxiety research concluded the term computer anxiety is “a kind of state anxiety, which can be changed and measured along multiple dimensions” (1999, p. 611). It is a feeling of unease or apprehension an individual experiences in anticipation of or while using computer technology that is disproportionate to the threat the technology presents resulting in computer avoidance, excessive caution with computers, negative remarks about computers, and minimizing the use of computer and related technology (Chua et al., 1999; Gerard et al., 1996; Selwyn, 1997b). Computer anxiety is the single term used to identify these negative responses to computers and associated technology.
Computer anxiety is a learned reaction to real or potential computer use. Research suggests that computer anxiety is a type of *state anxiety*, a temporary, emotional response involving feelings of tension or apprehension when faced with a real or perceived threats or danger (Desai, 2001; Gaudron & Vignoli, 2002; Heinssen, Glass, & Knight, 1987; Mahar, Henderson, & Deane, 1997; McInerney, 1997). The threat is recognized on a cognitive level to experience computer anxiety as an emotional response (Jouvent et al., 1999; Lazarus, 1991; Schwarzer, 1997). In contrast, *trait anxiety* is a personality trait or the result of stable individual differences with the tendency to respond with state anxiety towards stressful situations (Chua et al., 1999; Mahar et al., 1997; Schwarzer, 1997).

Research on both children and adults suggests that state anxiety is situation specific and can be changed (Barbeite & Weiss, 2004) and is learned within a shared environment (Lau, Eley, & Stevenson, 2006; Legrand, McGue, & Iacono, 1999). Computer anxiety has been studied extensively for a wide range of correlates. Among the most widely researched are: computer experience, gender, age (Chua et al., 1999), and socioeconomic factors (Attewell & Battle, 1999; Bozionelos, 2004; Roe & Broos, 2005; Selwyn, 1997b; Shashaani, 1994b).

**Computer experience**

Computer experience is the total of externally observable, direct, or indirect human-computer interaction completed over time. Direct experience includes an individual’s previous and current usage of computer technologies and can be divided into three measurable components: amount of computer use,
opportunity to use computers, and diversity of experience. Indirect experience is
the sources or medium through which the information or knowledge about
computers is acquired. These include people, such as teachers, family or peers,
sources such as web sites, magazines, books, or manuals, and other popular
media (Beckers & Schmidt, 2001; Smith et al., 1999). Computer experience also
includes the individual perception or emotions about the computer event (Smith
et al., 1999).

Early researchers found a decline in the level of computer anxiety as
computer experience increased (Glass & Knight, 1988; Heinssen et al., 1987;
Howard & Smith, 1986; Loyd & Gressard, 1984a; Loyd, Loyd, & Gressard, 1987;
Raub, 1981). As computer use became widespread, it was assumed that levels of
computer anxiety within the general population would decrease (Gos, 1996).
However, despite the increased level of computer experience, and the overall
increase in technology use including items such as cell phones, ATMs, and mp3
players, especially among undergraduate students, the level of computer anxiety
remains at approximately 25% (Mcilroy, Sadler, & Boojawon, 2007). Some studies
have shown the amount of computer anxiety increasing as the students gained
more experience with computers (Burger & Blignaut, 2004).

Subsequent research has shown the relationship between computer
experience and computer anxiety is more complex than first anticipated (Beckers
& Schmidt, 2003; Bozionelos, 2001; Broos, 2005; Burger & Blignaut, 2004; Gos,
1996; Rosen & Weil, 1995b; Rovai & Childress, 2002; Smith et al., 1999; Todman &
Drysdale, 2004). Among the significant factors found to influence the outcome of experience on computer anxiety are initial positive or negative experiences (Beckers & Schmidt, 2003; Gos, 1996; McInerney, McInerney, & Sinclair, 1994; Rosen et al., 1987), the nature of support received during the first experience (Beckers & Schmidt, 2003), and the extent and level of computer skill reached with computer experiences (Beckers & Schmidt, 2003). Students who had a negative introductory experience of computing or experienced negative significant events while using the computer had a greater tendency to develop computer anxiety (Mcilroy et al., 2007). These students were more likely to remain anxious or increase in computer anxiety as the level of experience increased (Gos, 1996; Holt & Crocker, 2000; Mcilroy, Bunting, Tierney, & Gordon, 2001; Rosen & Maguire, 1990; Rosen et al., 1987; Todman & Monaghan, 1994). Another influence on the outcome of experience on computer anxiety was the quality of instruction or support, as defined by relevancy, professionalism, friendliness, and enthusiasm of the instructor or other personnel (Abbott & Faris, 2000; Rosen et al., 1987; Russell & Bradley, 1997). Figure 2 illustrates the relationship of computer experience with computer anxiety and items as shown by research to be influencing factors. When the initial computer experience is positive and relaxed, the result is less computer anxiety. When these first computer experiences are negative or stressed, research suggests a higher level of computer anxiety.
Computer anxiety resulting from such early negative experiences may be reduced with subsequent positive experiences, but those individuals experience a rapid return of computer anxiety if a negative computer event reoccurs (Beckers & Schmidt, 2003). Individuals who have early, positive computer experiences with opportunities for continued development of skills are less likely to develop computer anxiety. Instruction or support also influences the tendency
to develop computer anxiety. There is a lower tendency to develop computer anxiety when the instruction is perceived as relevant to the need of the individual and the instructor is professional, friendly, and enthusiastic. Finally, computer experience, in the form of the extent and level of computer skills learned and used by the individual, influences the level of computer anxiety.

Those individuals who have used computers for a wide range of applications, for long enough periods of time to gain experience and expertise, and are able to customize the hardware and software to meet their needs, are experienced computer users and less likely to have computer anxiety. Figure 2 summarizes how the concept of computer experience encompasses several dimensions and provides insight into the development and operation of computer anxiety (Beckers & Schmidt, 2003).

The amount and level of computer anxiety appears to be directly influenced by the conditions under which the experiences are acquired, combined with the individual’s perception of the experiences (Smith et al., 1999). These perceptions are the result of the cumulative experience of an individual within a subjectively interpreted context, which is shaped by social and cultural patterns and beliefs (Beckers & Schmidt, 2001; Smith et al., 1999). The effect of computer experience on computer anxiety is also influenced by gender and age.
Gender and Computer Anxiety

Research on the influence of gender on computer anxiety provides insights into how computer experience, social and cultural patterns of beliefs, social context, and learning environment influence the levels of computer anxiety. A majority of studies of computer anxiety and gender, including studies focusing on preservice teachers, show higher levels of computer anxiety for females than for males (Aust, Newberry, & O’Brien, 2005; Ayersman & Reed, 1996; Broos, 2005; Brosnan, 1998b; Brosnan & Lee, 1998; Campbell & Perry, 1988; Chua et al., 1999; Colley & Comber, 2003; Colley, Gale, & Harris, 1994; Cooper, 2006; Cooper & Weaver, 2003; Kay, 1990, 2006; Liao, 1999; Rosen & Weil, 1995b; Temple & Lips, 1989; Todman, 2000; Todman & Day, 2006; Whitley, 1997). Some researchers has found little or no relationship of gender to computer anxiety levels and instead attribute differences in computer anxiety levels to experience or other variables such as access to computing facilities, characteristics of the initial instructor and first computing experience (Mcilroy et al., 2001); length and extent of computer experience, and academic major (Havelka, 2004); and among preservice teachers, tasks attempted and level of certification or licensure programs (Shapka & Ferrari, 2003).

Among the studies finding gender differences in computer anxiety, possible sources have been attributed to the introducer of the computer (Weil et al., 1990), socialization patterns (Cooper, 2006; Weil et al., 1990), social developmental differences between boys and girls, social and cultural
stereotypes of gender expectations, gender-specific attributional patterns 
(Cooper, 2006, p. 322), and the “masculinisation” of the computer (Brosnan & 
Davidson, 1996; Chen, 1986; Cooper, 2006; Cooper & Weaver, 2003; Whitley, 1997). The perception of the computer as a male-oriented object is strengthened 
by the introducer of the computer (Brosnan, 1998b), the psychological gender of 
the user (Brosnan, 1998b; Rosen et al., 1987; Todman & Day, 2006), software, and 
instructional environment (Cooper, 2006; Whitley, 1996, 1997), as well as parent, 
peer, and teacher expectations (Cooper, 2006; Shashaani, 1994b; Simpkins, Davis-
Kean, & Eccles, 2005). The expectations, opportunities, and patterns of computer 
use associated with gender are reinforced by the social context where computing 
is observed, learned, and used (Brosnan, 1998b; Cooper, 2006; Rosen et al., 1987; 
Todman & Day, 2006; Weil et al., 1990).

Beckers and Schmidt (2006; 2003) found that gender differences in 
computer anxiety can be accounted for by the differences in the way male and 
females perceive themselves as computer literate (Beckers et al., 2006; Beckers & 
Schmidt, 2003). Women generally have lower self-perception of their computer 
skills. When men and women have similar backgrounds and experiences of 
computer use, men perceive themselves more than women as being ahead of 
others with computer use, while more women perceive themselves as being 
behind others. As computer experience increases, men quickly gain confidence, 
while women take longer to reduce computer anxiety (Broos, 2005). Men and 
women may also react differently to training methods used to reduce computer
anxiety. For example, when comparing the behavioral modeling approach to an instruction-based approach, females improved more than men when using behavioral modeling and worst when compared to men using the instruction-based approach (Chou, 2001).

A significant influence on computer anxiety and gender is the home environment, especially parental expectations and attributional patterns. Parents act as “expectancy socializers,” communicating expectations and attributions, that children accept as their own (Cooper, 2006; Parsons, Meece, Kaczala, & Adler, 1982; Shashaani, 1994b). Beliefs about gender and computer anxiety are also influenced by teacher computer classroom use (Bain & Rice, 2006). In a study of 11 and 12 year olds, and 15 and 16 year olds, Colley and Comber (2003) found when comparing computing attitudes of the two groups, that the older girls had the least positive attitudes toward computers and that this may be influenced by cultural pressures of gender stereotyping by teachers and parents as well as the different classroom computer applications used by the two groups (Colley & Comber, 2003). These beliefs and attitudes continue as a student matures and moves into post-secondary education and employment (Selwyn, Gorard, & Furlong, 2006).

Given that all subjects used for this study are female, gender was not used as a factor in this study. However, the research on gender and computer anxiety is relevant to this study because the social and cultural factors influencing gender and computer anxiety such as parental expectations and attributions, teacher
influences, behavioral modeling, self-perception, and learning environment may also be significant when comparing individuals with or without computer anxiety. While this exploratory study did not consider gender, it investigated those other factors identified by studies that have examined gender.

**Age and Computer Anxiety**

Age is a variable commonly associated with higher levels of computer anxiety. However, research on the relationship of age and computer anxiety has shown mixed results. When comparing groups of learners, in studies where the age difference between groups is narrow, little or no difference in computer anxiety level is found. In research where age differences are wider, the differences in computer anxiety levels are larger (Chua, 1997; 2003; Ellis & Allaire, 1999). Individuals over age 60 have been shown in some studies to have higher levels of computer anxiety than the general population. Within this age group women show higher levels of anxiety than men (Karavidas, Lim, & Katsikas, 2005). Among middle to young adult-aged learners, researchers found higher computer anxiety levels in the younger group (Bozionelos, 2001; Kohrman, 2003). Present age and age at which the first experience occurred, did not significantly influence the level of computer anxiety or the amount of computer anxiety among first and second year psychology students (Beckers & Schmidt, 2003). Researchers suggest that computer experience may moderate the relationship between computer anxiety and age or gender (Dyck & Smither, 1996; Havelka, 2004).
Computer Anxiety and Socioeconomic Factors

Socioeconomic factors influence computer anxiety through several variables including levels of computer accessibility, the modeling of computer attitudes and behaviors by family members and peers (Attewell & Battle, 1999; Kerawalla & Crook, 2002; Selwyn et al., 2006), and informal learning opportunities (Facer, Furlong, Furlong, & Sutherland, 2003; Kafai, Fishman, & Bruckman, 2002; Selwyn, 2005; Sutherland, Facer, Furlong, & Furlong, 2000). Moll and others have described resources for social sharing of knowledge in the home as “funds of knowledge” (Moll & Greenberg, 1990, p. 320). They explain further, “Every household is, in a very real sense, an educational setting in which the major function is to transmit knowledge that enhances the survival of its dependents.” (Moll & Greenberg, 1990, p. 320) The socioeconomic level of a household influences the educational resources of all types available to the household, including access to and use of computers both at school and home for both children and young adults (Day, Janus, & Davis, 2005). For example, in households with incomes of $50,000 to $74,000, 84.5 percent of households owned a home computer, compared with 67.2 percent for households with incomes of $25,000 to $49,000 and 41.2% for households with incomes less than $25,000 (Day et al., 2005).

Research suggests that home computer access has significant influence on computer attitudes, including computer anxiety, with those with home computer access having less computer anxiety and more positive attitudes toward
computers (Martin, 1991; Selwyn, 1999; Sexton, King, Aldridge, & Goodstadt-Killoran, 1999; Woodrow, 1994), with even more positive effect on males than females (Selwyn, 1999). As Selwyn, et al (2006) explains, “The home is …a key site within which adults think about and ‘socially construct’ their notions and understandings of technology. …the home is considered to be a particularly apposite site where technology and education come together” (Selwyn et al., 2006, p. 104). Those who own a computer have higher positive attitude scores and generally tend to learn computing skills at home as well as outside the home, in places such as a university. Computer access also has impact on how college students perceive and feel about computers; the greater the access and usage, the more positive the attitudes. Among preservice teachers, home computer use and other types of computer ownership improved self-efficiency of students using computers, which can contribute to the lowering of computer anxiety (Albion, 2001). Since home access and computer ownership is largely determined by economic, social, and political factors, individuals in segments of society with less access have poorer attitudes, including higher levels of anxiety, towards computers (Attewell & Battle, 1999; Carey et al., 2002).

When a computer is used in a home environment, it is within a social environment where computer use is mediated with people and resources within that environment (Kerawalla & Crook, 2002; Selwyn et al., 2006; Sutherland et al., 2000). Friends, family, and other people provide support for informal learning of computer skills (Selwyn, 2005). Research suggests that informal learning of
computer skills builds confidence and provides students with greater diversity and depth of experience (Kafai et al., 2002), and builds a foundation for formal learning activities (Cole, 1996; Selwyn, 2005). While some studies have shown a relationship between computer anxiety and home computer access, the factors influencing computer anxiety and informal learning within the social environment of the computer user need further investigation.

**Computer Anxiety Scales**

Several instruments have been developed to measure computer anxiety and investigate the correlates of computer anxiety. Instruments used to identify and measure computer anxiety and associated attitudes include The Computer Anxiety Index (CAIN) and the Standardized Test of Computer Literacy (STCL) by Maurer & Simonson (1984), that assess the avoidance of, caution with, negative attitudes toward, and disinterest in computers; The Computer Attitude Scale (CAS) by Loyd and Gressard (1984b), that assesses computer liking, confidence, and anxiety; and the Attitudes Toward Computers Questionnaire by Raub (1981) that measured three factors: “Appreciation of Computers. . . as well as confidence in one’s ability to acquire computer skills,” “Computer Usage Anxiety,” and “Computer’s Negative Impact on Society” (1981, pp. 51-55). Results from these studies show computer anxiety, as identified by these instruments, is related to computer confidence and computer liking, and moderately related to mathematics anxiety (Loyd & Gressard, 1984b; Loyd & Loyd, 1985; Raub, 1981; Rosen et al., 1987). Others include the Campbell and
Dobson’s Computer Anxiety Scale (CAS) (1987), the Computer Anxiety Rating Scale (CARS) by Heinssen, Glass, and Knight (1987), the Computer Anxiety and Learning Measure (CALM) by McInerney, Marsh & McInerney (1999) and the Computer Anxiety Rating Scale (CARS), and the Computer Thoughts Survey (CTS) and General Attitudes Toward Computer Scale (GATC) by Rosen and Weil (2000). Rosen and Weil concluded from their research that technophobia has “three separate but overlapping dimensions including anxiety, negative cognitions, and negative attitudes” (Rosen & Weil, 2000, p. 9). Each dimension is measured separately with three instruments: Computer Anxiety Rating Scale (CARS), Computer Thoughts Survey (CTS), and General Attitudes Toward Computers Scale (GATCS).

The Computer Anxiety Rating Scale – Form A was modeled after the Mathematics Anxiety Rating Scale (MARS) created by Richardson and Suinn in 1972. It contains items about anxiety about computers, the role of computers, computer programming, computer use, consumer use of technology, problems with computers, technology, and technology in the media. Form A had 54 statements using a Likert scale from 1 to 5 with 1 the lowest (“not at all”) to 5 (“very much”). After use in several studies, including a study of elementary and secondary school teachers, CARS – Form C was developed. Form C contains 20 questions, 16 from the original CARS – Form A, and four new, updated items. The CARS results provide a Total Computer Anxiety Score and three Factor Scores.
The Computer Thoughts Survey (CTS – Form A) measures cognitions and feeling about abilities with technology. It is modeled after the CARS with a similar 5-point Likert scale. The individual reflects on and responds to how often the participant had each specified thought when working with or thinking about technology. Form A had 28 questions, 12 negative and 16 positive. After use in several studies, including a study of elementary and secondary school teachers, CTS – Form C was developed. Form C contains 20 questions, 18 from Form A plus two new items.

The General Attitudes Toward Computers Scale (GATCS – Form A) was created to measure attitudes toward computers and technology. It has 26 items each with a 5 point Likert scale. Nine items are stated in a negative direction, 17 in a positive direction. The shorter form, GATCS – Form C, contains 20 items, 13 from the original GATCS and 7 new items (Rosen & Weil, 2000). Because the GATCS is not as reliable as the CARS (Form C) or the CTS (Form C) (Rosen & Weil, 2000), it was not used in this study.

The CARS, CTS, and GATCS (Form A & Form C) have been used extensively in numerous studies of computer anxiety in the United States (Rosen et al., 1987; Rosen & Weil, 1990, 1995b) and internationally (Rosen & Weil, 1995a; Weil & Rosen, 1995). CARS-Form C and CTS-Form C continue to be some of the most commonly used measures for computer anxiety today. See Appendix B for examination copies of the CARS (Form C) and CTS (Form C) and Appendix C for
permission from Dr. Rosen to reproduce examination copies of the instruments in the dissertation.

Sociocultural Theory

Sociocultural theory is one of the frameworks that guide this study. It offers important insights into how computer anxiety is influenced by the social environment for learning. Sociocultural theory grew out of a rich intellectual history of the disciplines of anthropology, psychology, and sociology. In education, sociocultural theory was first advanced by Vygotsky (1978) and collaborators in Russia in the 1920s and 1930s, and later translated and published in the United States and Europe in the late 1970s. Vygotsky focused on the cognitive development of children within society. In recent years, adult learning theorists and others have applied sociocultural theory to all age levels of learning. Since college students are considered within the young adult range, it is appropriate to include this age group within a discussion of adult learning theory and sociocultural theory (John-Steiner & Mahn, 1996).

As discussed in Chapter 1, sociocultural theory is based on the concept that learning is socially and culturally situated in everyday life. It is the outcome of the dynamic interaction between individuals, other people, and cultural artifacts, all of which contribute to the social formation of the individual mind (Wertsch, 1991b) and lead to the realization of socially valued goals (Daniels, 1996; Engeström, Miettinen, & Punamäki, 1999; John-Steiner & Mahn, 1996;
Rogoff, 1990; Vygotsky, 1978; Whipp, Eckman, & Van den Kieboom, 2005). Learners receive assistance from more capable peers or others, such as teachers and parents, and technical tools or artifacts in their “zones of proximal development” (Vygotsky, 1978). The Zone of Proximal Development (ZPD) is, “…the distance between the actual developmental level as determined through independent problem solving and the level of potential development as determined through problem solving under adult guidance or in collaboration with more capable peers” (Vygotsky, 1978, p. 86). The knowledge, skills, and information needed by the individual to function within the sociocultural context are appropriated through guided participation in shared activity (Alfred, 2002; John-Steiner & Mahn, 1996; Putnam & Borko, 2000; Rogoff, 1990; Whipp et al., 2005). When assistance is given within a social context, the combination of modeling, feedback, support, and instruction reduces isolation and anxiety of the learner (Lave & Wenger, 1991; Whipp et al., 2005). Lave and Wenger (1991) refer to this type of combination of learning opportunities and support from social community members as a “community of practice” (Lave & Wenger, 1991). When applying these same principles to computers, it has been referred to as the social environment of computing (Cooper, 2006; Habib, 2000; Kiesler & Sproull, 1987).

Sociocultural theory asserts that all learners are, “primary members of a defined culture with a cultural identity” (Alfred, 2002, p. 5). The learning experience is strongly influenced by the cultural context and the cultural identity
of the learner. Learning is filtered by and through culture. It is “socially and culturally situated” (Alfred, 2002, p. 5; Lave, 1988). As Rogoff (1995) explains,

[w]hen a person acts on the basis of previous experience, his or her past is present. It is not merely a stored memory called up in the present; the person’s previous participation contributes to the event at hand by having prepared it. The present event is different from what it would have been if previous events had not occurred; this does not require a storage model of past events. (Rogoff, 1995, p. 155)

Another principle of sociocultural theory is that human activities are situated within cultural contexts, mediated by language and other symbolic systems, and best understood when considered in relation to their historical development (John-Steiner and Mahn, 1996, p. 191). Learning is influenced by cultural values as well as past experiences of the individual, and the environment or context in which the learner is placed, including the teacher, peers, and society at large. Language, tools, and other symbolic systems are forms of communications expressing the culture and society (Jacob, 1997). To better understand how and why an individual learns or not learns, it is necessary to understand the history of the individual, the community in which the individual learned, and how the individual relates to others and their place in society (Alfred, 2002; Nisbett & Norenzayan, 2002; Perez, 2004).

Studies of the individuals and computers within communities of practice provide insight into the sociocultural relationships involved in complex learning environments. Selwyn (2005; 2006) finds the success of informal and formal learning environments depends on the individual’s current context, as well as
past history of technology and computer education. Findings show learning how to use a computer as primarily an informal process, initiated by the individual and relying on the “warm experts” (2005, p. 132) who act as mediators between the technology and the learner. Warm experts are usually friends or acquaintances, but for older adults, it is more likely to be family members. These warm experts scaffold the learner’s acquisition of computer skills, providing assistance and encouragement, and model computer behaviors (Selwyn, 2005; Selwyn et al., 2006). Mciloy, Sadler & Boojawon (2007) in a study of computer anxiety found that among 363 university undergraduates, the student’s history of first experience of computer use, and the impact of home computer use significantly influence the level of computer anxiety. In a research study of older adults, Aberton (2005) found that, “learners constructed their learning experience, identity of self in the context of other activities, the physical learning environment, their own subjective past and present experiences and social relations” (Aberton, 2005, p. 6). Stanley (2003) in a study of computer use among multi-ethnic groups at six community technology centers found psychosocial and cross-cultural barriers inhibited learning by influencing the desire to learn how to use a computer as well as the perceived ability to learn how to use the computer.
Adult Learning Theory

The review of the literature on adult learners and adult learning theory focused on the population of the participants for this study, undergraduate-level education majors in a public Midwestern university, with an age range of 22 to 27 years old. Adult learning theory can be applied to these participants since they meet the standard of taking on adult roles in society including performing socially productive roles, and assuming primary responsibility for their own lives (Darkenwald & Merriam, 1982).

Among the most well known frameworks of adult learning is andragogy, “the art and science of helping adults learn” (Knowles, Holton, & Swanson, 2005, p. 61). The concept of andragogy originated in Europe where the term had been used to differentiate from pedagogy, the methods, techniques and philosophy used to teach children. Knowles introduced andragogy in 1968 and described adult learners, and the teaching-learning relationship (Knowles, 1980). Knowles proposed his andragogy theory with assumptions 2-5 (Knowles, 1975, 1978, 1980), later adding assumption 6 (Knowles, 1984), and finally assumption 1 (Knowles, 1989, 1990). Knowles, Holton, and Swanson (2005) describe six assumptions about adult learners essential to the andragogy model of learning.

1. **The need to know.** Adults need to know reasons for learning something before they attempt to learn it.

2. **The learner’s self concept.** adults have self-concepts of being responsible for their own lives and directing their own decisions.
3. **The role of the learners’ experiences.** Adults have a range and depth of experiences that influence learning as well as an individual’s potential contributions to the learning process.

4. **Readiness to learn.** Adults “become ready to learn those things they need to know and be able to do in order to cope effectively in their real-life situations” (Knowles et al., 2005, p. 67).

5. **Orientation to learning.** Adults are motivated to learn when they believe that the learning is directly relevant to a perceived need in their lives. They learn best when new knowledge is presented in context of real situations or problems that adults need to cope with or solve.

6. **Motivation.** For adults the most important motivations to learn are internal. However, such intrinsic motivators are thwarted by negative self-attitudes, lack of opportunities to learn, and poorly designed training programs (Knowles et al., 2005).

These assumptions provide a foundation for designing, implementing and evaluating learning activities with adults. Knowles proposes that in andragogy the adult educator establishes a suitable physical and psychological climate for learning designed to enhance adult learning. These include mutual respect, collaboration, supportive environment, openness, and enjoyment. Adult learners should also be involved in the planning of educational goals and activities. The learning contract is used to help adult learners develop self-direction to reach
goals, identify resources, implement plans, and evaluate learning (Knowles et al., 2005; Ross-Gordon, 2003).

While andragogy have been useful in adult education, it has been controversial. Some debate whether it can be classified as a theory of learning or theory of teaching (Knowles et al., 2005). Merriam and others have noted that andragogy fails to address sociocultural influences on individual learning (Merriam, Caffarella, & Baumgartner, 2007). Despite these criticisms, andragogy is an important framework when considering the young adults and computer anxiety in a university environment. Andragogy assumptions about adult learning such as the importance of learners’ experiences on the learning process, the influence of learners’ perception of abilities, and the importance of learners perceiving the subject matter as relevant to their work and lives (Knowles et al., 2005) may influence the appearance and level of computer anxiety within certain populations.

Adult learning occurs in three types of settings: formal institutional settings, non-formal settings, and informal context (Merriam et al., 2007; Schugurensky, 2000). Formal settings are the traditional classroom or training settings with standardized curriculums, certified teachers, grades, diplomas, or certificates. Previously, the mission of formal settings such as primary and secondary schools as well as post-secondary institutions has been to educate children (Merriam et al., 2007; Schugurensky, 2000). However, the percentage of adult students over 24 years of age in post-secondary institutions have increased
to over half of all students enrolled (Snyder, Tan, & Hoffman, 2006). Non-formal education is organized outside of the formal educational system, usually with a curriculum and instructor. Participation is voluntary, and is often run by the community, local organizations, or stores. It is usually short in length, interactive, and focused on the interests of the participants. Non-formal education can complement formal education such as adult learner classes for reading or be an alternative to formal education when a flexible response is needed such as training for emergency procedures. Non-formal education can be used by non-governmental agencies or other organizations to improve social conditions and raise social consciousness (Merriam et al., 2007).

Informal learning is the “spontaneous, unstructured learning that goes on daily in the home and neighborhood …in the workplace …and through various mass media” (Coombs, 1985, p. 92). Informal learning can be individual or group-based, and it has three forms: self-directed, incidental, and socialization. It can reinforce or undermine education acquired from other sources (Merriam et al., 2007). Regardless of the source, quality, and form, it is the largest type of learning for adults with up to 95% of adults claiming to be involved in some sort of significant informal learning (Livingstone, 2001), and approximately 70% claiming to be involved with informal learning at work (Kim, Hagedorn, Williamson, & Chapman, 2004).

Computer education is commonly found in both formal and non-formal settings. Formal computer classes are taught to children at school, while the
majority of adults get formal computer training through employment. Non-formal settings such as computer clubs for children and adult community computer classes provide opportunities to enhance computer knowledge. However, classes on their own do not always lead to computer use and confidence (Selwyn, 2005; Selwyn et al., 2006). Instead, the informal learning network that developed out of the contacts made in the classes helped the learner create and sustain computer knowledge. Learning how to use the computer depends on learning from others, especially family and household members (Selwyn, 2005; Selwyn et al., 2006). “We should not overlook the considerable influence of the family and household in shaping individuals’ informal learning” (Selwyn, 2005, p. 128).

Summary

The review of the literature for this study examined a number of relevant topics. The literature about computer anxiety and the three major correlates of computer experience, gender and age as well as the instruments used to measure computer anxiety were examined. The theories of sociocultural theory and adult learning theory were examined and then discussed in relation to the problem of computer anxiety. Sociocultural theory serves as the theoretical framework for this study as it examines the possible influences of social and cultural patterns of beliefs, values, performance, and social context in which they display and express computer anxiety. Additional theoretical support is provided by adult
learning theory and examining the assumptions about adult learners and the settings for instruction. Out of adult learning theory and sociocultural theory, the possible influences of the learning setting, including environment, provider, and social and cultural factors were reviewed. Table 1 provides an overview of the conceptual themes and citations found in the literature review aligned with the research questions for this study.

Table 1. Research questions aligned with literature review.

<table>
<thead>
<tr>
<th>Main Research Question:</th>
<th>How are typical preservice teachers in a Midwestern metropolitan university with computer anxiety socioculturally different from those with no computer anxiety and why?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conceptual Themes</td>
<td>Citation in Literature</td>
</tr>
<tr>
<td>Computer anxiety</td>
<td>(Ayersman, 1996; Barbeite &amp; Weiss, 2004; Bozionelos, 2001; Brosnan, 1998a; Carey et al., 2002; Chua et al., 1999; Compeau &amp; Higgins, 1995; Desai, 2001; Desai &amp; Richards, 1998; Gabriel &amp; MacDonald, 1996; Gaudron &amp; Vignoli, 2002; Gerard et al., 1996; Hakkinen, 1994; Heinsen et al., 1987; Jouvent et al., 1999; Kley-Kennedy, 2006; Kohrman, 2003; Lazarus, 1991; Mahar et al., 1997; McIorvey, 1997; Milbrath &amp; Kinzie, 2000; Perschitte et al., 2003; Rosen et al., 1987; Rosen &amp; Weil, 1995b; Rovai &amp; Childress, 2002; Schwarz, 1997; Selwyn, 1997b; Smith &amp; Caputi, 2001; Todman &amp; Day, 2006; Todman &amp; Drysdale, 2004; Wilson, 1999; Wood et al., 2002)</td>
</tr>
<tr>
<td>Computer anxiety</td>
<td>measurement (Barbeite &amp; Weiss, 2004; Campbell &amp; Dobson, 1987; Gordon, Killey, Shevlin, McIorvey, &amp; Tierney, 2003; Heinsen et al., 1987; Kernan &amp; Howard, 1990; Loyd &amp; Gressard, 1984b; Loyd &amp; Loyd, 1985; Maurer, 1994; McIorvey et al., 1999; Raub, 1981; Rosen et al., 1987; Rosen &amp; Weil, 2000)</td>
</tr>
</tbody>
</table>

Research Sub-Question A:

| How do preservice teachers with computer anxiety compare to preservice teachers with no computer anxiety in life experiences and background in relation to computer use? |
|------------------------|------------------------------------------------------------------------------------------------------|
| Conceptual Themes      | Citations in Literature                                                                               |
| Sociocultural theory   | (Attewell & Battle, 1999; Becker, 2000; Child Trends DataBank, 2004; Cooper, 2006; Dickerson, 1983; Facer et al., 2003; Habib, 2000; Kent & Facer, 2004; Kerawalla & Crook, 2002; Kiesler & Sproull, 1987; Knezek & Christensen, 2002; Love & Wenger, 1991; Martin, 1991; Selwyn, 1997a, 2004a; Simpkins et al., 2005; Selwyn et al., 2002; Venkatesh & Brown, 2001; Weil et al., 1990) |
| Social environment     | (Andersson & Andersson, 2005; Cole, 1996; Kafai et al., 2002; Livingstone, 2001; Marsick & Watkins, 2001; Pringle, Dawson, Marshall, & Pringle, 2002; Selwyn, 2005; Selwyn et al., 2006; Stevenson, 2004) |
| Informal learning      | (Aberton, 2005; Alfred, 2002; Bonk & Kim, 1998; Jarvis, 1992; Knowles et al., 2005; Merriam, 2001b; Selwyn et al., 2006) |
Table 1. Research questions aligned with literature review. (continued)

<table>
<thead>
<tr>
<th>Research Sub-Question B:</th>
<th>What is the pattern in the background and experiences of computer use between students with and without computer anxiety?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conceptual Themes</strong></td>
<td><strong>Citations in Literature</strong></td>
</tr>
<tr>
<td>Socioeconomic</td>
<td>Albion, 2001; Attewell &amp; Battle, 1999; Bozionelos, 2004; Carey et al., 2002; Facer et al., 2003; Kafai et al., 2002; Kerawalla &amp; Crook, 2002; Roe &amp; Broos, 2005; Selwyn, 1997b, 1999, 2005; Selwyn et al., 2006; Sexton et al., 1999; Shashaani, 1994a; Sutherland et al., 2000; Van Braak &amp; Kavadias, 2005; Warschauer, Knobel, &amp; Stone, 2004; Whaley, 2004; Woodrow, 1994</td>
</tr>
<tr>
<td>Computer experience</td>
<td>Abbott &amp; Faris, 2000; Beckers et al., 2006; Beckers &amp; Schmidt, 2001, 2003; Bozionelos, 2001; Broos, 2005; Burger &amp; Blignaut, 2004; Chua et al., 1999; Garland &amp; Noyes, 2004; Glass &amp; Knight, 1988; Gos, 1996; Heinssen et al., 1987; Holt &amp; Crocker, 2000; Howard &amp; Smith, 1986; Loyd et al., 1987; Mcilroy et al., 2001; Mcilroy et al., 2007; Mcinerney et al., 1994; Raub, 1981; Rosen &amp; Maguire, 1990; Rosen et al., 1987; Rosen &amp; Weil, 1995b; Rovai &amp; Childress, 2002; Russell &amp; Bradley, 1996; Selwyn, 1997b; Smith et al., 1999; Todman &amp; Day, 2006; Todman &amp; Drysdale, 2004; Todman &amp; Monaghan, 1994; Weil et al., 1990; Wilson, 1999</td>
</tr>
<tr>
<td>Social environment of computing</td>
<td>Bonk &amp; Kim, 1998; Colley, 1996; Colley et al., 1994; Cooper, 2006; Habib, 2000; Kerawalla &amp; Crook, 2002; Kiesler &amp; Sproull, 1987; McCann, 2004; Parsons et al., 1982; Rogoff, 1995; Selwyn, 2003, 2005; Selwyn et al., 2006; Shashaani, 1994a; Sutherland et al., 2000; Todman &amp; Day, 2006</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Research Sub-Question C:</th>
<th>What sociocultural factors influence computer anxiety among preservice teachers?</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Conceptual Themes</strong></td>
<td><strong>Citation in Literature</strong></td>
</tr>
<tr>
<td>Sociocultural factors</td>
<td>Aberton, 2005; Bonk &amp; Cunningham, 1998; Bonk &amp; Kim, 1998; Ertmer, Conklin et al., 2003; Gunter, 2001; Hill &amp; van Aalst, 2001; John-Steiner &amp; Mahn, 1996; Pelton &amp; Pelton, 1996; Rogoff, 1995; Rovai &amp; Childress, 2002; Selwyn, 1997a, 2003; Sun &amp; Zhang, 2006</td>
</tr>
</tbody>
</table>
CHAPTER IV

METHODOLOGY

Introduction

An exploratory case study research method was used to address the research questions in this study. A case study is an in-depth study of contemporary phenomenon within a natural or real setting, particularly when the boundaries between the phenomenon and context are not distinct (Yin, 2003). As a case study, this study investigated phenomena where variables are embedded within a situation. Since the goal of this study is to answer questions of what, how and why about current events in a natural settings over which the investigator has no control, it meets the criteria for an exploratory case study (Yin, 2003). Exploratory case studies help identify questions, select measurement constructs, develop measures, and can be used with all research strategies (Davey, 1991; Yin, 2003).

A multiple-case approach was used to examine possible sociocultural factors contributing to the computer anxiety levels of selected preservice teachers enrolled in four sections of a required educational psychology course within a College of Education at a Midwestern University. Questionnaires collected
demographic data and assess computer experience. Two instruments measured
levels of computer anxiety, Computer Anxiety Rating Scale - Form C (CARS-C)
and Computer Thoughts Survey - Form C (CTS-C) (Rosen & Weil, 1995a, 2000).
Based on the results of these measures, participants were selected for further
study using the data collection techniques of semi-structured interviews, student
daily journals, and field notes from on-site observations to provide the depth and
thick description of the phenomenon needed for a case study analysis (Gall, Gall,
& Borg, 2005).

Research Method and Design

A qualitative, exploratory case study method was used for this study. The
case study methodology is especially well suited for the investigation and
understanding of complex, contemporary social phenomena since this approach
studies the phenomena within context (Merriam, 2001a). According to Yin (2003)
this is one of the defining requirements of a case. The boundaries between the
context and the phenomenon are difficult to discern, and context is a significant
part of the study (pp. 13-14).

This is a case study of preservice teachers with computer anxiety versus
no computer anxiety and the potential differences of sociocultural factors
between students within each category. The specific boundaries of the case are
the individuals to be studied within each classification of anxiety level. The
contemporary phenomenon to be studied within its real-life context is the social
and cultural patterns of beliefs, values, performance, and social context in which they display and express computer anxiety.

Case Studies

The case study methodology was chosen for its ability to investigate and describe the events and processes that may affect computer anxiety. It allows the study to retain holistic, meaningful descriptions and characteristics of contextual events, such as initial computer experiences and current computer relationships. In addition, this approach is particularistic, descriptive, and heuristic as described by Merriam (2001a). A case is particularistic because it focuses on a specific situation, event, program, or phenomenon. The focus of this case is the way preservice teachers with computer anxiety or without computer anxiety differ in computer experience, attitude, availability, and other sociocultural factors.

The descriptive characteristic of a case study refers to the complete, rich description of the phenomena being studied (Merriam, 2001a). Anthropologists call this a “thick” description (Gall, Gall, & Borg, 2003; Geertz, 1973). This is done through extensive documentation of multiple data sources that help reconstruct the phenomenon being studied through (Merriam, 2001a). By collecting data through a variety of sources, using multiple techniques, and triangulating the data, the completed case study provides the reader with new insights into preservice teachers and sociocultural factors influencing computer anxiety. A case study of preservice teachers and the differences between students with
versus students without computer anxiety using a sociocultural approach has not been found in relevant literature.

**Research Questions**

One primary research question drove this study as follows:

How are typical preservice teachers in a Midwestern metropolitan university with computer anxiety different from those with no computer anxiety and why?

Three additional sub-questions were considered in this study.

1. How do preservice teachers with computer anxiety compare to preservice teachers with no computer anxiety in life experiences and background in relation to computer use?

2. What is the pattern in the background and experiences of computer use between students with and without computer anxiety?

3. What sociocultural factors influence computer anxiety?

**Student Population**

The students chosen for the case study were selected from a group using a criterion sample. The criterion is based on the student demographic profile for the College of Education in Fall 2007, 14.8 percent non-white, 62% female, and average age of 23. The data is summarized in Table 2.
Table 2. Demographic profile for the College of Education in Fall 2007.

<table>
<thead>
<tr>
<th>College of Education for Fall 2007</th>
<th>Number of Majors</th>
<th>Percentage Non-White</th>
<th>Percentage Female</th>
<th>Average Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Baccalaureates in the College of Education</td>
<td>2270</td>
<td>14.8</td>
<td>62%</td>
<td>23</td>
</tr>
</tbody>
</table>

**Unit of Analysis**

The unit of analysis for this study is the preservice teacher and her expressed past and present experiences associated with learning and using computers. It is within this context that the phenomenon of preservice teachers with computer anxiety and without computer anxiety can be studied.

**The Sample**

The sampling procedure used to select students to be studied in the cases was purposeful and based upon criterion sampling. Purposeful sampling is used when looking for specialized qualifications or experience (Merriam, 2001a). As Patton (2002) explains, “The logic and power of purposeful sampling lies in selecting information rich cases for study in depth” (p. 230). Criterion based sampling is used to select cases that match a specific list of attributes. Selecting the information rich participants reflects the goals and purpose of the study (Merriam, 2001a). The process and results for case selection is illustrated in Figure 3.
Figure 3. The case selection process for the study.
Phase I

In Phase I of sample selection, a population was chosen for initial study and sampling. The population consisted of individuals enrolled in four sections of Educational Psychology (n=121). This course was chosen because it is one of the first required courses for students admitted into the College of Education. Enrollment is restricted to those students who have taken the required prerequisites, successfully met the college and department admission requirements, including the computer literacy requirement, and are fully admitted to the College of Education. These preservice teacher education candidates are Early Childhood, Middle, and Multi-Age, or Secondary Education majors.

Using the procedures and forms approved by the Institutional Review Board for the Protection of Human Subjects (see Appendix D), participants were recruited during normal class sessions of Educational Psychology during the second and third week of the Fall 2007 semester. An explanation of the study and oral instructions was read to the class. The explanation was written to provide clear distinctions between the levels of participation and the expectations from the students once they had agreed to participate in the study. This was based on the experiences learned from the pilot study (to be explained later). There were two levels of participation. The first was completion of the packet containing the Student Profile Questionnaire, and the computer anxiety measurement instruments. The second level was agreeing to participate in the case study by
signing the Informed Consent Form, which explained the details of the case study.

During a normal class session, all students attending the selected sections of Educational Psychology received a packet containing Student Profile Questionnaire asking for demographic and computer experience information including name, gender, computer experience, computer learning, and support, and other relevant information (see Appendix E). The packet also contained two measures, the Computer Anxiety Rating Scale - Form C (CARS-C), and Computer Thoughts Survey - Form C (CTS-C) to assess levels of computer anxiety. Each packet was assigned a unique number and grouped according to course section. Students were asked not to open the packet until directed. Next, the Match Sheet was passed around the room. A student agreed to the first level of participation by signing the Match Sheet, matching the number on the cover sheet of the packet to a numbered line on the match sheet. A student declined to participate by not signing the match sheet and returning the uncompleted packet when all packets were collected. After the packets and the match sheets were collected, informed consent forms were distributed to all students and the second level of participation explained. See Appendix F for a copy of the informed consent form. Students were given an opportunity for questions and consideration, and all the forms were returned.

Of the 121 packets distributed, 119 students signed the match sheet, two students did not sign the match sheet and returned the packet uncompleted, one
signed the match sheet but did not complete the packet, and three signed the match sheet, completed the Student Profile Questionnaire, but did not complete the computer anxiety measures. Therefore, of the 121 students eligible to participate in the study, 115 completed both the match sheet and all parts of the packet. Seventy-four students signed and returned the informed consent forms. Seventy-one of the students completed both the match form and all parts of the packet, and the informed consent forms, and were therefore reviewed as possible case study participants in the study. Table 3 summarizes the results of the match sheet, packets, and informed consent forms.

Table 3. Packet completion and informed consent forms returned by course section.

<table>
<thead>
<tr>
<th></th>
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<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30</td>
<td>29</td>
<td>1</td>
<td></td>
<td>29</td>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>29</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>26</td>
<td>21</td>
<td>19</td>
</tr>
<tr>
<td>3</td>
<td>31</td>
<td>31</td>
<td></td>
<td></td>
<td>31</td>
<td>14</td>
<td>14</td>
<td></td>
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<tr>
<td>4</td>
<td>30</td>
<td>30</td>
<td></td>
<td>1</td>
<td>29</td>
<td>19</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>121</strong></td>
<td><strong>119</strong></td>
<td><strong>2</strong></td>
<td><strong>1</strong></td>
<td><strong>115</strong></td>
<td><strong>74</strong></td>
<td><strong>71</strong></td>
<td></td>
</tr>
</tbody>
</table>

Regardless of self-selecting, participants represent a typical sample of preservice teachers enrolled in this course at the institution where this study took place. The results of all the computer anxiety measurements for the 115 participants are in Appendix G. A summary of those results with an explanation of the scoring is in Table 4.
Table 4. Summary of the results of the computer anxiety measurements (CARS-C and CTS-C) completed by Phase I participants.

<table>
<thead>
<tr>
<th>Summary of Computer Anxiety (CA) Measurements &amp; Percentages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Computer Anxiety Levels</td>
</tr>
<tr>
<td>-------------------------</td>
</tr>
<tr>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>Low Computer Anxiety</td>
</tr>
<tr>
<td>Moderate/High Computer Anxiety</td>
</tr>
<tr>
<td>Total Number with Computer Anxiety</td>
</tr>
<tr>
<td>Computer Anxiety Percentage</td>
</tr>
</tbody>
</table>

**Explanation of Scoring**

- Any subject who scores in the Moderate/High Computer Anxiety Group on any one measure is considered to possess moderate or high computer anxiety.
- Any subject who scores in the No Computer Anxiety on all measures is considered to have no computer anxiety.
- Any subject who scores in the Low Computer Anxiety Group on one or more measures, but does not score in the Moderate/High Computer Anxiety Group on any measure is considered to have low computer anxiety (Rosen & Weil, 2000).

The scores and the data collected from the Student Profile Questionnaire for each participant were coded to identify students who meet the criteria for further inclusion in the study in Phase II and Phase III of the sample selection. The variables coded were computer anxiety level, gender, age, student level, area of licensure & endorsement, computer ownership, computer access, computer access distance, length of computer experience, first computer experience pleasantness level, computer assistance identification, socioeconomic range, home computer ownership, and computer proficiency level. Narrative fields were used to collect data to aid case selection, guide interviews, and improve validity: computer knowledge acquisition description, first computer experience
pleasantness description, home computer description, and memorable computer experiences descriptions.

Phase II

In Phase II, from those students that completed the packets and match sheet, a group of students was selected using a criterion sample. The criteria was based on the student demographic profile for the College of Education (see Table 2). Based on this demographic profile, the typical undergraduate student enrolled in the College of Education is female, and 21 to 27 years old. Forty-two students meeting this set of criteria and willing to complete the Student Profile Questionnaire and CARS-C and CTS-C, and sign the match sheet, were placed in the second level group. Table 5 shows the Phase II qualified students grouped by age.

Table 5. Phase II qualified students by age.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age &gt;=21 to &lt;=27</th>
<th>Total Per Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>21</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total Qualified Students</td>
<td>42</td>
</tr>
</tbody>
</table>

Students in Phase II were divided into two subgroups, those with computer anxiety (n=17), and those with no computer anxiety (n=25). The
criteria for these subgroups were the results of the CARS-C and CTS-C as specified by the scoring manual (Rosen & Weil, 2000). Table 6 shows the qualified students by age and computer anxiety subgroup.

Table 6. In Phase II of case selection, qualified students are placed into subgroups according to computer anxiety levels.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Computer Anxiety</th>
<th>No Computer Anxiety</th>
<th>Total by Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>21</td>
<td>7</td>
<td>11</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>4</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td></td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>3</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>1</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>2</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>17</td>
<td>25</td>
<td>42</td>
</tr>
</tbody>
</table>

Students who signed an informed consent form were then selected for further review. Table 7 shows participants who met the demographic criteria of gender and age grouped according to computer anxiety level and informed consent status. Of the 42 women who were qualified for the study, 24 signed participation agreements.
Table 7. Students who have met the demographic criteria (gender and age) were grouped according to computer anxiety level and selected for further review based on the Participation Agreement status.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Age</th>
<th>Computer Anxiety</th>
<th>Informed Consents Signed with Computer Anxiety</th>
<th>No Computer Anxiety</th>
<th>Informed Consents Signed with No Computer Anxiety</th>
<th>Total by Age</th>
<th>Total Informed Consents Signed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female</td>
<td>21</td>
<td>7</td>
<td>3</td>
<td>11</td>
<td>7</td>
<td>18</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>4</td>
<td>1</td>
<td>5</td>
<td>2</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>23</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>27</td>
<td>2</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>9</td>
<td>25</td>
<td>15</td>
<td>42</td>
<td>24</td>
<td></td>
</tr>
</tbody>
</table>

**Phase III**

In Phase III, the third level of sampling, a purposeful interview sample was used to select two students each from the two computer anxiety subgroups of computer anxiety and no computer anxiety for the case study. The subgroups were from the 24 qualified students who had signed informed consent. Since there are no rules for sample size in qualitative inquiry (Patton, 2002), the sample size is guided by “what you want to know, the purpose of the inquiry, what’s at stake, what will be useful, what will have creditability, and what can be done with available time and resources” (p. 244). The research problem suggests a multiple case approach using a small sample size from each subgroup of students, as defined by their level of computer anxiety, will work best to provide in-depth, rich, thick descriptions, while also giving the comparative information needed for analysis of the primary research problem.
Selection was based primarily on responses to the written questions on the Student Profile Questionnaire and the scores on the CARS-C and CTS-C. The scores and results are in Table 8.

Table 8. Results of the Computer Anxiety Rating Scale Part C and the Computer Thoughts Survey Part C for qualified participants.

<table>
<thead>
<tr>
<th>ID</th>
<th>CARS-C Score</th>
<th>CARS-C CA Rating</th>
<th>CTS-C Score</th>
<th>CTS-C CA Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>3101</td>
<td>24</td>
<td>No Computer Anxiety</td>
<td>93</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3102</td>
<td>37</td>
<td>No Computer Anxiety</td>
<td>70</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3114</td>
<td>46</td>
<td>Low Computer Anxiety</td>
<td>68</td>
<td>Low Computer Anxiety</td>
</tr>
<tr>
<td>3121</td>
<td>31</td>
<td>No Computer Anxiety</td>
<td>89</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3206</td>
<td>31</td>
<td>No Computer Anxiety</td>
<td>91</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3208</td>
<td>35</td>
<td>No Computer Anxiety</td>
<td>78</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3211</td>
<td>26</td>
<td>No Computer Anxiety</td>
<td>82</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3214</td>
<td>40</td>
<td>No Computer Anxiety</td>
<td>67</td>
<td>Low Computer Anxiety</td>
</tr>
<tr>
<td>3215</td>
<td>38</td>
<td>No Computer Anxiety</td>
<td>85</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3217</td>
<td>57</td>
<td>Moderate/High Computer Anxiety</td>
<td>68</td>
<td>Low Computer Anxiety</td>
</tr>
<tr>
<td>3226</td>
<td>36</td>
<td>No Computer Anxiety</td>
<td>70</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3229</td>
<td>25</td>
<td>No Computer Anxiety</td>
<td>80</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3301</td>
<td>51</td>
<td>Moderate/High Computer Anxiety</td>
<td>82</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3304</td>
<td>43</td>
<td>Low Computer Anxiety</td>
<td>88</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3307</td>
<td>40</td>
<td>No Computer Anxiety</td>
<td>72</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3309</td>
<td>29</td>
<td>No Computer Anxiety</td>
<td>88</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3310</td>
<td>75</td>
<td>Moderate/High Computer Anxiety</td>
<td>47</td>
<td>Moderate/High Computer Anxiety</td>
</tr>
<tr>
<td>3312</td>
<td>27</td>
<td>No Computer Anxiety</td>
<td>61</td>
<td>Low Computer Anxiety</td>
</tr>
<tr>
<td>3319</td>
<td>38</td>
<td>No Computer Anxiety</td>
<td>86</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3330</td>
<td>27</td>
<td>No Computer Anxiety</td>
<td>82</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3410</td>
<td>27</td>
<td>No Computer Anxiety</td>
<td>81</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3417</td>
<td>39</td>
<td>No Computer Anxiety</td>
<td>80</td>
<td>No Computer Anxiety</td>
</tr>
<tr>
<td>3423</td>
<td>30</td>
<td>No Computer Anxiety</td>
<td>68</td>
<td>Low Computer Anxiety</td>
</tr>
<tr>
<td>3426</td>
<td>51</td>
<td>Moderate/High Computer Anxiety</td>
<td>74</td>
<td>No Computer Anxiety</td>
</tr>
</tbody>
</table>

The written questions were:

11. How and where did you learn to use computers?

13. Describe those first experiences and explain your answer to Question 12.
Question 12 asked the respondent to rate the pleasantness of their first experiences on a scale from 1 to 5, with 1 being “Very unpleasant,” and 5 being “Enjoyable.”

17. **If the answer is yes, who used the computer in your family when you were in grades P-12?** Please list the persons by their relationship to you below (For example, “Mother,” “Father,” and so on) and HOW they used the computer: Use the back of this sheet if necessary.

The previous question, Question 16, asked the respondent to check “Yes” or “No” if there was a computer in the home when the respondent was in grades P-12.

18. **Describe your most memorable computer experiences – negative and positive. You can use the back of this sheet if necessary.**

After consideration of the richness of the written responses and computer anxiety scores, five students with computer anxiety, and five students without computer anxiety were selected and prioritized according to responses and scores. The first three candidates from each list were emailed to schedule a meeting. When no response was received within 48 hours, a second email was sent and the candidate phoned, if a telephone number was supplied by the candidate. If after three attempts there was no response from a case candidate, the next candidate was selected from the list and contacted. While the group of qualified students who had signed participation agreements initially appeared to be more than sufficient to select cases for the study, getting students to commit to the research was challenging. Several students did not return emails or phone calls, or did not confirm interview appointments despite expressing interest
when first contacted. For example, one student with computer anxiety and especially expressive and rich descriptions in her responses stopped communicating after initially committing to setting up an appointment. She did not respond to emails or phone messages, and she was removed from the candidate list.

Four students who scheduled and confirmed appointments did successfully complete the research project. Within three weeks after initial contact with the candidates, four participants were individually interviewed, received a notebook to record Daily Student Reflections, and scheduled and completed Field Observations, received and reviewed copies of the interview transcript for member checks, and completed follow-up meetings. The following section describes the steps used to improve methodology and procedures. This increased the accuracy of the processing of the forms and instruments, focus of the interviews, and organization of the research.

Pilot Study

In May 2006, a pilot study was completed to check the accuracy and completeness of the Student Profile Questionnaire, and review the procedures used to administer and score the Computer Anxiety Scale (CARS-C) and Computer Thoughts Survey (CTS-C). Before initiating the study, an application for review of the pilot study was submitted and approved by the Institutional Review Board (see Appendix H).
The pilot was conducted in a course similar to the one to be used for this study. Nine students were in attendance that day and all agreed to participate. The time to complete the Student Profile Questionnaire, the Computer Anxiety Scale (CARS-C), and the Computer Thoughts Survey (CTS-C) was 18 minutes. Participants in the pilot study were junior or senior level, and an average age of 26. Students are pursuing a range of teaching licenses, from Early Childhood (n=3), Middle Level (n=1), Multi-Age (n=4), and Adolescent to Young Adult (n=1). Most have owned their own computers four or more years, and learned how to use computers in school or at home.

Following the interpretation standards of the measurements (Rosen & Weil, 2000), the Computer Anxiety Rating Scale–Form C (CARS-C) and Computer Thoughts Survey–Form C (CTS-C) were scored. Based on the scores from the CARS-C or the CTS-C, there are three levels of results: no computer anxiety, computer anxiety – low level, and computer anxiety - moderate/high level. If the scores are in the low or moderate/high computer anxiety on either measurement, then the participant is classified as having computer anxiety (Rosen & Weil, 2000).

Pilot results of the Computer Anxiety Rating Scale–Form C (CARS-C) revealed seven students with no computer anxiety and the remaining two students with low levels of computer anxiety. The Computer Thoughts Survey–Form C (CTS-C) results showed one student with low level of computer anxiety and one student with moderate to high computer anxiety, with the remaining
seven students showing no computer anxiety. There was no overlap of students scoring within the anxiety range for the CARS-C or CTS-C. Therefore, four students of the nine students scored within ranges for computer anxiety. Figure 4 summarizes the results.

<table>
<thead>
<tr>
<th>Student ID No</th>
<th>CARS</th>
<th>CTS</th>
<th>Computer Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>1001</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1002</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1003</td>
<td>0</td>
<td>2</td>
<td>Y</td>
</tr>
<tr>
<td>1004</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1005</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1006</td>
<td>1</td>
<td>0</td>
<td>Y</td>
</tr>
<tr>
<td>1007</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>1008</td>
<td>0</td>
<td>1</td>
<td>Y</td>
</tr>
<tr>
<td>1009</td>
<td>1</td>
<td>0</td>
<td>Y</td>
</tr>
</tbody>
</table>

**Total Completed**: 9

**Computer Anxiety Levels**

<table>
<thead>
<tr>
<th></th>
<th>No Computer Anxiety</th>
<th>Low Computer Anxiety</th>
<th>Moderate/High Computer Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

**Total Number with Computer Anxiety**: 2

**Computer Anxiety Percentage**: 22% 22% 44%

**Score Key**

0 = No Computer Anxiety  
1 = Low Computer Anxiety  
2 = Moderate/High Computer Anxiety

Figure 4. Pilot study results of CARS-C and CTS-C.

While the number of students participating was small, it did not affect the primary purpose of the pilot, which was to review the steps to administer, score, and analyze the results. Based on the results of the pilot, changes were made to the administration procedures, the Student Profile Questionnaire, and the scoring procedures for the CARS-C and CTS-C which improved the study.
Clarification of administration instructions improved student compliance, especially at the start of each step of completing the forms.

Added questions about the computing interaction and support within the family, informal learning opportunities, and collaboration with peers inserted into the Student Profile Questionnaire elicited further information about computer learning and experience within the informal settings that may influence computer anxiety suggested by research by Facer, Furlong, Furlong & Sutherland (2003), Selwyn, Gorard, & Furlong (2006). This assisted in developing interviews that were more effective and improved validity by providing additional primary sources for information. Data analysis was improved by developing comprehensive data coding procedures and a database.

A pilot study of the Interview Guide was completed in April 2007 to check the ability of the questions and prompts to elicit descriptive, in depth responses. The participant was a female, 20 years old, college sophomore, who was enrolled at the same Midwestern University as the earlier pilot study. An interview guide was used to facilitate the interview and assure the needed topics were covered. Detailed notes were taken of the responses. Problems and needed improvements in the guide were noted both during and after the interview. Overall, the interview was successful, with the respondent giving narrative responses to questions and prompts. Some questions need further refinement to reduce redundancy and provide opportunities for more descriptive responses. Early in the interview the respondent answered in short, simply answers, but as the
interview continued the responses became richer and more complex. Due to problems with the digital recorder, the interview was not recorded; however, the recording difficulties did not affect the value of the pilot interview since the primary purpose was to test the interview guide. During the research study, improved equipment provided a complete and accurate record of the interview. The revised questions and reorganized guide improved responses and helped elicit full and detailed narrative account (Weiss, 1994).

Data Collection

Data collection followed the three principles as described by Yin (2003): have multiple sources of evidence, create a case study database, and maintain a chain of evidence. Yin (2003) proposes following these principles to, “establish construct validity and reliability of the case study evidence” (p. 97). Once participants were selected and consented to participate, data collection began.

The interviews took place in a group meeting room in the university library, at a time convenient to the participant’s college and work schedule. The interview put the participant’s computer experiences in context and reconstructed activities and thoughts that may be related to the presence or absence of computer anxiety using an Interview Guide revised after the Pilot Study in Summer 2007 (see Appendix I). Initial information for the interviews were taken from Student Profile Questionnaires participants had been completed earlier in Phase I of the selection process. The interviews were completed during
the 6th and 7th week of the Fall 2008 semester. Audio recordings of each interview were made and written notes taken by the researcher. The recordings were transcribed and given to the participants for member checking to improve completeness and accuracy of the interview transcripts. All participants returned the transcripts with confirmation of the accuracy.

In the 8th, 9th, and 10th week of the Fall semester, field observations of participants’ computer use was conducted at an on-campus location chosen by the participant. Three participants chose locations in the university library, and one chose a coffee shop in the student center. See Appendix J for the Field Observation Guide used during the observation. After the observation, the participants answered questions about the observed computer use and any follow up questions necessary to clarify responses from the first interview.

“Simple Daily Reflection” or daily journals were completed by the participants to record whether the computer was used and if so, for what purpose, if assistance was received, and the relationship of the person or persons who assisted participants. Participants described experiences of using computers during the day and any additional comments or observations. The purpose was to have participants reflect on computer use and possible negative or positive experiences. Participants completed the daily journal for four weeks using binders, and returned them on the assigned date. The Simple Daily Reflection prompts are in Appendix K.
Participants returned the Simple Daily Reflections in two parts. Initially participants met with the researcher to return the first seven days of the reflections to check the contents of the reflections and to clarify any issues that might have occurred while completing the reflections. When the interview was completed, and the first seven days of reflections returned, the participants received a $25 card to use at the campus bookstore. When the remaining reflections were returned, and the study completed, the participants received an additional $75 card for the same store. The compensation was approved by telephone by the Office of Research Services and Sponsored Programs.

*Case Study Protocol*

A case study protocol was used to guide and organize the data collection and to improve the reliability of the research (Yin, 2003). The plan contained the interview instrument with corresponding general rules and procedures that were followed throughout the study. See Appendix L for the Case Study Protocol. Data collection followed the procedures in the case study protocol. Data was organized and stored in the case study database. The case study tactics of using multiple sources of evidence and establishing a chain of evidence was used to deal with challenges to construct validity (Yin, 2003). A summary of the data collection for this study is provided in Table 9.
Table 9. Summary of data collection, schedule, and research questions addressed.

<table>
<thead>
<tr>
<th>Data Collected</th>
<th>Schedule</th>
<th>Research Questions Addressed</th>
</tr>
</thead>
</table>
| Explanation of Research and Solicitation of Participants | During class periods 2nd week of semester     | • What sociocultural factors influence computer anxiety?  
• Is there a pattern in the background and experiences between students with high and low computer anxiety? |
| Student Profiles                      | Completed during class periods 2nd week of semester |                                                                                            |
| Computer Anxiety Instruments CARS-C & CTS-C | Completed during class periods 2nd week of semester | • How are typical preservice teachers in a Midwestern metropolitan university with high computer anxiety different from those with low computer anxiety and why?  
• How do preservice teachers with high computer anxiety compare to low computer anxiety preservice teachers on their beliefs, life experiences and background?  
• What sociocultural factors influence computer anxiety?  
• Is there a pattern in the background and experiences between students with high and low anxiety? |
| Semi-Structured Interviews            | Conducted 6th & 7th week of semester  
Transcribed 6th – 9th week of semester  
Sent to Participant upon transcription 7th – 9th week of semester | • How are typical preservice teachers in a Midwestern metropolitan university with high computer anxiety different from those with low computer anxiety and why?  
• How do preservice teachers with high computer anxiety compare to low computer anxiety preservice teachers on their beliefs, life experiences and background?  
• What sociocultural factors influence computer anxiety?  
• Is there a pattern in the background and experiences between students with high and low anxiety? |
| Field Observation and Notes           | Recorded during and after field visits and observations 8th – 10th week of semester | • How are typical preservice teachers in a Midwestern metropolitan university with high computer anxiety different from those with low computer anxiety and why?  
• Is there a pattern in the background and experiences between students with high and low anxiety?  
• What sociocultural factors influence computer anxiety? |
| Daily Journals                        | Recorded by students during the case study, 6th -7th week through 10th – 11th week of semester | • Is there a pattern in the background and experiences between students with high and low anxiety?  
• What sociocultural factors influence computer anxiety? |
While the research design is primarily one of an exploratory case study, all participating students completed two instruments to measure levels of computer anxiety. Therefore, it is necessary to address the reliability and validity of these measurement instruments, as well as the validity of the case study research design.

**Computer Anxiety Measurement Instruments**

Computer anxiety was measured using two instruments, the Computer Anxiety Rating Scale Form C (CARS-C), and the Computer Thoughts Survey Form C (CTS-C). CARS-C is a 20-item scale in a 5-point Likert format. Respondents are asked to express how they feel “at this point in time”: “1 = Not at All”, 2 = “A Little”, 3 = “A Fair Amount”, 4 = “Much” and 5 = “Very Much”.

Questions address issues concerning anxiety related to the use of computers, the role of computers in society, trouble with computers and other technologies, and computer programming. Rosen and Weil (Rosen & Weil, 1995a; 2000) report alpha coefficients among multiple studies were in the range of .90 to .95. Analysis showed three factors named by Rosen and Weil as (1) Interactive Computer Learning Anxiety with 11 items, (2) Computer Technology Anxiety with four items, and (3) Observational Computer Learning Anxiety with five items. Higher scores indicate higher levels of computer anxiety. Table 10 describes the factors, and associated questions within the Computer Anxiety Rating Scale (Form C).
While the research design is primarily one of an exploratory case study, all participating students completed two instruments to measure levels of computer anxiety. Therefore, it is necessary to address the reliability and validity of these measurement instruments, as well as the validity of the case study research design.

Table 10. Factors within the Computer Anxiety Rating Scale (Form C) and questions associated each factor.

<table>
<thead>
<tr>
<th>Factor Title</th>
<th>Description</th>
<th>Question on CARS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1: Interactive Computer Learning Anxiety</td>
<td>Includes items that are related to learning about computers and how to use computers, recovering from mistakes and computer errors, applying for a job that requires computer skills, and purchasing of computers.</td>
<td>11. Learning to write computer programs 16. Learning computer terminology 20. Learning how a computer works 17. Reading a computer manual 1. Thinking about taking computer course 14. Taking a class in use of computers 7. Getting error messages from computer 13. Erasing or deleting from computer file 3. Applying for job requiring computer training 12. Thinking about buying personal computer 10. Unable to receive information – computer down</td>
</tr>
<tr>
<td>Factor 2: Consumer Technology Anxiety</td>
<td>Includes items that are about common household technology tasks and the technology related activities of taking a test with a computer scoring sheet and watching others work on a P.C.</td>
<td>15. Resetting digital clock after power off 19. Programming a microwave oven 2. Taking test with computer scoring sheet 18. Watching someone work on personal computer</td>
</tr>
<tr>
<td>Factor 3: Observational Computer Learning Anxiety</td>
<td>Includes passive or observational items. The individual is asked to consider situations where they observe computer hardware, computer output, consequences of computer technology, others working with computers, or use a common consumer application of technology while being observed.</td>
<td>6. Looking a computer printout 5. Watching movie about intelligent computer 9. Visiting a computer center 4. Sitting in front of a home computer 8. Using the automated bank teller machine</td>
</tr>
</tbody>
</table>

The Computer Thoughts Survey Form C (CTS-C) is a 20-item scale in a Likert format with 11 questions phrased negatively and 9 items phrased positively. Respondents indicate how often they have one of the listed thoughts.
when using or thinking about using a computer: “1 = Not at All”, 2 = “A Little,” 3 = “A Fair Amount,” 4 = “Often” and 5 = “Very Often.” These are reversed for negatively phrased questions. Higher scores indicate more positive computer thoughts. Questions address issues related to computer use, confidence when using the computer, and computer playfulness. Rosen and Weil (2000) reported reliabilities ranging from .81 to .93. Factor analysis by Rosen and Weil (2000) indicated three emergent subscales named (1) Negative Computer Cognitions with 11 items, (2) Positive Computer Learning Cognitions with five items, and (3) Computer Enjoyment with four items. Higher CTS-C scores indicate more positive thoughts and feelings toward computers and technology (2000). Lower levels are indications of computer anxiety. Table 11 describes the factors and associated questions within the Computer Thoughts Survey (Form C).

Interpretation of the CARS-C and CTS-C scores followed the guidelines as specified by Rosen and Weil (2000, p. 33). The results of the two instruments give a more complete measurement of a respondent’s level of computer anxiety. See Appendix C for a copy of an email requesting permission to reproduce the instrument in the dissertation, and the response. Permission was granted to reproduce examination copies of the instruments in the dissertation. The measures and manual were ordered by email and send by Dr. Rosen via email for reproduction in this research.
Table 11. Factors within the Computer Thoughts Survey (Form C) and questions associated each factor.

<table>
<thead>
<tr>
<th>Factor Title</th>
<th>Description</th>
<th>Question on CTS-C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Factor 1: Negative Computer Cognitions</td>
<td>Expresses negative thoughts about computer operation and use.</td>
<td>3. Everyone else knows what they’re doing&lt;br&gt;7. People will notice if I make a mistake.&lt;br&gt;9. I am totally confused&lt;br&gt;6. I feel stupid&lt;br&gt;20. Not able to get computer to do what I want&lt;br&gt;15. What if I hit the wrong button?&lt;br&gt;13. I’m afraid I’ll wreck the program&lt;br&gt;19. I feel overwhelmed by how much not know&lt;br&gt;1. I am going to make a mistake&lt;br&gt;12. I hate this machine&lt;br&gt;17. I’m too embarrassed to ask for help</td>
</tr>
<tr>
<td>Factor 2: Positive Computer Learning Cognitions</td>
<td>Reflects positive thoughts primarily about learning to use computer.</td>
<td>11. I am willing to give it a try&lt;br&gt;14. I can get help if I get stuck&lt;br&gt;18. Others have learned this and so can I&lt;br&gt;10. I know I can do it&lt;br&gt;8. This will shorten my work</td>
</tr>
<tr>
<td>Factor 3: Computer Enjoyment</td>
<td>Reflects feelings of enjoyment and fun while using the computer.</td>
<td>2. This will be fun&lt;br&gt;4. I enjoy learning about this&lt;br&gt;5. I like playing on the computer&lt;br&gt;16. This is really interesting</td>
</tr>
</tbody>
</table>

Case Study

Qualitative research designers need to test and demonstrate that their studies have trustworthiness, credibility, confirmability, and data dependability (Golafshani, 2003; Lincoln & Guba, 1985; Yin, 2003). Yin (2003) uses positivist-based criteria to judge the quality of case design by specifying three types of validity criteria and one reliability criterion: construct validity, internal validity, and external validity; and reliability. This approach was used for research design.
Construct Validity

Construct validity is defined as, “establishing correct operational measures for the concepts being studied” (Yin, 2003, p. 34). It is up to the case researcher to develop adequately operational set of measures while also using objective judgment in the collection of data. To increase construct validity and counteract threats to construct validity, Yin (2003) proposes three tactics within a case study. First, use multiple sources of evidence encouraging convergent lines of inquiry during data collection to facilitate triangulation. Second, establish a chain of evidence during data collection. Third, during the composition stage, the draft case study report is reviewed by key informants (Yin, 2003).

Multiple sources of evidence was used to support the validity of the case through triangulation (Denzin, 1984). First, descriptive information obtained through the Student Profile Questionnaire provided insight into the participant’s demographic and socioeconomic background, computer experiences, and level of perceived computer knowledge. The Computer Anxiety Rating Scale - Form C and the Computer Thoughts Survey - Form C measured the presence of computer anxiety. Focused interviews with selected participants provided insight into the life histories and experiences that may have shaped the sociocultural influences on computer anxiety. Direct observations of the participants using computers and journal entries written by the participants corroborated questionnaire and interview findings. With these sources, participants provided information about their life experiences and background in
relation to computer use as well as sociocultural factors related to computer use. Field notes recorded while observing the student using a computer at designated location was analyzed and used as an additional source of evidence. Using different sources of evidence and converging lines of inquiry improved the validity of the case study through data triangulation (Denzin, 1984; Mathison, 1988; Patton, 2002; Yin, 2003). Figure 5 illustrates the sources of data and how they support the construct validity.

As recommended by Yin (2003), a case study database was created to organize and document the data collected for the case studies. Following the procedures stated in the case study protocol, the case study database includes the written notes taken during the interview and direct observations, audio tapes and digital pictures, tabular materials, including results from the Student Profile Questionnaire, the CARS-C, and the CTS-C, and transcribed records of the taped interviews. A chain of evidence was established and maintained to increase the reliability of the information in the case study and to provide clear and meaningful connections between the research questions, the data, and the case study findings. This permits external researchers to reconstruct the study (Yin, 2003). Data collection procedures followed the case study protocol.

Original forms, including the Student Profile Questionnaire, instruments (CARS-C and CTS-C), interview and observation notes, transcriptions, and participant journals, were labeled with participant code, time, and day of origin, and location.
Figure 5. Data sources and triangulation to support construct validity.

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The last step to increase construct validity was to have key participants review interview transcripts and notes after interviews and observations to check for accuracy and give feedback (Yin, 2003). Participants were given an opportunity to clarify facts, make corrections, and provide additional insight by reviewing the transcribed drafts of the interviews.

**Internal Validity**

Internal validity is, “how the findings match reality” (Merriam, 2001a, p. 201). Internal validity is only a concern for causal or explanatory studies and not used in descriptive and exploratory case studies. Therefore, according to Yin (2003), as an exploratory case study, this study does not need to deal with threats to internal validity. However, Merriam (2001a) points out that it is still necessary to assess the interpretive validity of the researcher observations and that what is being observed are people’s “constructions of reality – how they understand the world” (p. 203).

Merriam (2001a) identifies six basic strategies to improve internal validity of qualitative research: triangulation using multiple investigators, multiple sources, or multiple methods to confirm emerging findings; member checks of data and interpretations throughout the study; gathering data over a period of time using repeated observations or long-term observations; peer examination of findings as they emerge; involvement of participants throughout the research process, and a discussion of the researcher’s assumptions, worldview, and theoretical orientation at the start of the study.
This study investigated preservice teachers with and without computer anxiety and explored the potential differences of sociocultural factors between students within each category. The contemporary phenomenon studied within its real-life context are the social and cultural patterns of beliefs, values, performance, and social context in which they display and express computer anxiety. Patterns and themes between and among each category of student were investigated using the strategies of triangulation, member checks, gathering data over time, peer examination of findings, and discussion of researcher bias.

External Validity

Case studies have external validity, “to the degree to which their results can be generalized to other individuals, settings, and times” (Gall et al., 2005, p. 254). In contrast to survey research, which relies on statistical generalization, external generalization is often not needed in case study design and may, in some circumstances, be detrimental to the case research (Maxwell, 1996). Case study research may use analytical generalization, where a particular set of results is generalized into the development of a theory that can be extended to other cases (Maxwell, 1996; Yin, 2003). Additional strategies can be used to enhance the external generalizability of a qualitative study. The strategy of rich, thick descriptions increases the ability of other researchers to recognize matching situations and possibly transfer findings. The typicality or modal category strategy, where the researcher describes in the case how typical the program, event, or individual is compared with others in the same category, helps readers
understand how the case compares with their own research problem. The strategy of multisite design, where the researcher uses multiple sites, cases, and situations, lets the reader apply the results to a wider range of other situations (Merriam, 2001a). This study addresses external validity by collecting rich, thick descriptions from multiple cases, from multiple sources, on multiple visits, in multiple situations. Data was collected from participants using questionnaires, scales, interviews, observations at field visits, and journals, as well as member checking. As explained earlier, data was collected through The Student Profile Questionnaire, Computer Anxiety Rating Score (Form-C) & Computer Thoughts Scale (Form-C), interviews, Field Observations, and Participant Journals.

Reliability

In case study research, reliability is defined as “the extent to which other researchers would arrive at similar results if they studied the same case using exactly the same procedures, as the first researchers” (Gall et al., 2003, p. 635). Yin (2003) stated that rather than replication, reliability within a case study is the ability to conduct a case study using the same procedures. Therefore it is essential that the researcher have complete and accurate documentation for the procedures used throughout the case research process. The case study protocol and the case study database provide the procedures and documentation necessary to support reliability. The case study protocol is in Appendix L while the case study database is discussed earlier in this chapter. The case study protocol and case study database increases accuracy and decreases bias. These
techniques give transparency to the research process that would guide later researchers to duplicate the process (Yin, 2003). These techniques were used in this study to meet the reliability requirements of a qualitative study. As an exploratory study whose focus is on the pattern of differences between the students with computer anxiety, and those without computer anxiety, criteria were chosen that permitted a greater focus on the sociocultural differences between individuals with and without computer anxiety.

**Ethical Issues**

This study has been designed to meet high ethical standards and safeguard the privacy of all participants. Merriam (2001a) states that ethical problems are most likely to occur during the collection of data and in the publication of findings and provides or suggests steps can be taken to avoid ethical pitfalls. Of fundamental importance to the ethics of data collection and dissemination of results is the relationship between the researcher and the participant. For this study, all appropriate steps were be taken to protect participants and meet ethical standards. The primary researcher is not associated in any way with the course in which the students are enrolled. The course instructor had no information on participants at any stage of the study. During interviews, the researcher was sensitive to issues related to privacy and unintended reactions. Field observations were scheduled at mutually agreed locations and times on campus. Entries in journals recorded by participants were disassociated from individual identification, and participants informed about
their use before creating entries. For publication or other forms of dissemination, participants are identified by pseudonyms and all personally identifying information disguised to guard privacy. Table 12 provides an outline of the research questions, themes from the literature review, and the data collection methods for the questions.
Table 12. Research questions aligned with conceptual themes and literature.

<table>
<thead>
<tr>
<th>Main Research Question</th>
<th>Citation in Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>How are typical preservice teachers in a Midwestern metropolitan university with computer anxiety socioculturally different from those with no computer anxiety and why?</td>
<td>(Ayersman, 1996; Barbeite &amp; Weiss, 2004; Bozionelos, 2001; Brosnan, 1998a; Carey et al., 2002; Chua et al., 1999; Compeau &amp; Higgins, 1995; Desai, 2001; Desai &amp; Richards, 1998; Gabriel &amp; MacDonald, 1996; Gaudron &amp; Vignoli, 2002; Gerard et al., 1996; Hakkinen, 1994; Heinssen et al., 1987; Jouvent et al., 1999; Kleyn-Kennedy, 2006; Kahrman, 2003; Lazarus, 1991; Mahar et al., 1997; McInerney, 1997; Milbrath &amp; Kinzie, 2000; Persichitte et al., 2003; Rosen et al., 1987; Rosen &amp; Weil, 1995b; Rovai &amp; Childress, 2002; Schwarzer, 1997; Selwyn, 1997b; Smith &amp; Caputi, 2001; Todman &amp; Day, 2006; Todman &amp; Drysdale, 2004; Wilson, 1999; Wood et al., 2002)</td>
</tr>
</tbody>
</table>

Data Collection

- **Computer anxiety measurement**: CRTS-C & CARS-C

**Interview: Computer Use Context**

1. Have you always been anxious/comfortable about using computers?
2. Describe the most enjoyable and the most stressful parts about using a computer?
3. Tell me how you learn to use a new program, or solve a problem you may have on the computer.
4. When you have questions about using the computers, who do you ask? Describe how that person helps you.
5. When you have a question about using the computer, do you usually ask a friend who is a female or male?

**Field Observations**

- What behaviors does the participant exhibit when using the computer?

**Research Sub-Question A:**

How do preservice teachers with computer anxiety compare to preservice teachers with no computer anxiety in life experiences and background in relation to computer use?

<table>
<thead>
<tr>
<th>Conceptual Themes</th>
<th>Citations in Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sociocultural theory</td>
<td>(Attewell &amp; Battle, 1999; Becker, 2000; Child Trends DataBank, 2004; Cooper, 2006; Dickerson, 1983; Facer et al., 2003; Habib, 2000; Kent &amp; Facer, 2004; Kerawalla &amp; Crook, 2002; Kiesler &amp; Sproull, 1987; Knezek &amp; Christensen, 2002; Lave &amp; Wenger, 1991; Martin, 1991; Selwyn, 1997a, 2004a; Simpkins et al., 2005; Sølvberg, 2002; Venkatesh &amp; Brown, 2001; Weil et al., 1990)</td>
</tr>
<tr>
<td>Social environment of computing</td>
<td>(Andersson &amp; Andersson, 2005; Cole, 1996; Kafai et al., 2002; Livingstone, 2001; Marsick &amp; Watkins, 2001; Pringle et al., 2002; Selwyn, 2005; Selwyn et al., 2006; Stevenson, 2004)</td>
</tr>
<tr>
<td>Informal learning</td>
<td>(Aberton, 2005; Alfred, 2002; Bonk &amp; Kim, 1998; Jarvis, 1992; Knowles et al., 2005; Merriam, 2001a; Selwyn et al., 2006)</td>
</tr>
</tbody>
</table>
Table 12. Research questions aligned with conceptual themes and literature (continued).

<table>
<thead>
<tr>
<th>Data Collection</th>
<th>Journal Prompts</th>
<th>Field Observations</th>
</tr>
</thead>
</table>
| **Student Profile Questionnaire** | **Interview: Computer History & Experiences**  
1. Tell me about your computer experiences in the past?  
a. Tell me how you learned how to use a computer?  
b. When you had problems or questions, were there people you could ask or talk to?  
2. Tell me about other people in your life (family or friends) that used computers. Who where they and what did they do on the computer?  
3. Did you have a computer in your home when you were growing up?  
a. Describe where it was located, rules (if any) for using it, was it shared and who with?  
b. What were the hardware, software, and internet connection like?  
c. What was it used for?  
4. Where there other people in your family that used the computer?  
5. Did your mom or dad use computers? If so, what for?  
6. Who were the computer “experts” in your house?  
7. Tell me about computers at your schools.  
8. What do you think has influenced your feelings about using computers today? | 1. Describe how you used the computer today.  
2. Did you get assistance from someone?  
3. If you received assistance, what was their relation to you?  
4. Describe your experiences with using computers today. | • Where is the computer located?  
• Is the computer in a public or shared place? |

**Research Sub-Question B:** What is the pattern in the background and experiences of computer use between students with and without computer anxiety?

<table>
<thead>
<tr>
<th>Conceptual Themes</th>
<th>Citations in Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Socioeconomic</strong></td>
<td>Albion, 2001; Attewell &amp; Battle, 1999; Bozionelos, 2004; Carey et al., 2002; Facer et al., 2003; Kafai et al., 2002; Kerawalla &amp; Crook, 2002; Roe &amp; Broos, 2005; Selwyn, 1997b, 1999, 2005; Selwyn et al., 2006; Sexton et al., 1999; Shashaani, 1994a; Sutherland et al., 2000; Van Braak &amp; Kavadias, 2005; Warschauer et al., 2004; Whaley, 2004; Woodrow, 1994)</td>
</tr>
<tr>
<td><strong>Computer experience</strong></td>
<td>Abbott &amp; Faris, 2000; Beckers et al., 2006; Beckers &amp; Schmidt, 2001, 2003; Bozionelos, 2001; Broos, 2005; Burger &amp; Bliignaut, 2004; Chua et al., 1999; Garland &amp; Noyes, 2004; Glass &amp; Knight, 1988; Gos, 1996; Heinssen et al., 1987; Holt &amp; Crocker, 2000; Howard &amp; Smith, 1986; Loyd et al., 1987; Mcilroy et al., 2001; Mcilroy et al., 2007; Mcnerney et al., 1994; Raub, 1981; Rosen &amp; Maguire, 1990; Rosen et al., 1987; Rosen &amp; Weil, 1995b; Rovai &amp; Childress, 2002; Russell &amp; Bradley, 1996; Selwyn, 1997a; Smith et al., 1999; Todman &amp; Day, 2006; Todman &amp; Drysdale, 2004; Todman &amp; Monaghan, 1994; Weil et al., 1990; Wilson, 1999)</td>
</tr>
<tr>
<td><strong>Social environment of computing</strong></td>
<td>Bonk &amp; Kim, 1998; Colley, 1996; Colley et al., 1994; Cooper, 2006; Habib, 2000; Kerawalla &amp; Crook, 2002; Kiesler &amp; Sproull, 1987; McCann, 2004; Parsons et al., 1982; Rogoff, 1995; Selwyn, 2003, 2005; Selwyn et al., 2006; Shashaani, 1994a; Sutherland et al., 2000; Todman &amp; Day, 2006)</td>
</tr>
</tbody>
</table>
Table 12. Research questions aligned with conceptual themes and literature (continued).

<table>
<thead>
<tr>
<th>Interview Questions: Patterns</th>
<th>Field Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Tell me about your experiences using the computer today.</td>
<td></td>
</tr>
<tr>
<td>2. When you have questions about using the computers, who do you ask? Describe how that person helps you</td>
<td></td>
</tr>
<tr>
<td>3. If you could change anything about your computer skills or abilities, what would it be?</td>
<td></td>
</tr>
<tr>
<td>1. Does the participant ask for assistance, if so, what gender?</td>
<td></td>
</tr>
<tr>
<td>2. Where is the computer located?</td>
<td></td>
</tr>
<tr>
<td>3. Is the computer in a public or shared space?</td>
<td></td>
</tr>
</tbody>
</table>

**Research Sub-Question C:** What sociocultural factors influence computer anxiety among preservice teachers?

<table>
<thead>
<tr>
<th>Conceptual Themes</th>
<th>Citation in Literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sociocultural factors</td>
<td>(Aberton, 2005; Bonk &amp; Cunningham, 1998; Bonk &amp; Kim, 1998; Ertmer, Conklin et al., 2003; Gunter, 2001; Hill &amp; van Aalst, 2001; John-Steiner &amp; Mahn, 1996; Pelton &amp; Pelton, 1996; Rogoff, 1995; Rovai &amp; Childress, 2002; Selwyn, 1997a, 2003; Sun &amp; Zhang, 2006)</td>
</tr>
</tbody>
</table>
CHAPTER V

THE CASES

The participants in the study were selected using purposeful sampling, based upon criterion sampling. Purposeful sampling provided cases with specialized qualifications and experiences that were information rich in relation to the goals of this study. Criterion based sampling was used to select cases that matched a specific list of attributes. The criteria judged best suited for the selection of participants for this study was based on the student demographic profile for baccalaureate students in the College of Education at the Midwestern University (female, 21 to 27 years old), enrollment in one of the four Fall 2007 sections of Educational Psychology, the level of computer anxiety, and willingness to participate in the study. Twenty-four students met these criteria, 15 with no computer anxiety and nine with computer anxiety. After reviewing the written responses for richness of descriptions and potential for interview information, five students from each group were invited by email and phone call to participate in Phase III of the study. Of those five, two from each group (computer anxiety and no computer anxiety) agreed to complete the final phase of case studies. Table 13 and Table 14 contain the descriptive data collected from
the Student Profile Questionnaire for the four cases. Barbara and Elizabeth are the two cases with no computer anxiety, and Susan and Vanessa have computer anxiety.

Table 13. Descriptive data for cases, Part 1.

<table>
<thead>
<tr>
<th></th>
<th>Age</th>
<th>Year</th>
<th>Own Computer?</th>
<th>Number of Years Own a Computer</th>
<th>Years Using a Computer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara</td>
<td>21</td>
<td>Jr.</td>
<td>Yes</td>
<td>9 - 10 yrs</td>
<td>10 or more</td>
</tr>
<tr>
<td>Elizabeth</td>
<td>21</td>
<td>Jr.</td>
<td>Yes</td>
<td>&gt; 10 yrs</td>
<td>10 or more</td>
</tr>
<tr>
<td>Susan</td>
<td>26</td>
<td>Jr.</td>
<td>Yes</td>
<td>&gt; 1 yr</td>
<td>10 or more</td>
</tr>
<tr>
<td>Vanessa</td>
<td>27</td>
<td>Sr.</td>
<td>Yes</td>
<td>4 - 6 yrs</td>
<td>10 or more</td>
</tr>
</tbody>
</table>

Table 14. Descriptive data for cases, Part 2.

<table>
<thead>
<tr>
<th></th>
<th>First Exp. Rating</th>
<th>Support Persons</th>
<th>Family income range</th>
<th>Computer in home during P-12</th>
<th>Rating computer proficiency</th>
<th>Computer knowledge</th>
<th>CARS-C Rating</th>
<th>CTS-C Rating</th>
<th>Computer Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara</td>
<td>4</td>
<td>Father, Brother, Friend, Teacher</td>
<td>$30,001 - $80,000</td>
<td>Yes</td>
<td>High</td>
<td>No CA</td>
<td>No CA</td>
<td>No CA</td>
<td></td>
</tr>
<tr>
<td>Elizabeth</td>
<td>1 (error?)</td>
<td>Mother, Father, Sister</td>
<td>$80,001 - $100,000</td>
<td>Yes</td>
<td>High</td>
<td>No CA</td>
<td>No CA</td>
<td>No CA</td>
<td></td>
</tr>
<tr>
<td>Susan</td>
<td>2</td>
<td>Friend</td>
<td>$30,001 - $80,000</td>
<td>Yes</td>
<td>Average</td>
<td>Moderate/High CA</td>
<td>CA</td>
<td>CA</td>
<td></td>
</tr>
<tr>
<td>Vanessa</td>
<td>3</td>
<td>Friend, Internet chat room people</td>
<td>$10,001 - $30,000</td>
<td>Yes</td>
<td>Average</td>
<td>Moderate/High CA</td>
<td>No CA</td>
<td>CA</td>
<td></td>
</tr>
</tbody>
</table>

Table 13 describes the age of the participant (“Age”), the year in school (“Year” where “Jr.” equals Junior, and “Sr.” equals Senior), whether she owns a computer (“Own Computer?”), the number of years she has owned a computer...
(“Number of Years Own a Computer”), and the number of years she has used a
computer (“Years Using a Computer”). Table 14 describes the following
responses for each participant: First Experience Rating (“First Exp. Rating”
1=Very unpleasant, 2=Somewhat unpleasant, 3=Somewhat pleasant, 4=Pleasant,
5=Enjoyable); Who was asked for help when confused, frustrated, had a question
or the computer stopped working (“Support Persons”); Approximate income
range of family when the participant was growing up (“Family Income Range”);
A computer in the home when the participant was in grades P-12 (“Computer in
home during P-12”); Rating of current level of computer proficiency (“Rating
computer proficiency” Very high (i.e. written some programs/scripts or
courseware, and/or could teach others how to use computers), High (can use
computers without referring to manuals/instructions/other help), Average (can
use applications such as word processing, spreadsheets, and/or basic Web
searches, Fair (can use applications with assistance), Computer Anxiety Rating
Scale – Form C (CARS-C) Ratings (No CA=No Computer Anxiety,
Moderate/High CA=Moderate/High Computer Anxiety), Computer Thoughts
Survey – Form C (CTS-C) Ratings (No CA=No Computer Anxiety,
CA=Computer Anxiety), and Computer Anxiety status (if the score for either the
CARS-C or CTS-C indicates computer anxiety, then the status is “CA,” if neither
indicates computer anxiety, then the status is “NCA”).

The two participants classified as having computer anxiety are identified
with the pseudonyms of Vanessa, and Susan. The two participants classified as

having no computer anxiety are identified with the pseudonyms of Barbara and Elizabeth. In addition to the Student Profile Questionnaires and Computer Anxiety measures that all potential participants completed, the four participants selected for the case study responded to interview questions, wrote responses to a series of daily journal prompts for 28 days, and were observed using the computer. This chapter provides the descriptions of the cases using Student Profile Questionnaires, interview transcripts, field notes of the observations, and daily journal entries.

Computer Anxiety - Case Study One: Vanessa

Vanessa is a 27-year-old Intervention Specialist Early Childhood major. She uses computers to browse the internet, networks with friends, emails family and friends, and uses Word for papers. She rated herself as “Average” in computer skills on the Student Profile Questionnaire. Vanessa reported that she has been using computers for more than 10 years and has owned a computer for 4 to 6 years. She scored Moderate/High Computer Anxiety on the CARS-C, and No Computer Anxiety on the CTS-C. Figure 6 gives a complete set of scores for the Computer Anxiety measurement instruments, an explanation for the factors contained within each measurement and the scoring guidelines for both the CARS-C and CTS-C.
Vanessa: Computer Anxiety Rating Scale (CARS) Form C Scores

<table>
<thead>
<tr>
<th>ID</th>
<th>Interactive Computer Learning Anxiety</th>
<th>Consumer Technology Anxiety</th>
<th>Observational Computer Learning Anxiety</th>
<th>Computer Anxiety Level</th>
<th>CARS-C Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanessa</td>
<td>38</td>
<td>6</td>
<td>8</td>
<td>Moderate/High</td>
<td>51</td>
</tr>
</tbody>
</table>

Factor Descriptions

**Factor 1:** Interactive Computer Learning Anxiety
Includes items that are related to learning about computers and how to use computers, recovering from mistakes and computer errors, applying for a job that requires computer skills, and purchasing of computers.

**Factor 2:** Consumer Technology Anxiety
Includes items that are about common household technology tasks and the technology related activities of taking a test with a computer scoring sheet and watching others work on a P.C.

**Factor 3:** Observational Computer Learning Anxiety
Includes passive or observational items. The individual is asked to consider situations where they observe computer hardware, computer output, consequences of computer technology, others working with computers, or use a common consumer application of technology while being observed.

CARS (Form C) Scoring Guidelines:
- No Computer Anxiety: 20-41
- Low Computer Anxiety: 42-49
- Moderate/High Computer Anxiety: 50-100

Vanessa - Computer Thoughts Survey (CTS) Form C Scores

<table>
<thead>
<tr>
<th>ID</th>
<th>Negative Computer Cognitions</th>
<th>Positive Computer Learning Cognitions</th>
<th>Computer Enjoyment</th>
<th>Computer Anxiety Status</th>
<th>CTS-C Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vanessa</td>
<td>40</td>
<td>17</td>
<td>17</td>
<td>No Computer Anxiety</td>
<td>74</td>
</tr>
</tbody>
</table>

Factor Descriptions

**Factor 1:** Negative Computer Cognitions
Expresses negative thoughts about computer operation and use.

**Factor 2:** Positive Computer Learning Cognitions
Reflects positive thoughts primarily about learning to use computer.

**Factor 3:** Computer Enjoyment
Reflects feelings of enjoyment and fun while using the computer.

CTS (Form C) Scoring Guidelines:
- No Computer Anxiety: 69-100
- Low Computer Anxiety: 61-68
- Moderate/High Computer Anxiety: 20-60

Figure 6. CARS-C and CTS-C scoring guidelines and factor descriptions for Vanessa.

**Vanessa: Interview**

During her interview, Vanessa expressed frustration with her computer abilities and the increased levels of computer applications in college.

Before I came, I took some time off from the university and since I’ve come back now everybody’s big into PowerPoint presentations, and I’ve never had to put one together and I still haven’t to this day, I mean. But I
have helped people that have done it. …. So I think it’s (pause) challenging consistently. (quietly) I don’t think it will ever get easier for me, now, maybe for my daughter, who growing up now, might be easier for her.

Sometimes I want to throw the computer (smile), sometimes, you know, (quietly) sometimes I’ve even cried because I’ve gotten so confused and one time I deleted my whole report because I wasn’t thinking about saving it as I went and I don’t know what I did but next thing (getting quieter) I know the whole thing went and I just wanted to cry.

Vanessa believes that she is behind other students at the university in computer skills, especially the younger students. She explains this lag as an outcome of her lack of time and interest with computers.

Um, I think that just because I learned from friends and not in a formal setting, that I, I lack a lot of the terminology, and skills that a lot of people even my age have. If you start talking about RAM, I’d wouldn’t have a clue, you know. I mean, I do know (short laugh as she speaks) it’s part of a computer, but as far as like, the specifics (pause). Hmm, a lot of my friends were self taught. They spent hours on the computer. I prefer to watch movies, so I didn’t spend as much time as they did, so I don’t know as much which now (pause) has perpetuated the problem, that why I took a class on computer terminology in college, and (speaking more quietly) I still honestly don’t know that much more, but at least it did help me with some things as far as computers and understanding them goes.

She thinks that the lack of family and peer support makes it harder for her to keep up with others.

…as I’ve become older too I’ve grown away from most people that I used to associate myself with for various reasons and I guess that makes it harder now for me, because it’s a lack of a support system to ask if I need help? And since obviously my mother doesn’t know anything very much, you know I can’t really ask her, so sometimes I’ll ask my sister. But then again she’s in Hawaii, and she’s in college herself and, so she’s quite busy too, so (pause) I have a girlfriend that goes to school here too, and we sometimes talk and she can help me, and if we don’t know, we pretty much just guess. Because asking for help sometimes makes you feel stupid
because most people know about computers, especially the younger
generations.

Some of the kids around here look at me like “What? You don’t know
that?” I’m like, like today I guess there’s a website where you can check
out your professors? RateMyProfessor.com? (louder) I’d never heard of it,
because they were talking about it in class, (talking in a conversational
tone) I said, “What are you talking about?” He says, (higher pitch) “Yeah,
you haven’t heard about it?” (lower pitch, as if embarrassed) “Like no”,
you know, because I’m, you know, I live off-campus with my daughter
and I don’t come on campus unless I need to come to school so (quietly)
I’m not in with the “In crowd” (voice trailing off) I guess, I don’t know.

As a learner, Vanessa described relying primarily on peers to teach and
support her use of computers. In her Student Profile Questionnaire, Vanessa
explained how and where she learned to use computers.

I learned to use a computer from a high school classmate at her house. I
also learned from trial and error on my own later at home. In high school I
took a typing class that enabled me to better use the keyboard. In college I
also took a basic computer class. Later on I would even log into a
chatroom and ask people how to perform a certain task on the
computer.

On the same Questionnaire she rated her first experiences as “3.
Somewhat Pleasant,” and when asked to describe that experience she wrote:

I really enjoyed searching the Internet and instant messaging people. We
thought it was a fun game to make up things to tell people. However, the
first time I had to use the computer to write a report I was quite frustrated
because I was unsure how to use the Microsoft program. I had to play
around with it. I even called a few friends for help.

During our interview, Vanessa elaborated learning to use the computer
with her classmate. She was excited as she talked.

Ah, (smiling) I think we thought it was a game, cause her father, I can’t
remember where he worked, he had to been something with technology
and computers since he had the latest pagers, since back then that was the
big thing and he then had a cell phone and they had a computer,
(speaking rapidly) so we would play on it, just talking to random people and we thought it was hilarious. Like in an AOL chat room. Just picking random people you don’t know and we’d make up stuff, like we’d say, you know, boys or something, and we’d just have them going on and we’d tell them **crazy stories.** (smiling) We’d just really use it for fun.

…she showed me how, she’d let me type. She actually didn’t know how to type, but I did so she would like, it would be faster for me and but she knew how to like work the program and stuff so, we played around a lot. Her dad had showed her a lot. It was just fun back then.

[If Vanessa had a question] usually I’d ask her if she didn’t know, we would ask her father. He was usually, usually more than willing to help us out or whatever. Hmm, he’d take us step by step, you know, it’d be like click on this and then click on that (illustrating the mouse action with her hand). He’s help us figure out what it was we were doing wrong. But sometimes, you if nobody would help us, or was around, we’d just kept hittin’ buttons until we got somewhere (laugh) so, I don’t know if we messed anything up but that’s how it kinda was.

While this experience was cited by Vanessa as her initial computer experience, during the interview she was asked if she had used the computer while she was in elementary school. She described learning to use the computer earlier, in 3rd or 4th grade. As she spoke, she appeared to strain to bring back the memory.

We had **big** Apple computers, like I think the first one they had **made,** green and black screen, and I remember doing word problems, like where the little person, that looked like a little Pac-man, like a little **stick** on him, and he would munch the word. I don’t remember what the program was called, but it was like Word Mun, it was like Word Munchers or something, and they would eat the little math word when you got it right or the math problem when you got it right. …I specifically remember doing the math thing because I thought it was fun (laugh) and (smiling) I liked to watch the little guy eat the numbers so… because it was games we were playing, generally, educational games, so everybody had a good time. **We thought it was pretty cool.**
Vanessa described how her teacher provided instruction and support and students helped each other.

She was very nice, she would just, you know, take the mouse, (lower tone) I don’t even know if we had a mouse back then. She would take, you know, take us aside so she could sit down and she would, you know, do whatever it was, and she would show us what she was doing and explain it at the same time, so that we knew. And if we didn’t get it, she would get behind us, back out of the program, and then make us do it in front of her so that we would make sure that we were getting on it correctly or whatever it was correctly.

I would just ask them [the girl sitting next to her], and if they didn’t know, I mean, then I’d go to the person at my right and generally it was another girl. Cause we’d try to sit next to each other that, you know, people that we knew. Then if I still didn’t know I would raise my hand but that would be last thing.

However, school was not a consistent source of computer instruction for Vanessa. Her next experience with computers was while she was in middle school and most of her use of the computer was primarily outside of school with friends and classmates. In the 10th grade, she moved to a different high school.

I moved around a lot and I ended up at 10th grade I came to [Name] High School and [Name] Public Schools and we didn’t use computers. I don’t, I don’t want to say ever, but we never as a class collectively used the computers. So it was always outside.

When Vanessa was in the 8th grade her mother bought a computer for herself and her two daughters to use. Vanessa reported on the Student Profile Questionnaire.

We got a computer when I was in the 8th grade. My mother, sister and myself. These were the only people in my home. We all just used the computer to email family and friends. We also used it for entering chat rooms and research for report.
When asked during the interview, why she thought her mother brought the computer home, she answered.

Umm, if I’m not mistaken, I’m almost positive that the main reason was me and my sister were asking for it, because everybody is getting a computer mom. You know we’ve got to (extra emphasis) keep up with the Jones’ and we explained to her that she could be able to email people and she found that fascinating and interesting, and she liked the idea of being able to keep in contact with some friends of hers that had moved far away (pause) So I think we kind of convinced her to go out and get a computer. And we told her it would be beneficial for our education and that we’d be able to do research so, (softly) we convinced her.

The computer was placed in a breakfast nook, right off the kitchen. Vanessa thought it was a convenient location since it was not in someone’s bedroom, it did not interfere with TV watching in the living room, and the instant message “ding” was easy to hear. Vanessa did not have any restrictions on her computer use. The computer had a dial-up connection through America Online, Yahoo Instant Messenger, and Microsoft Word. Vanessa was not interested in playing computer games but she thought there were a couple of games with a controller, but no educational games.

Vanessa thought her mother wanted her children to achieve better success in life by having access to computer technology. She expressed pride in her mother’s accomplishments and appreciation for her.

I think she wanted us to, because my mom, she understands how the times have changed. Through the generations and that you have to keep up with that in order, (pause) in order to, I don’t know. She knew that she, like my grandmother never finished high school. My mother had finished high school, and went to some college and then she went to nursing school and she was like, almost 40 and got her LPN. And so she wanted us to be higher achievers than even her. Anything she thought would benefit
us, in that way, she would have done. Because she knew that was probably the way that the world was going to go, more towards technology and that we would have to gain those skills in order to be effective in the workforce, when we, you know, (softly) finally made our career choice.

Vanessa describes her mother as someone, who even today, has very limited computer skills.

…my mother, bless her soul, (laugh) she’s not computer literate, she knows very little. She can write an email, and (tapping her finger on the table for emphasis) send it, and that is all she uses it for…(speaking rapidly). She cannot copy and paste anything, even though we’ve wrote it down for her like, (pause) 500 times, still to this day. That’s all she uses the computer for. She doesn’t (small laugh with each word) use it for research really, often, I mean, she knows how to type and like if she wants to buy something online, she knows how to do that, but like as far as (pause) other things, (quietly) she hasn’t a clue. ….She still has a computer, and still just uses it for email and sometimes she orders like Christmas gifts online, but that’s it.

Since her mother did not know how to use computers and computer instruction and use in school was either missing or limited, Vanessa learned how to use computers primarily through friends.

…it’s hard for me too because I like, because my mom doesn’t anything about computers, just like most of my parents, friends’ parents they didn’t know a whole lot unless they were in the business field. So it makes it harder for us because we didn’t have anybody to go to really who could teach us....

One of friends she turned to for help was her former fiancé and his friends. As she described this experience, she expressed admiration for their skills, and warmly remembered the times online with them.

I had (pause) been engaged to a guy who was pretty computer literate, mostly self taught. And a lot of his friends from very, (pause) they called them computer geeks, but they were very into computers and they knew a lot. If he didn’t know when I asked him, he would call one them, or have
them come over and they would ever fix the computer or show us how to do it. He taught me a lot. He taught me how to like delete your cookies, and you know, how to get into chat rooms, they used to sit there for hours and they’d kick people out of chat rooms on Yahoo Chat (laughing) and because they figured out how to do it, and they would use the microphone and talk to people and figured out how to (pause) keep microphone on lock so no one else in the room could get on, it was just your voice. (laughing) Whatever you want to say for like hours. (speaking softly, remembering) I spent a lot of time on the computer. That attributed a lot to the knowledge I have. He was in a specific chat room. I can’t remember the name of it now, on Yahoo, everyday. And we knew a lot of these people in real life, they lived close, so. If I didn’t know something and he wasn’t around, a lot of times I’d just log in and I’d ask one of them. And if they didn’t know, I would go to random chat rooms just, and ask. (quietly) Because sometimes people are really friendly and they’ll tell you. So, that’s how I find out a lot of stuff.

When asked how her former fiancé treated her when he helped her, and how it made her feel, she explained,

I suppose he didn’t make me feel stupid because (laugh) he’d know I wouldn’t like that and (laughing) I’d probably get mad and that would be an argument, all in it’s self. But, he was very helpful and very (pause) calm because I had already told him I didn’t know a lot about computers so he didn’t treat me like I was (pause) an idiot or anything. He just kinda just showed me how to do it. Even if I asked more than once, I mean every once in a while he’s go “Huh [heavy breath], you don’t remember?” or something. And he’d even sometimes even write it down, like it was something I had to do often and I’d kept forgetting. He was pretty good about helping. (softer) In a good way.

Vanessa thought that gender, and perhaps age made a difference when she or someone else asked a question or needed help from her fiancé’s friends or others in the online chat rooms. She matter-of-factly described the advantages and disadvantages of being a female among her fiancé’s friends, and online in the chat rooms.
Sometimes they laughed at me and thought I was kind of (pause) **dumb**, like I didn’t know. But you get away a lot with stuff when you’re female I’ve noticed. Like, even when I ask for help in the chat rooms a lot of, a lot of **males** would help me because they would assume that, *oh you know, that’s the stereotypical dumb woman*, you know (laugh)? And I didn’t care because I just wanted the answer so. It helped out a lot, I did notice that cause, I’ve noticed that some of the times people would ask for help and if they were males, (softer) I think that male testosterone thing. A lot of times they wouldn’t help them. They wouldn’t even answer their questions. They would be **rude to them** when they’d come into a chat room, like, especially that **regular** chat room that the same people were in every day. They (laughing) **were so mean to some people** that generally it was the males. Usually any girl that came in, or female, in general, they were always nice and anytime they **asked anything** they would tell them. (softer) I got away with a lot of that, probably just cause I was a woman. (pause) And **younger** I suppose, (quietly) I don’t know if it mattered but that helped.

Vanessa understands her problems with computers and when asked if she could change anything about her computer skills or abilities, she responded,

I would have to say to know like, the newer programs so that would be able to use them and understand the terminology a little better. Like, the whole. I went to take the computer test again for the education school and I didn’t even, *I never used the a Zip Drive*. *I never had to*, you know, up until this point, and I’m looking at it, and I’m like, *you know*, they make you put it in, and they don’t ever tell you where it goes, so, I mean I did figure it out because of the little symbol on it which makes it easy for **even stupid people** because it matches right up with the other thing, but I mean, I have used it, used a USB port before for my camera but *I’ve never had to do*, you know, I’ve never had to use one of those before. *I still haven’t* to this day had to use one, except for in that test. .... I would have to say that would definitely help me out a lot to know those things, and to how to use like the Microsoft PowerPoint, which I do plan on figuring out on my own, once I get the program. But I wasn’t going to rush out to buy it right now because I just had to buy TK20 so....

While Vanessa is open to using computers in the classroom, she believes that technology should be used carefully.

*I do not necessarily 100 percent agree with it, I still feel that you should teach children how to like hand write a letter for example, rather than*
making a email. ...Even, I’ve heard teachers complain that even the same area that their colleagues will IM them, rather than getting up and walking one door over, to ask them a question, and some teachers really don’t like that cause, you know, it’s, there’s no socialization, and I think it’s scary because a lot of the children I’m noticing spend a lot of times on video games and on the computer and when you watch their social interaction with other people, sometimes it’s scary because they’re very shy and they don’t, (softer) they don’t really know how to talk to people. So I agree with technology but I do think you still have to make children understand that, you know, there is another side that you do need to have. It’s good to communicate with people. Because people get really anti-social when they’re on the computer, a lot with chatting. I knew a couple people that they didn’t come out of their house for like months and months, and that’s kind of scary, and I even got like that for a while, I mean I went out to go to work and things but I would spend all my time on there until finally I was like, forget it, and I just, I turned the computer off, like months.

Vanessa: Field Observation

Vanessa was observed using a computer at a library public desktop computer. During the field observation, Vanessa used an internet portal (Yahoo), MySpace, Microsoft Word, and the university web-based email. These were applications she had mentioned earlier in the interview. She moved between the applications without difficulty, sending emails, creating and editing a document with Word, browsing the Internet and posting items on her MySpace page. While in Word, she edited a document using commands such as Find and Replace, and Spell Checking. She also used numbering, removing it, and then replacing it later in the document. Vanessa continued to revise the document for 25 minutes before she saved it. She also had difficulty with applying paragraph line spacing to the entire document. After approximately 50 minutes, a major problem appeared as she attempted to attach the document to an email using several
different approaches, but was unsuccessful. She was using a technique that she probably knew on her home computer, but would not work on a public computer on the university network. Instead, she would need to rely on a “work-around” that was within her skill set, and she could have done, if she had gotten some help. She continued to struggle with the problem for approximately 10 minutes before stopping and returned to MySpace until she was finished approximately 10 minutes later. After the field observation was finished, this researcher showed her how to send the attachment using the university web-based email system.

Overall Vanessa did not exhibit stress or frustration until she could not send the email attachment. While she had the skills to accomplish the task, she did not understand how to seek a solution. At that time, she exhibited no help-seeking behavior. She did not use online help, ask a peer nearby, nor ask a designated expert at the information desk. She continued for several minutes between programs until she gave up. The Daily Reflection for that day recorded her feelings.

It was very frustrating [sic] not knowing how to email my work. I tried several different ways and was unsuccessful. It made me frustrated and I gave up and did something else. Thanks for the help.

*Vanessa: Journal*

Vanessa completed the student journals ("Simple Daily Reflections"), for a total of 28 days. A summary of her entries is contained in Table 15.
Table 15. Summary of the journal entries completed by Vanessa during the period of 10/4/2008 to 10/31/2008.

<table>
<thead>
<tr>
<th>Software Used</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internet Explorer</td>
<td>24</td>
</tr>
<tr>
<td>American Online email</td>
<td>23</td>
</tr>
<tr>
<td>Web-based university email</td>
<td>20</td>
</tr>
<tr>
<td>WebCT</td>
<td>13</td>
</tr>
<tr>
<td>Microsoft Word</td>
<td>9</td>
</tr>
<tr>
<td>Google Scholar</td>
<td>7</td>
</tr>
<tr>
<td>MySpace</td>
<td>7</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>1</td>
</tr>
<tr>
<td>YouTube</td>
<td>1</td>
</tr>
</tbody>
</table>

**Computer Experiences Reported by Vanessa**

- Felt great – found all information
- Enjoyed today – familiar with Word & Google, wish it was easier to find information
- Fun surfing the web
- Fun surfing the web – good sites, found daughter educational coloring books
- Set up account on KISS fm site
- Fun surfing the web
- Listen to KISS while working
- Good work done, checking email for professor, emailed friends
- No problems – emails
- Frustration sending email
- Fun reading emails
- Filled out sample forms
- Not on very long
- Frustrated with MS Word, not enough space. Deleted files and made enough room
- Good day, no problems, deleted old files
- Easy day, no problems with Word
- Okay – short while
- Easy report to revise, typed notes
- Worked on reports
- Easy day – worked on reports
- Relaxing day looking at websites and sending for information at government websites
- No problems, enjoyed time – wish spell check would fix all errors
- Report work editing – took long time because of spelling errors

**Assistance or Help**

- None – figured out bookmarks on own
- Mrs. Hallum for sending attachment

**Additional Comments**

- None

Her journal entries frequently refer to enjoying her time “surfing the web,” and finding web-based recreational activities for herself and her daughter. She also expressed satisfaction with using Google Scholar, a web-based research
tool, but was frustrated by the overwhelming number of links returned when she would search.

Email was another frequent computer activity. She actively used three email accounts almost every day, America Online, web-based university email, and WebCT and one occasionally, MySpace. MySpace was used seven times during this period, which was lower than expected, given the popularity of the site among students in this demographic group, and her history of online social networking. YouTube, another popular site, was reported as being used once. Microsoft Word was used nine times during this period for reports and assignments. Vanessa was unhappy that Word would not catch her grammar and spelling errors. Microsoft PowerPoint was used only once, to watch a presentation from WebCT.

During her interview, Vanessa explained that although she was expected to use PowerPoint in her presentations, she was unable to have it on her computer because of cost. She was unaware of the campus computer store and the licensing agreement with Microsoft that would allow students to purchase software at the campus computer store at a significant discount. Vanessa recorded two entries for seeking assistance. First, she proudly wrote that she had not needed help because she had figured out bookmarks on her own, and second, this researcher, after the field observation, showed her how to send an email attachment. The small number of entries may indicate she was using
applications that she was comfortable with, or that she did not use help-seeking strategies even when needed.

Computer Anxiety - Case Study Two: Susan

Susan is a 26-year-old junior, majoring in P-12 French. She uses computers to browse the internet, uses MySpace, watches videos, finds and copies media files, shops online, emails, and uses WebCT and Word to complete coursework. She rated herself as “Average” in computer skills on the Student Profile Questionnaire. She reported that she has been using computers for more than 10 years, and has owned a computer for less than 1 year. She recently purchased a new laptop computer. She scored Moderate/High Computer Anxiety on the CARS-C and Low Computer Anxiety on the CTS-C. Figure 7 gives a complete set of scores for the Computer Anxiety measurement instruments, an explanation for the factors contained within each measurement and the scoring guidelines for both the CARS-C and CTS-C.

She has two older sisters. Her parents divorced when she was 10 and she continued to visit her father and stepmother. At the time of the interview, she was single with a 5-month-old son.
## Susan - Computer Anxiety Rating Scale (CARS) Form C Scores

<table>
<thead>
<tr>
<th>ID</th>
<th>Interactive Computer Learning Anxiety</th>
<th>Consumer Technology Anxiety</th>
<th>Observational Computer Learning Anxiety</th>
<th>Computer Anxiety Level</th>
<th>CARS-C Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susan</td>
<td>42</td>
<td>9</td>
<td>6</td>
<td>Moderate/High</td>
<td>57</td>
</tr>
</tbody>
</table>

**Factor Descriptions**

- **Factor 1:** Interactive Computer Learning Anxiety
  - Includes items that are related to learning about computers and how to use computers, recovering from mistakes and computer errors, applying for a job that requires computer skills, and purchasing of computers.

- **Factor 2:** Consumer Technology Anxiety
  - Includes items that are about common household technology tasks and the technology related activities of taking a test with a computer scoring sheet and watching others work on a P.C.

- **Factor 3:** Observational Computer Learning Anxiety
  - Includes passive or observational items. The individual is asked to consider situations where they observe computer hardware, computer output, consequences of computer technology, others working with computers, or use a common consumer application of technology while being observed.

### CARS (Form C) Scoring Guidelines:

- **No Computer Anxiety**: 20-41
- **Low Computer Anxiety**: 42-49
- **Moderate/High Computer Anxiety**: 50-100

## Susan - Computer Thoughts Survey (CTS) Form C Scores

<table>
<thead>
<tr>
<th>ID</th>
<th>Negative Computer Cognitions</th>
<th>Positive Computer Learning Cognitions</th>
<th>Computer Enjoyment</th>
<th>Computer Anxiety Status</th>
<th>CTS-C Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Susan</td>
<td>36</td>
<td>18</td>
<td>14</td>
<td>Low Computer Anxiety</td>
<td>68</td>
</tr>
</tbody>
</table>

**Factor Descriptions**

- **Factor 1:** Negative Computer Cognitions
  - Expresses negative thoughts about computer operation and use.

- **Factor 2:** Positive Computer Learning Cognitions
  - Reflects positive thoughts primarily about learning to use computer.

- **Factor 3:** Computer Enjoyment
  - Reflects feelings of enjoyment and fun while using the computer.

### CTS (Form C) Scoring Guidelines:

- **No Computer Anxiety**: 69-100
- **Low Computer Anxiety**: 61-68
- **Moderate/High Computer Anxiety**: 20-60

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Figure 7. CARS-C and CTS-C scoring guidelines and factor descriptions for Susan.
Susan: Interview

While she uses computers daily, Susan is struggling to keep up with the computer requirements of her education class.

No, cause I haven’t really needed to learn how to use different software until now. So I’m still in the learning process for that. It’s kinda like for creating PowerPoints? I still don’t know how to do that, because I got the directions in class but he didn’t show me how to do it, and I haven’t done it myself yet, so I’m still kinda in limbo about that. Um…same thing with the concept map. I had to download that program. Well I haven’t been able to get that program to work, cause I can’t find it, I don’t know where to look on my computer (laugh), cause it said downloaded, but (laugh) I’ll do the search thing, it won’t come up with anything and I’ll click on recent downloads and it’s not there either, and I’ll say, where the hell is this thing?, and I haven’t gotten around to asking him where I would look about it yet. I haven’t had much experience having to learn new programs cause usually I’ve just gotten by with Microsoft Word, and that’s pretty self explanatory. It has little pictures and stuff and you just click around on stuff, you figure out where stuff is.

When asked to describe her most memorable positive and negative computer experiences on the Student Profile Questionnaire, Susan recalled past and recent events.

I remember one summer writing short stories. That’s one of my best. Also when I discovered the wonders of the Internet in High school on my friends [sic] computer. I was amazed at how fast it went. The most recent good memory is getting my first laptop that enabled me to do work and watch my baby son at the same time easier. My worst experiences were working on slow computers after getting spoiled by fast ones. However, not much beats the terror of “Technology in Education” class when the teacher’s speaking in techno-babble and you have no idea what he’s talking about. Then you get behind everyone else and feel like an idiot.

Susan completed the Fundamental Educational Computing Skills course to fulfill her Basic Computer Literacy requirement for the College of Education and she is currently enrolled in the College of Education core course, Educational
Technology. She is having a hard time keeping up with the class and finds it very stressful.

…I’m taking a Technology and Education course right now, and that *scares the crap out of me*, I’ve already skipped it twice, (laugh) (pause). …But anyway, it’s very (long pause) irritating to go to a formal class setting and have to be told certain ways to do things because sometimes I know how to do something and cause I figured out how to do it by myself,… so I like to do it my own way, because I’m comfortable with that and… but then they make me do it *this* way, and I get points docked if I don’t do it that way because that’s the way the teacher’s teaching you…. I very much like just taking my time, doing it on my own, by myself, trial and error, just exploring, cause I think with technology I learn best that way, just by exploring, by you know, playing around with it,… Because if it is a less formal setting than a classroom, I’m more relaxed and I think that is very helpful to me cause I’ll still [inaudible] in better, and it will be more like, Oh something fun and new to *play with!* But if it’s the formal setting it will be incredibly intimidating and scary because it will be more along the lines of okay, *I have* to get this, the way that they’re telling me because that’s where I’m going to get points and if I don’t get this, then the next thing they talk about I’m not going to get because it’s probably going to be based on the first thing. So it’s just (pause) it depends *a lot* on the setting. It’s like it could be great or it could be *hell* (laugh).

Susan feels that she learns better in an informal atmosphere where she can learn at her own pace.

…if it is a less formal setting than a classroom, I’m more relaxed and I think that is very helpful to me cause I’ll still (fit) in better, and it will be more like, Oh something fun and new to *play with!* But if it’s the formal setting it will be incredibly intimidating and scary because it will be more along the lines of okay, *I have* to get this, the way that they’re telling me because that’s where I’m going to get points and if I don’t get this, then the next thing they talk about I’m not going to get because it’s probably going to be based on the first thing. So it’s just…it depends *a lot* on the setting. It’s like it could be great or it could be *hell* (laugh).

Susan sees herself as part of a unique age group that had to adjust from having no computers at all to a computer-filled world.
I kinda was born before the computer boom and got to live through all these different eras of...sparse computers, little more abundant computers, now computers are everywhere, and you have to deal with it, so I’m kind of, it’s an interesting generation to be in, I would have to say, cause you have two different perspectives. You have the, what the hell is that machine, and then you have the, oh that’s a daa der daa der daa der daa, and this is what I use it for, and daa der daa, and it’s so necessary, and God, I can’t live without it but I’m remembering when I was a kid...(softer and slower) never even heard of a computer.

On the Student Profile Questionnaire, rated her first experience on the computer at “2. Somewhat Pleasant,” and provided the following description:

My first experiences where when I was in the 6th grade. I had no one to show me how to do the things I wanted to and it was when the Internet was still rather new. Using Office and Word tools were the most difficult while learning how to use the Internet was easier.

When on the same form she was asked to explain how and where she learned to use computers, she wrote,

first started using computers in middle school to write stories. Used it in High school for papers. It wasn’t until College that I really used it for research. I learned to use it very gradually and the best way I learned it was on my own and through experimentation.

During her interview, Susan recalled her first opportunity to use a computer when she was in the 1st or 2nd grade. Her father brought home a computer to use for his work. He was a teacher at the university and needed it to write assignments and keep track of grades.

…it was his thing, toy, and I kinda saw it that way, so I idolized my dad, so of course I wanted to play with his stuff, so that’s what kinda drew me to it, at first I would just, you know, I didn’t know how to turn it on, so I just typed the keyboard and looked at the screen and just imagined.

She described her dad and mom and their attitudes toward the computer.
He was more new gadget, new technology-type person. As compared to mom, who’s a little more traditional. …I think dad would have conceptualized more use out of it by us kids than mom would have because mom’s the type of person where she would have looked at it and thought, okay, I can use that for household, grown-up things, and dad…dad liked this toys. So he’s going to be playing with it, so therefore the kids are probably play with it. So (pause) I’m sure he had more of an idea of the entire family using it when he got it than mom had. I think mom was a little more reserved and dad was a little more ready to play with the machine.

The computer was located in an entrance room that normally would have been used for coats and shoes. Susan thought it was in a convenient place, with just enough room for one person. Family members shared the computer, using a priority system based on age and authority.

I think it’s probably the easiest room, for it to have been in…, I mean it was the perfect size for it, it was actually about this size room, I’d say…hmm…8 feet by…about 8 by 8, it would be about the perfect size room for a computer to be used by one person at one time. …I guess where they placed it was, it kinda reflected how it was meant to be used by one person at one time. It was just the perfect spot for it. ….Certain people took precedence, like I knew the rank, the ranking in the family. I was last cause I was the youngest. Dad wanted to use the computer, he’s the one that uses it and nobody else can, (pause), except for mom, of course. If mom wanted to use it then, the kids couldn’t. Everybody could kick me off the computer. Yeah, that’s kinda how it went, by age, there dad, mom, (pause), Kate, then me. Yeah, it was very unspoken, but obvious. It’s like mom would not have said, your sister gets to use it first because she’s older than you. She would never say that, dad would never say that, but me knowing (laugh)my sisters and how they go, and just the general rule of childhood, the older siblings get it first, and then if I get lucky I’ll have time to….dad or if I whined at mom long enough, (laugh)she’ll say, (higher pitch) Kate get off the computer, you’ve been on there long enough.
As Susan watched her mother and two older sisters use the computer to type assignments, she got more curious about using the computer. That motivated her to use it for a variety of applications.

So I would play around with it, there was an art drawing type program that I would use to make these stupid little angular drawings cause you know you used a (pause)I forget, there wasn’t a mouse back then (pause) somehow with the keys, I don’t remember, but um, I would make these stupid little pictures and print them out and give them away to everybody, and then I discovered how to use the word program or typing stories or whatever and we had a printer, actually, and it was dot matrix, and (softer) I think it would have been around 5th or 6th grade, it might be the summer in-between, I just spent just typing (pause) and typing, and typing, and typing. And I think I did that for a couple of summers? But I was (pause), God, I gotten (pause) a hundred or so pages of what I deemed would be my novel, which was never completed, I was so proud of myself, single-spaced and everything… I really didn’t use computers very seriously until high school, but I would do little, tiny little writing projects on the computer. I just kinda fiddled around with it.

When Susan was asked where and who she found help from when she had questions about using the computer, she responded,

I didn’t really go to either of them [her parents], I just kinda tried to figure it out on my own. You fiddle around with it until you figure out, okay, if I do it this way then I’ll get this and ….I need to keep that that way, so I need to do this instead, and oops, I messed it up, I have to go back again. Yeah, just trial and error.

Susan had two older sisters that she watched use the computer for papers but did not work or play with them.

So I just.., it was just present, to me, and I didn’t really, I don’t recall actually learning anything from watching them, it’s just (pause) I was aware and that gave me the gumption to try it out and do it. … I kinda figured, why bother if I can’t figure it out my (laugh)self?

When asked why she didn’t ask her sisters how to make the computer work, she responded,
(Speaking quickly) I don’t know, (pause) wasn’t (pause) didn’t seem that important enough to put that kind of effort into it, and I kinda figured, why bother if I can’t figure it out my (laugh) myself? And I wasn’t entire sure I was suppose to be messing with it anyway.

Later in the interview, when asked if she asked anyone about how a floppy drive worked before tearing it apart, Susan stated,

“’Nope, I was a very solitary child.”

However, she did specify that she would go to her mother if she needed help with the computer due to a hardware problem because

“I was closer…to mom; she seemed less intimidating than dad did.”

While she was in grade school and middle school, Susan did not use computers with her friends.

I don’t recall any of my friends ever using the computer. I didn’t have very many friends that I actually hung out with, outside of school (pause) and (pause) I remember one had games for the computer, but I (softer) never messed with that and we never messed with that when I was hanging out with her. That friend that I was close to growing up, next store, I don’t think they had a computer that he was allowed to touch.

She explained her absence of computer experience with her peers as a matter of when she was born and when computers became commonplace at home and school.

See, when I was growing up, I was born in 1980, so during that time computers weren’t really something that kids used a whole lot from what I recall. It wasn’t until 1990 hit and in high school. *Let’s see that would have been 96 through 99* that computers came really to be evident and really present everywhere and pretty necessary to get by and actually it wasn’t really until high school that I had the formal presence of a computer in the classroom. …kinda like computers were just coming out of it’s niche (pause) half way through me growing up. So it was there but it was kinda heh. (softer) Not sure what that is (pause) I’ve only seen it a couple times, so I’m not going to mess with it cause it’s not familiar. … and I didn’t
hear about it from kids at school and I didn’t hear about it from my
teachers, so it really wasn’t in the forefront.

When Susan was in 10th grade computers appeared at her high school in
the library and computer lab and her English and literature classes required
research and papers done on computers. She took a small seminar in the school
library on using the Internet for research. However, she explained that most of
her teachers did not like computers.

…it was very, very new and most of the teachers that I had had been there
for ten, twenty, thirty years and they had their lesson plans, and they had
their usual requirements for papers and they had, they’re, you know, they
had their set ways. And to have to change everything for this new era of
technology, I imagine would have been very scary and very aggravating
for them. Because it’s just alien, and so new and…I didn’t get a sense of
real acceptance on the teacher’s behalf for this new technology. Most of
the teachers didn’t require you to use internet sources and they, most of
the teachers didn’t ask you to research on the internet, or do whatever.
Most of the teachers wanted typed papers, of course, but I, there were
very few teachers (pause) in fact I can only think of one who seemed
enthusiastic about the internet. …I didn’t see many computers at all in the
classroom, and if they were they might be the personal property of the
teacher, because [name] High is not a rich school, so they’re not going to
put a computer in every classroom, cause they just…they can’t afford it,
and at that point it was still a little new, bringing computers full force into
the classrooms, so it was the beginnings…

During her high school years, Susan explored the Internet at home, at
friends’ houses and at her dad’s house.

Let’s see, growing up, dad left when I was ten, so there was me, Mom, and
my two sisters, so I would contend with my sisters, and then there were
my friends computers, and I could play on there sometimes, when I went
over there, but I didn’t want to be too rude so I wouldn’t spend a whole
lot of time. And then when I would go over to my dad’s, (laugh), I had
free reign over there (laugh), so I’d spend all the time on the computer
that I wanted to. And then when my dad reunited with his first wife, oh,
she had Road Runner, which I had never known anybody with, and it was
fast. So I was just like, mesmerized by the speed of this thing. I just spend all my time on the computer and so, yeah I didn’t have to really contend with anybody unless I was actually at home. ….That was the coolest thing to click on the screen and have it come up immediately or to type something out hit print and it printed it immediately. And it was, the speed was really enthralling. To me, like wow, instant gratification. My God (laugh)!

When pressed for more information about what she did while on the Internet with her friends’ at their houses, she responded,

…just searching around looking at stuff. Like different web sites, um (pause) let’s see, I was really into weird, arcane-type, occultish-looking stuff, which I [inaudible] fascinating. So I’d look up all the sites on that. It’s like, (speaking as if she is talking to herself) Ok, what is this person have to say about this? and all that fun stuff (pause) and then, yeah, it’s just fascinating.

When asked, what else she did with her friends on the computer, or if they helped each other, she responded,

Not really, no. But back then it wasn’t really that interesting…it, it could be something along the lines of look what I found, I found this neat web site, it says, it talks about this, you know, that would pretty much be it. Well, I didn’t have a whole lot of friends, so it really wouldn’t be like that. But I would say my friend Cathy, my best friend; still (pause) she’s still around. Hey I found this about this music group, online, or whatever, and do you have a Hotmail account or whatever, yeah…she’d well (pause) really wasn’t one person that stood out, and it really didn’t happen a whole heck of a lot, but yeah. As usually the one teaching myself how to do something by trial and error. I was usually alone on the computer, just messing around. I really didn’t have somebody instructing me (pause) and I don’t recall getting tips from anybody…. Hmm-hmm, it just kinda did it by myself.

Since leaving high school and starting college, Susan has continued developing her computer skills. She uses Microsoft Word, the Internet, and email.

It wasn’t until (pause) the past couple years that I really started to rely on the internet for things like email and (pause) my God, now I have a MySpace page so I have to upkeep that and that’s how I keep in touch
with most of my friend (laugh). So we constantly go over stuff on the inter
(pause) that’s been going on, on the internet now.

Since purchasing her laptop computer, she has taught herself how to use
the installed software including Microsoft Vista and Media Player. She explained
how she learns a program or solves a problem.

I usually start out with fiddling around with it and clicking on different
things and pressing different buttons to just figure out what does what
and if I do enough of that, if I think that I learn enough from that then I’ll
try and do what I’d set out to do. Then if I encounter problems, I usually
go to one of my friends, and, I choose the friend based on how big of a
computer geek I think they are, and that would require them to
[inaudible]. Have a computer and [inaudible]me think that they know
what they’re doing, cause they mess around with this. That’s usually
(soft) not the case, they know quite deal less than I think that they do,
and…I don’t usually have to go to somebody to figure out how to use a
piece of software. Because I’m usually able to read directions and figure it
out on my own.

And I’ll have more propensity to give up if I’m in the classroom setting
and somebody’s trying to show me how to…well tell me how to do
something on the computer. I’ll usually be pretty okay if somebody
actually comes to me and shows me and works with me through it. And if
I’m, if I’m on my own, I’ll have a lot of patience because there’s nobody
there to stress me out and there’s nobody there to give me a some kind of
time limit, or to indicate that I’m going to get some sort of grade based on
my performance.

If she needs help and given a choice, she’ll ask a male for help or look for
from help from the computer.

I generally equate computer knowledge to guys, and (pause) guys always
seem more technically minded than girls, to me, and (pause) I would most
likely approach a friend first that I’ve known for a couple of years. I
haven’t had much luck with that so I’ve had to move up the ladder. Now
I’m more likely to ask the computer itself cause there’s usually a little help
button and usually when I get direction from that I can work it out.
Despite her own difficulties, Susan believes computers belong in classrooms.

I think that it opens up an incredible range of ability for the students. I think that it teaches them how to ask questions, it’s like if you know how to research you can find whatever you want on the internet and what that boils down to is how to ask the right question. And a student’s is not going to learn what they need to learn unless they can learn to ask the right questions, if they have a problem, they need to know where that problem is. But also, how to find the information they don’t have and part of that involves knowing what you don’t know which can be confusing but I think that that can be helped along by using computers and the internet. So I think that it greatly expands students’ abilities if computers were in the classroom.

_Susan: Field Observation_

Susan was observed while using her personal laptop at a public coffee shop in the student center of the university. During the field observation Susan used WebCT, Facebook, MySpace, and played Solitaire. She operated the hardware, logged on to the wireless network, and moved between applications without difficulty, sending emails, as well as posting and reading items on Facebook and MySpace. Throughout the session she appeared confident but this may be due to the nature of applications she chose to use while being observed. All participants were asked, and then reminded by email, to have course assignments to use while being observed. Except for email, she did not use course-related work. However, the field observation did show her comfortably using hardware and software that she selected. While answering questions after the observation, she expressed concern that she did not know how to use some of the features of her laptop, such as adjusting the brightness of the screen or the
Function keys. While she did not actively seek or need help during this observation, she appears to be somewhat unaware of potential computer features or uses.

Susan: Journal

Susan completed the student journals (“Simply Daily Reflections”) for 27 days. A summary of her entries is contained in Table 16. Internet Explorer was the primary application recorded by Susan in her journals. Other web based application were also significant. MySpace was used for social networking five times, Google was used three times, and eBay and WebCT were both recorded as being used one time. She especially enjoyed searching for and recording music with Media Player, using it four times, as well as computer games such as Mine Sweeper and Solitaire which she used once and PowerPoint, twice. Microsoft Word was used seven times for personal and course-related work, including creating a web site for her Educational Technology course. Susan recorded six instances of using email, which was less than expected since email is a common form of communication among students, instructors, and others. The utilities of Disk Defragmenter (used twice), and Spy Sweeper (used once) are an indication of her interest in maintaining her new laptop. It also shows that she is willing to learn new software when she feels it is necessary. Her comments ranged from self-satisfaction, because she has increased her knowledge of technology since getting a laptop, to frustration, when the computer is slow, or not understanding the teacher when he attempts to explain how to create a web site using Word.

<table>
<thead>
<tr>
<th>Software Used</th>
<th>Frequency</th>
</tr>
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<tbody>
<tr>
<td>Internet Explorer</td>
<td>8</td>
</tr>
<tr>
<td>Microsoft Word</td>
<td>7</td>
</tr>
<tr>
<td>Email</td>
<td>6</td>
</tr>
<tr>
<td>MySpace</td>
<td>5</td>
</tr>
<tr>
<td>Media Player</td>
<td>4</td>
</tr>
<tr>
<td>Google</td>
<td>3</td>
</tr>
<tr>
<td>Disk Defragmenter (Windows Utility)</td>
<td>2</td>
</tr>
<tr>
<td>PowerPoint</td>
<td>2</td>
</tr>
<tr>
<td>eBay</td>
<td>2</td>
</tr>
<tr>
<td>Games</td>
<td>1</td>
</tr>
<tr>
<td>Mozilla Firefox</td>
<td>1</td>
</tr>
<tr>
<td>Spy Sweeper (Virus Utility)</td>
<td>1</td>
</tr>
<tr>
<td>WebCT</td>
<td>1</td>
</tr>
</tbody>
</table>

**Computer Experiences Reported by Susan**

It was aggravating [sic] because I had to defrag it because it was going at a snail pace.
It was irritating. I got kicked off using WiFi and I couldn’t reconnect quickly so I gave up.
I find that email is mostly how I keep in touch with my friends, especially since I had my son.
Remember to “save” often to not get screwed if the machine crashes. I got a bit irritated as how having nails now has effected my typing. It’s worse.
Mr. Jones, Took the class through the steps of setting up a website. I still don’t get it.
Powerpoints easier than I thought. Vista was easier to navigate, though I know many don’t like it.
Experiences were very satisfying, seeing as how I searched all over Chapel Hill Mall and Summit Mall to find that damn zester, only to find it online.
Ever since I’ve gotten this laptop; my improvement with technology has grown at an exponential rate. Play is an incredible learning tool!
I really, really hate high-glare screens.
I actually got to use a Mac in class today. It’s not that bad if I’m just surfing. However, I didn’t like not being able to email images to my classmate when we were working on the webpage for class.
I find that I’m pretty irritated w/ Vista. I have to continually change the type font & site to Times 12. I wonder if there’s any way to reset it.
Didn’t feel much. Upkeep’s pretty boring.
It was fun to just play around and find out what I can do on powerpoint.
It was frustrating at the [name] student center because [wireless network] was only there intermittently. I couldn’t get some of the work done at that time that I wanted to.

**Assistance or Help**

Advised friend her on where she should look on web to find pictures stored on her computer.
Researcher explained how to change the brightness (thanks!) and gave me a general exp. On webpages and word

**Additional Comments**

I like not paying for Internet b/c of Wifi, but it’s rather precarious to have intermittent and unreliable access to the internet.
Why on earth do I procrastinate so badly!? Why did I just work on this bit by bit instead of spending all day on my paper cause its due tomorrow? AARGH!
I was very irritated & confused in class today (T.E.) because everyone else was on a Mac and I was using a PC with Microsoft Vista instead of Windows. I thought the general steps seemed pretty simple, but it was confusing because I had to convert the steps from Windows to Vista so I could do the exercise.
Why do I bother going in to stores anymore?
Notably, Susan wrote that “Powerpoints [sic] are easier than I thought…”, and Macs are “not that bad if I’m just surfing.” Additional comments focused on her frustrations with herself, and challenges she is having in school and at home. Finally, as expected from her interview and Student Profile Questionnaire, Susan does not show frequent requests for assistance or help. She advises a friend on how to find pictures stored on a computer, and then thanks the researcher for showing her how to change the screen brightness and other features.

No Computer Anxiety – Case Study One: Barbara

Barbara is a 21 year old junior majoring in Middle Level Education. She enjoys using computers to browse the Internet, download music using, create presentations, spreadsheets, documents, web pages with FrontPage and html, and is active in social networking with Facebook and MySpace. She rates herself as “High” in computer skills on the Student Profile Questionnaire. She is an active, confident computer user. She scored No Computer Anxiety on the CARS-C and No Computer Anxiety on the CTS-C. Figure 8 gives a complete set of scores for the Computer Anxiety measurement instruments, an explanation for the factors contained within each measurement and the scoring guidelines for both the CARS-C and CTS-C.
<table>
<thead>
<tr>
<th>ID</th>
<th>Interactive Computer Learning Anxiety</th>
<th>Consumer Technology Anxiety</th>
<th>Observational Computer Learning Anxiety</th>
<th>Computer Anxiety Level</th>
<th>CARS-C Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara</td>
<td>15</td>
<td>5</td>
<td>6</td>
<td>No Computer Anxiety</td>
<td>26</td>
</tr>
</tbody>
</table>

**Factor Descriptions**

**Factor 1:** Interactive Computer Learning Anxiety
Includes items that are related to learning about computers and how to use computers, recovering from mistakes and computer errors, applying for a job that requires computer skills, and purchasing of computers.

**Factor 2:** Consumer Technology Anxiety
Includes items that are about common household technology tasks and the technology related activities of taking a test with a computer scoring sheet and watching others work on a P.C.

**Factor 3:** Observational Computer Learning Anxiety
Includes passive or observational items. The individual is asked to consider situations where they observe computer hardware, computer output, consequences of computer technology, others working with computers, or use a common consumer application of technology while being observed.

**CARS (Form C) Scoring Guidelines:**

<table>
<thead>
<tr>
<th></th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Computer Anxiety</td>
<td>20-41</td>
</tr>
<tr>
<td>Low Computer Anxiety</td>
<td>42-49</td>
</tr>
<tr>
<td>Moderate/High Computer Anxiety</td>
<td>50-100</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ID</th>
<th>Negative Computer Cognitions</th>
<th>Positive Computer Learning Cognitions</th>
<th>Computer Enjoyment</th>
<th>Computer Anxiety Status</th>
<th>CTS-C Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara</td>
<td>51</td>
<td>15</td>
<td>16</td>
<td>No Computer Anxiety</td>
<td>82</td>
</tr>
</tbody>
</table>

**Factor Descriptions**

**Factor 1:** Negative Computer Cognitions
Expresses negative thoughts about computer operation and use.

**Factor 2:** Positive Computer Learning Cognitions
Reflects positive thoughts primarily about learning to use computer.

**Factor 3:** Computer Enjoyment
Reflects feelings of enjoyment and fun while using the computer.

**CTS (Form C) Scoring Guidelines:**

<table>
<thead>
<tr>
<th></th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Computer Anxiety</td>
<td>69-100</td>
</tr>
<tr>
<td>Low Computer Anxiety</td>
<td>61-68</td>
</tr>
<tr>
<td>Moderate/High Computer Anxiety</td>
<td>20-60</td>
</tr>
</tbody>
</table>

Figure 8. CARS-C and CTS-C scoring guidelines and factor descriptions for Barbara.
Barbara: Interview

When asked her most enjoyable and most frustrating aspects of using computers, Barbara explained,

I like Facebook, so I’m always on there, that’s what I think is enjoyable (laugh). That’s really enjoyable. It interacts and it brings the students together and you’re friends…. [The most frustrating is] mostly trying to search for things that have to deal with academics, cause I had a report before that I had to um… find a certain journal online and I absolutely couldn’t find it anywhere. …. I was absolutely exhausted. I didn’t care for it. And then the other thing that frustrates me, … when the computer freezes or … when you turn on the computer and … you can’t get on the computer, … another thing would be… would be like when the Internet doesn’t work. Cause there’s basically nothing that you can really do without the Internet. … it absolutely kills me that I can’t get on the internet (laugh). I… I’d say I’m addicted in a way… to it, yeah. I mean, I use it everyday so constantly. Like I have a one hour breaks in between all my classes and I’m always on a computer. … even … when I gather with my friends we’ll be on Facebook and chatting with each other (laugh).

Barbara reported that she has used computers more than 10 years and has owned a computer from nine to 10 years. She is from a two-parent home, with eight children, including Barbara, two older sisters, an older and younger brother, and a younger sister. Barbara rates her initial computer experience as 4 of 5, “Pleasant.” She attributes the rating to her 6th grade teacher who taught her step-by-step to use the computer and made it easy to learn and use. Barbara transferred from a school without computers into one that used computers throughout the school.

… when I transferred to [name of school] and I sat in front of the computer, everybody else knew what to do but me. So the teacher, she came, she was really good, and she came and she taught me what to do and stuff like that. It was through her instructions were basic and then
like, a couple of my friends they would help me along if I had any problems or trouble and stuff like that.

I was new there and I felt like I was left out. She helped me kind of, by introducing me to the computer and stuff like that, I could relate to all my other, other colleagues and classmates. So it made me fit in more.

It’s good that I could like, interact with the students, you know, and connect with them over something.

…it was very social, you know, and I think it made me fit in more, and it helped me from being the new kid, kinda like relate to everybody else.

While in 6th grade she used computers in her math class and for games such as Oregon Trail. The computer became Barbara’s entry into the social environment of the classroom. The students learned through the interaction with each other and the computer.

…it was very social, you know, and I think it made me fit in more, and it helped me from being the new kid, kinda like relate to everybody else.

…the teacher shows you how to do stuff, how to get starting a program and stuff like that, but they’re not there with you all the time, so if you have questions you ask your peers and your friends. So I think mostly it’s your friends but in some way the teacher gets you started. That the difference.

Barbara noted how the adults and students in the school emphasized the importance of computers.

…we had a computer lab that we would be able to go to whenever we want, but we had to have a teacher’s permission. And they would lock the room so none of the computers could get damaged. …they did value it a
lot and every teacher had a computer... in her class. So she had access to it all the time and sometimes... we would use the computer for our class, like maybe couple times a week. So like research and we also had many projects that we had to do online, you know, on the computer we had no other ways of doing them.... my librarian; she taught like different classes on how to use the computer. She would always show us different sites and like when we’re having trouble on our homework that we could just go on and they could help us out or to do different projects.... when you would never find a student at that school that didn’t know how to use a computer.

While at school, Barbara would ask more capable peers for help.

...I remember back in like 7th grade when we were on the computers and we’re doing a report, my one friend, she knew everything on the internet, like she knew how to do absolutely everything, so I’d look for her for advice.

While Barbara was in the 6th grade, her parents purchased a home computer. Neither her father nor mother used the computer; Barbara thought it was primarily for the older children who were in college but it was available to all the children of the family.

I think basically for us, for the kids, to interact with, and it was something like everybody was doing it so, you know, why not us? ...not for me or my brother that were in middle school but for my older siblings, cause they were in college... so my dad was like, it’s time to get a computer....

At home, Barbara shared the computer with her siblings. At times, it was challenging.

It was tough.... So we would always be fighting on the computer, “It’s my turn you know!,” and kick each other off.... we would just fight.... sometimes when I would want to use the phone to call my friend, I’d have to kick him off and he would get mad and we’d get into a fight, but we solved it eventually. Or if like we have a report or we need, for school work too, that would base it too, and it depends on the day before, if you had it the longest and then it’s my turn and if you were in trouble you were not allowed to use it so... based on different things.
However, her siblings were also her primary source of computer support and they provided role models for each other.

They [older brothers and sisters] were more experienced with it and anytime I have a problem I just go to my older brothers and sisters so since I’m in the middle, you know, my younger sisters, they look up to me and I look up to my older brothers and sisters.

When asked if she contacted other friends for support or get help, she responded,

No, it was mostly my brothers and sisters, like even when my friends were there, like as, we were kinda on the same line as computers, you know, so I didn’t really, I don’t know, we just really went to my older brothers and sisters (laugh).

While in the 8th grade she took a computer class which by then she felt was almost a waste of time.

We took a class actually in I think it was 8th grade, as when they really introduced us to computers and going on the internet and stuff like that. …I knew mostly everything, how to get everything since, by 8th grade cause, …I have a computer at home, and my brother is like a computer whiz, so he would help me out, but umm, …when I got there it helped me out in a way cause there some things I didn’t know, so it helped emphasis on them, like really find out what to do but then again it kinda was like wasting time since we already knew it on our own you know.

Later, in high school, Barbara decided to take a class on creating web pages. She found it to be both exciting and rewarding to have recognition for her computer expertise while helping others.

…it was between that and yearbook and I didn’t really know if I wanted to be on yearbook, kind of basically because of my friends. They were a big influences and I didn’t know for sure if I wanted to on that because my friends were split between that and yearbook, so I decided I wanted to go into web paging and um, at first I was like, what is this? You know, what did I get myself into? I think I wanted to do it more because my dad was constantly telling us that computers are, you know, very
knowledgeable and you’ll need it in the future, so I was like, you know web paging sounds you know, kinda cool maybe I should try this. So my dad kinda influenced me to go there. And once…I started it was, ah-h-h I hate this, but then when we actually got past the codes and actually started making our own web page, it was a lot of fun. …our teacher …she was very patient and very willing to like let us slack off a little bit, …when we would get overwhelmed, so she was very understanding. …once I started getting that class I absolutely loved it and then,… you’re only suppose to allow to take this class once, but my teacher let me take it …for the three years, and I was kinda like the headmaster almost. Like I would get the big important jobs and I would look over everybody else’s web pages to make sure that it is good and appropriate to put on the…school web site, and …me and …a couple of other people we actually designed the front page of our web site. So…it was interesting I mean …it was a good feeling …cause they, you made it, something that you made, you know? Yeah, I wanted, right when I saw my teacher showing us how to do make the web pages, I wanted to be like her. …I really found my niche and I wanted to teach students that.

In college, Barbara uses computers for her classes and recreation. In addition to the software listed earlier, she uses math Excel for her Math classes, WebCT (the Learning Management Software used at the university in Fall 2008) and is learning how to use TK20 for electronic portfolio management. She continues to rely on her siblings for computer support when necessary, but seeks help from university support people when necessary.

If I had... a computer...um, if it’s dealing with the [name] web site, I would go down to the circulation desk and just ask any older person cause I think they’re more, they’re wiser into that type of thing and then just female, male, whatever. If it has to actually has to do with the computer, I would maybe... maybe I would go down there too. Yeah, probably, just go down there, yeah.

Barbara believes that computers belong in classrooms but also believes that students need the fundamentals before teaching them with technology.
I think like the teacher we’re suppose to teach them the basics and get back to like the paper and pencil and books and stuff, but then also give them the opportunity to look on it online. So kind of a both, because you can’t, you can’t just go straight to computers and stuff like that, you need a foundation first and I mean, they’d be missing out on a lot you know if they just did it that one way. This way you can have a broader sphere of knowledge.

Barbara: Field Observation

For her field observation, Barbara chose to use a shared laptop computer checked out from the library at a study carrel in the university library. The computer contains Windows XP compatible software that is routinely used by students at the university such as Microsoft Office, Internet Explorer, and Windows Media Player. The laptop has both a touchpad and stick mouse so Barbara could use whatever pointing system was comfortable for her.

Barbara appeared to be an experienced user of these systems since she knew where and how to check out a laptop at the library. Within a few minutes, she had located a place to work, unpacked her lunch, and turned the computer on. As the computer started, it showed a long series of messages about loading the system files. Barbara remained confident and selected the correct option to start the computer. Then the computer had problems with new downloads and finding the network. Barbara used the Help command listed on the screen for assistance. She went back to the Windows desktop and attempted to start the Internet three times before finally loading the university home page. Subsequent operation of the hardware and software went smoothly. Throughout the computer errors and connection problems, Barbara was calm and deliberate in
her approach and sought help from online resources when needed. She persisted until she was successful in logging on and getting to work.

While being observed, Barbara used primarily web-based applications. First, she scheduled classes using the university web site. While on the site, she opened a document in Adobe Reader and then switched back to the site with the class schedule. She continued using both applications until she closed the document and went to Facebook. While in Facebook, she emailed her friends, added pictures, and added applications to her profile. She moved to MySpace and checked for postings and emails. Barbara then went to the Yahoo portal andchecked her Yahoo email before returning to Facebook and logging off.

Barbara and the other participants were asked, and then reminded by email, to work on course-related assignments while being observed. However, she chose to do other computer activities. However, the field observation did show her calmly troubleshooting system and network errors, easily switching between the internet browser and .pdf document, and using Facebook and MySpace to network with friends.

Barbara: Journal

In her journal, Barbara recorded a variety of computer uses including Microsoft Word for coursework, Google for research, learning management system uploading, email, MySpace and Facebook. A summary of her entries is contained in Table 17. Barbara completed the Simply Daily Reflections for 27 days.
Table 17. Summary of the journal entries completed by Barbara during the period of 10/5/2007 to 11/1/2007.

<table>
<thead>
<tr>
<th>Software Used</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Email</td>
<td>14</td>
</tr>
<tr>
<td>Word</td>
<td>9</td>
</tr>
<tr>
<td>Facebook</td>
<td>8</td>
</tr>
<tr>
<td>WebCT</td>
<td>6</td>
</tr>
<tr>
<td>MySpace</td>
<td>6</td>
</tr>
<tr>
<td>Internet Explorer</td>
<td>4</td>
</tr>
<tr>
<td>YouTube</td>
<td>2</td>
</tr>
<tr>
<td>FrontPage</td>
<td>1</td>
</tr>
<tr>
<td>Yahoo</td>
<td>1</td>
</tr>
</tbody>
</table>

**Computer Experiences Reported by Barbara**

Since I was working on my midterm for class I was frustrated and in a hurry to finish the paper and go to work.

Was relaxed in no big hurry to go anywhere so I could take my time writing e-mails.

Experience today was ok. Had to write paper so I was a little stressed because I was running out of ideas.

Overall it was ok.

I found everything I needed, no difficulties today, so experience was good.

Wrote paper, was an essay, had some trouble with writing the paper but was an ok experience.

It was a good experience. Everything went well. Internet froze a couple of times but able to continue work.

Was a bad experience. While writing paper computer froze and restarted. I had to ask a person to help and could recover half of my paper.

Much better than last time. I finished everything I needed to do. Overall good experience.

Good, I just hate how U of A’s computers are sometimes really slow.

Good cause I didn’t have to do any school so I could relax and chill out. LOL.

Was ok, computer kept on freezing had to log off a couple of times & restart computer. If I wasn’t in a good mood I would have lost it.

Good no problems thank goodness

Bad. Tried to fix myspace [sic] profile nothing was working. Computer froze 5 times in 20 minutes. I hate these machines sometimes.

Great. Love watching videos, it calms me down. Apologize is the best song ever!

Was ok got to make webpage so it was good & relaxing.

Absolutely sucks. Was in a hurry to finish 3 papers for school. Couldn’t print in bierce library, and jump drive would not work. I had to e-mail myself my papers and print out from home.

Was more relaxing and enjoyed watching music videos.

Had no time to do anything but write on e-mail. Experience was good but no time to spend on computer.

Good, spent most time on Facebook. Was fun talking to friends.

Was really frustrating. Paper was too hard and overwhelming. It was also too long which I began to get anxious [sic] to finish.

**Assistance or Help**

Friend, showed me how to block person

Person at circulation desk showed me how to get saved work under Microsoft (autosave)

**Additional Comments**

I hate being overwhelmed by papers and in a hurry to finish them. It didn’t help that I had to leave campus to print papers out.

Email and Microsoft Word were the most frequently used applications recorded by Barbara in her journals with email being used 14 times, and Word
used nine times. Word was used for course-related work, while email was used for both school-related and social reasons; the learning management software, WebCT was used six times for course related work. Barbara was also an active user of the social networking sites, Facebook, using it eight times and using MySpace six times. With her experience with html programming and creating web pages, she said in her interview that she especially enjoyed working on her MySpace page and helping her friends with their MySpace pages. She also recorded using Internet Explorer four times for a variety of applications. Barbara used the Microsoft web authoring software, FrontPage, once to update her web page and Yahoo as a web portal.

In her comments, Barbara was relaxed and happy when she was able to find everything that she needed, or doing something she enjoyed such as working on her web site, or talking to friends on Facebook. She became stressed when the computer was slow or the system froze. However, she did ask for help when it was needed. For example, she got assistance from the library circulation desk staff member when the computer froze, and they showed her how to use the Automatic Backup. This help-seeking behavior may contribute to her resiliency, especially during instances when the computer does not work, as demonstrated by her persistence during the field observation.
No Computer Anxiety – Case Study Two: Elizabeth

Elizabeth is a 21-year-old junior, majoring in Early Childhood Education. She currently uses computers to browse the Internet, chat with friends, email, conduct online research, write papers, and uses Facebook to keep in touch with her friends. She rates herself as “High” in computer skills on the Student Profile Questionnaire. Elizabeth enjoys using computers. She scored No Computer Anxiety on the CARS-C, and No Computer Anxiety on the CTS-C. Figure 9 gives a complete set of scores for the Computer Anxiety measurement instruments, an explanation for the factors contained within each measurement and the scoring guidelines for both the CARS-C and CTS-C.

I like it (laugh), I use, I use my computer every single day, so um, whether I’m checking email, or you know, just messing around, checking, you know, Facebook or something, um, or typing papers or you know, making spreadsheets, or PowerPoint presentations or something, I’m constantly on the computer doing something for school. … I can communicate with my family and stuff all the time, and friends and stuff that live in other states, like my sister lives in another state, my aunt lives way down south and stuff, and I just don’t get to see her, so I love to email and IM, and stuff like that just to keep in touch with people. Um, my mom has an IM name so I’m constantly talking to her online and stuff at night which is always a good thing....

Elizabeth reported that she has used computers for more than 10 years and has owned a computer for more than 10 years. She is from a two-parent home, with three children, Elizabeth, an older sister, and a younger sister.
<table>
<thead>
<tr>
<th>ID</th>
<th>Factor 1: Interactive Computer Learning Anxiety</th>
<th>Factor 2: Consumer Technology Anxiety</th>
<th>Factor 3: Observational Computer Learning Anxiety</th>
<th>Computer Anxiety Level</th>
<th>CARS-C Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elizabeth</td>
<td>19</td>
<td>4</td>
<td>6</td>
<td>No Computer Anxiety</td>
<td>29</td>
</tr>
</tbody>
</table>

**Factor Descriptions**

**Factor 1:** Interactive Computer Learning Anxiety
Includes items that are related to learning about computers and how to use computers, recovering from mistakes and computer errors, applying for a job that requires computer skills, and purchasing of computers.

**Factor 2:** Consumer Technology Anxiety
Includes items that are about common household technology tasks and the technology related activities of taking a test with a computer scoring sheet and watching others work on a P.C.

**Factor 3:** Observational Computer Learning Anxiety
Includes passive or observational items. The individual is asked to consider situations where they observe computer hardware, computer output, consequences of computer technology, others working with computers, or use a common consumer application of technology while being observed.

**CARS (Form C) Scoring Guidelines:**

<table>
<thead>
<tr>
<th>No Computer Anxiety</th>
<th>20-41</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Computer Anxiety</td>
<td>42-49</td>
</tr>
<tr>
<td>Moderate/High Computer Anxiety</td>
<td>50-100</td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Elizabeth</td>
<td>55</td>
<td>17</td>
<td>16</td>
<td>No Computer Anxiety</td>
<td>88</td>
</tr>
</tbody>
</table>

**Factor Descriptions**

**Factor 1:** Negative Computer Cognitions
Expresses negative thoughts about computer operation and use.

**Factor 2:** Positive Computer Learning Cognitions
Reflects positive thoughts primarily about learning to use computer.

**Factor 3:** Computer Enjoyment
Reflects feelings of enjoyment and fun while using the computer.

**CTS (Form C) Scoring Guidelines:**

<table>
<thead>
<tr>
<th>No Computer Anxiety</th>
<th>69-100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low Computer Anxiety</td>
<td>61-68</td>
</tr>
<tr>
<td>Moderate/High Computer Anxiety</td>
<td>20-60</td>
</tr>
</tbody>
</table>

Figure 9. CARS-C and CTS-C scoring guidelines and factor descriptions for Elizabeth.
Elizabeth rated her initial computer experience as 1 of 5, “Very Unpleasant.” This is most likely an error since her description of the experience on the Student Profile Questionnaire is positive.

It was very pleasant because using computers was tons of fun when I was little. Now it's like nothing to use a computer. One of the first experiences using a computer was just play games that you bought on CD at the store. I would be on there all day if I was allowed to.

*Elizabeth: Interview*

Elizabeth first started using a computer when she was in the third or fourth grade. Her father brought a computer home as for Christmas.

…we were all so excited that we got it because you know we’re like, *Oh computer, how cool*, you know and everything….

Her dad used computers at work. When asked why her father brought the computer home, Elizabeth responded:

I think it’s a little bit of everything. Um, I think he, you know, he wanted it at home so he didn’t constantly have to bring the laptop home or something from work, so he could, you know, check emails, and do taxes, and everything that he does on the computers, but I think he wanted us, you know, to get used to the new technology that was becoming more popular, um because we were constantly using it at school, and numerous classes, I mean it wasn’t just like a computer class, We used it in English, we were using it to play games and like a social studies class I remember we used it in all kinds of classes. So I think he just wanted us to get used to it and, you know, really just have it in the house so we could use it and really, you know, play around with it so we were conscious about it and smart and you know, use it, he knew that we were going to be using it later on in life anyways probably, so.

Her dad encouraged Elizabeth and her sister to use the computer. He taught them the basics of operating the computer, how to play games, and some basics of Word.
... he’s always had background with computers and worked with them at work and everything, so it was kinda him always showing us too how to do stuff that we didn’t know how to do so... Definitely, he was probably the one that taught my sisters and I mostly how to use the computer before we went, before, you know played around with them more or less at school.... my dad, my dad would be there to help us if we needed it, but like right when we got it he was more or less, like this is how you do it, and he wouldn’t really walk away and just say go ahead and explore, and you know, try it, so it was more or less right at the beginning, you know, he was really, you know, this is how you do this, and this is how you do that, but once we kinda got the hang of it and everything, he would be there if we had questions or something,...

Elizabeth’s mom used the computer for keeping in touch with friends and family with email, and her older sister used it for homework and email. Elizabeth played games such as Math Blaster, Oregon Trail, and Roller Coaster Tycoon, and completed homework assignments using Microsoft Office software. She worked closely on the computer with her younger sister and she thought sharing a computer helped her learn.

... right when we got it, um, I have a younger sister, she’s actually a freshman here this year, ... we both kinda used it and I would kinda help her, and she would kinda help me..., because me and my younger sister would get on there a lot together and you know, we were making crafts or something, when we were little, we, you know, we’d do it together. If we were playing games we’d help each other, or you know, if she didn’t know how to do something on the computer, I’d be helping her. We both sat there a lot together because we’re so close in age. We’re only two years apart, so we were constantly helping each other...I caught on pretty quickly with the use of computers and how to use it, and you know, using all the programs and stuff. I just, I caught on pretty quickly and I think, I think my, both my sisters did too. I think we all had a pretty easy time with using the computer....

About the same time, there were also computers at Elizabeth’s elementary school. Students would occasionally go to a computer lab and play an
educational game or puzzle. According to Elizabeth, while in the lab, students would work on their own computers

…they were just more or less little activities and stuff that we would do that would, so everyone would be kinda on their own doing their own thing, while we were in the lab.

Teachers would assist students throughout the room. Students would also ask peers for help.

I mean, there’s only, you know, one teacher for how many students, and it’s not like we were, it’s not completely silent in there, so yeah, kids would always be talking like, hey, how do you do this? or something, so I would definitely ask one of them, or I mean if the teacher was literally walking right behind me, I would be like, hey, you know? But, um…, if the teacher is on the other side of the room or something we would ask friends and stuff.

Computer use increased when she reached junior high (grades 7, 8, and 9). Elizabeth enjoyed playing games with partners in her social studies class, writing papers in her English classes, and working on French assignments.

I specifically remember in 8th grade because I loved my 8th grade teacher, um…she would always have us in the computer lab doing that kind of stuff, um…I remember in social studies we were, we were studying um, stuff that has to do with the Oregon Trail and everything, so we went and played the game, we got with partners and whoever got the highest score, you know at the end got a prize or whatever, so I remember playing that in social studies in 7th grade, so. Definitely junior high would be where I used computers the most, mostly for like English-type classes or you know, I was, I took French so we would always be in there typing out stuff in French too for our French class...

When Elizabeth got to high school the opportunity to use computers at school changed. Students did assignments requiring a computer outside of class or at home.
…the only time we would ever use computers would be if, I mean this would be very rarely too, if we had to type something for like an English class and the teacher was able to get the lab or you know, during a study hall I’d go into the library or something. We never really used them that much actually within our class to be honest with you. I would always do, you know, the homework I had to do with typing at home or if I had a project to do, you know, I’d look it up at home. We never really had time in class to go to the computer because there was only, there’s two computer labs in our school, in the library one, the first floor, one on the second floor, so, I don’t know why. We just didn’t use them that much in high school.

In college, Elizabeth uses computers for her coursework and recreation.

She uses Microsoft Word, PowerPoint, Excel, Windows Media Player, digital picture editor, as well as email, Internet Explorer, and social networking with Facebook. When she needs help or has a problem with her computer, she calls her older sister who is a major in Management Information Systems at a different university.

...I am constantly on the phone with my sister, because she is so computer smart. ...I’m just glad I have my sister because she, she knows so much about computers that I can constantly call her and ask if I need help. She’ll try to explain to me um, well first she’ll kinda talk to me and rephrase what I just said so she makes sure that, you know, we’re on the same page with what’s going on, and then she’ll usually try to walk me through something, step-by-step on how to fix it, or you know, ideas that she has on how to try to make it work.

Elizabeth also asks a male friend at the university to help with computer problems.

... I have a really good friend, he is crazy about computers. He loves computers. He knows like everything about computers ...usually he shows me if it’s something, you know, if he’s trying to explain something to me and I really don’t understand it, I’m just like, Just go ahead, just do it (laugh). If I tell him not to [explain], he won’t know. But usually he does, so just in case if some certain problem would happen again then I
would be able to try to at least try to figure it out first before I would call him and be like I need your help.

She explains that their support helps her feel more secure about her computer abilities.

I’m pretty happy with, you know, my ability with computers, um…everything I can do a lot of things, and I mean, if I have questions or I need help or something, you know, I’m constantly asking somebody, and then that’s something else I can add to my knowledge of computers, um, but I’m pretty, pretty good with computers, so there’s nothing really that I could really want that’s more, um, like with the knowledge of computers, like fixing computers and stuff? I could care less.

Elizabeth believes that computers should be used in classrooms.

I think they should be used in the classrooms a lot more, yeah, because I mean because it’s, if you can bring technology into the classroom I think it’s a good thing. Um, a lot of schools now, I know, have at least 4, 5 computers in the classroom because all the classes that I’ve gone to either observe or do my service learning and stuff, all of them have had computers in the back. …I definitely think computers in the classroom are important because it’s technology. Like I said, if you can bring technology into the classroom, it’s a good thing….

Elizabeth: Field Observation

For her field observation, Elizabeth chose to use a shared laptop computer checked out from the library in a public snack lounge at the university library.

She explained that she usually worked at home and had not previously checked out a laptop computer at the library. The researcher showed her where to check out laptops at the library and, within a short time, she checked out the equipment without difficulty. The computer contains Windows XP compatible software that is routinely used by students at the university such as Microsoft Office, Internet Explorer, and Windows Media Player. The laptop has both a
touchpad and stick mouse so Elizabeth could use whatever pointing system was comfortable for her.

Once she had obtained the laptop, she confidently located a place to work, unpacked her work from her backpack, and powered-up the computer. As the computer started, Elizabeth logged on to the university network and attempted to start Internet Explorer. However, instead of connecting to the internet, a computer update message appeared. Without hesitation, Elizabeth restarted the computer, allowed a software update to run, started Internet Explorer and went to the Google home page. She appeared confident and calm throughout this process. Within a few minutes, she was searching the internet using Google, going to web sites such as “The Reading Teacher,” and reviewing the contents on the screen and writing down information. She continued searching, locating, reading, and writing for 20 minutes. Even when a site took an unusually long time to load, Elizabeth’s body language and expression remained confident, calm, and patient. When she finished the search, she returned to the university web-based email system and Yahoo where she read and sent emails for over thirty minutes and then logged off.

Elizabeth: Journals

Elizabeth was a frequent user of Facebook, Microsoft Word, and email. Facebook was recorded as being used fifteen times, where Microsoft Word was used twelve times. Elizabeth had three email accounts (university email, Yahoo email, and SBC email) which she used for communicating with professors,
friends, and family a total of 23 times. Google was used for internet research, WebCT for a course quiz and America Online Instant Messenger for contacting friends. In her comments, Elizabeth reported few problems, except for losing an internet connection. A summary of entries in Elizabeth’s journals are in Table 18.

Summary

This chapter provided the results of data collection on four cases. The four participants in this study were selected using purposeful sampling, based upon criterion sampling. After using the criterion defined for the sample and reviewing written responses given in the Student Profile Questionnaire, five students with computer anxiety, and five students without computer anxiety were selected. Two from each group agreed to participate. The two participants with computer anxiety are identified as Vanessa, and Susan. The two participants with no computer anxiety are identified as Barbara and Elizabeth. Emails were exchanged to schedule interviews, observations, and meetings. Data were collected from the participants using semi-structured interviews, field observations, and daily journals. The participants were open in their answers and cooperative throughout the study. The interviews and field observations took place in September and October 2007, and participants kept the daily journals for 28 days in October and November 2007.

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>Software Used</strong></td>
</tr>
<tr>
<td>Facebook</td>
</tr>
<tr>
<td>Word</td>
</tr>
<tr>
<td>University email</td>
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<tr>
<td>Yahoo email</td>
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<td>Email</td>
</tr>
<tr>
<td>Google</td>
</tr>
<tr>
<td>Internet</td>
</tr>
<tr>
<td>AOL Instant Messenger</td>
</tr>
<tr>
<td>WebCT</td>
</tr>
</tbody>
</table>

**Computer Experiences Reported by Elizabeth**

- It was a boring day with the computer. Wasn’t home much, so I didn’t use it much. No papers due tomorrow so not much use. It was an average day and everything went well.
- Everything was good until I lost internet connection. Then I got frustrated b/c our connection/wireless line wouldn’t show up but after we both played around w/ it we got it to work.
- It was a long day w/ using the computer. I was up late finish my midterm but everything ran smoothly!
- Did not have much time for the computer today.
- It was an average day w/ the computer. Just wrote a paper and used Facebook for leisure.
- It was an average day w/ the computer. Just wrote a paper and used Facebook for leisure.
- I used the computer a lot today to start papers that are due next week.
- I typed out a study guide (the answers) for an exam I have tomorrow.
- I don’t have class on Fridays so I took a break on school work!
- Did not use the computer much at all today. I was not home so I had no access.
- I had no reason to do much of anything on the computer today.
- The only thing I did today was start to write my papers.
- I mainly looked up centerpiece ideas for my cousins baby shower.
- One of my friends came over and we looked up topics together for our literacy development paper.
- Friend I could not get my internet connection to work.
- My main computer use was on a lap at the library so I could be watch how I use the computer.
- I just finished up my paper that is due in ed. psych.
- I mainly looked stuff up for my research paper.
- Today was a busy day so I didn’t have much time for computers.
- Roomate My internet got disconnected
- I worked on my paper most of the day.
- Pretty much worked on my paper. Used the internet to refer to info on the internet for paper.

**Assistance or Help**

- Roommate, helped me connect to the internet b/c I lost connection
- Friend, helped show APA style

**Additional Comments**
CHAPTER VI

ANALYSIS, DISCUSSION, & RECOMMENDATIONS

This was a case study of four preservice teachers, two with computer anxiety, and two with no computer anxiety regarding the potential differences of sociocultural factors between students within each category. The two cases with computer anxiety were given the pseudonyms Vanessa and Susan, and the two cases with no computer anxiety were called Barbara and Elizabeth. The purpose of this chapter is to analyze the data collected during the study, discuss the results in relation to the literature and theoretical framework, and make recommendations for future research and applications.

The purpose of this exploratory study was to examine the influence of social and cultural factors on computer anxiety in a select group of preservice teachers. When considering the four cases in this study of preservice teachers with computer anxiety and those with no computer anxiety, similarities and differences between the two groups emerged during the analysis of the data. These are essential to the understanding of possible sociocultural factors contributing to computer anxiety. The experiences are grouped into four clusters of sociocultural environments: home, which includes computer experiences at
home and with family members; \textit{school}, which consists of computer experiences while enrolled in grades P-12, teachers, and classmates; \textit{peers}, which includes computer experiences with friends and other peers; \textit{others}, which includes all other experiences. The analysis is guided by answering three sub questions, leading to the main research question.

\textbf{Analysis}

\textit{How are typical preservice teachers in a Midwestern metropolitan university with computer anxiety different from those with no computer anxiety and why?}

In addressing this question, this section will first review the results from each case, review the similarities among the cases, and then discuss differences as found in collected research data. Following each case description is a map of computer learning experiences within sociocultural environments for each participant. A key to the symbols used the maps is in Figure 10.
**Explanation of Symbols for Sociocultural Environment Maps**

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<thead>
<tr>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Person symbol" /></td>
<td>Person in the sociocultural environment. May be in a formal or informal learning relationship as indicated by arrows.</td>
</tr>
<tr>
<td><img src="image" alt="Sociocultural environment cluster" /></td>
<td>Sociocultural environment cluster</td>
</tr>
<tr>
<td><img src="image" alt="Learning relationship" /></td>
<td>Learning relationship with arrow indicating direction of knowledge sharing. The thicker the line, the stronger or richer the relationship.</td>
</tr>
<tr>
<td><img src="image" alt="Collaborative relationship" /></td>
<td>Collaborative or sharing learning relationship with knowledge exchanged between learners. The thicker the line, the stronger, or richer the relationship.</td>
</tr>
<tr>
<td><img src="image" alt="Connection" /></td>
<td>Connection or information not directly related to learning</td>
</tr>
<tr>
<td><img src="image" alt="Computer use" /></td>
<td>Explanation of computer use or experience and connected to a person by a line or arrow.</td>
</tr>
<tr>
<td><img src="image" alt="Additional explanation" /></td>
<td>Additional explanation related to sociocultural environment.</td>
</tr>
</tbody>
</table>

Figure 10. Symbols used in the maps of computer experiences.

*Computer Anxiety Case One: Vanessa*

Vanessa had access to the computer at school in the 3rd or 4th grade, at home in the 8th grade and through her peers with her high school classmates and later her fiancé and friends. However, she had no access to a “warm expert” (Selwyn, 2005, p. 132) at home such as a knowledgeable parent or sibling and limited instruction and collaboration at school either with teachers or classmates. Her sister was taught by friends and did not collaborate with Vanessa on the computer. Her mother’s minimal computer use developed only after Vanessa was able to teach her. When she did interact with peers while in high school, her participation appears to be more passive than active. For example, when she described playing with her high school classmate at her home, she told how she did the typing while her classmate told her what to do. When she played with her former fiancé and his friends in the chatroom, she expressed admiration for...
his ability to control the chatroom voice functions, and told how he would tell her how to make the computer work. She used others such as people in chatrooms or at help desks when needing assistance.

Vanessa continues to have access to computers, but the sociocultural environment and the low access to learning resources may have influenced her computer anxiety level. Figure 11 shows how Vanessa interacted with the four clusters of sociocultural environments, and how these affected her computer learning experiences.
Vanessa had computer access at home and school, as well as a limited number of peers to collaborate with and other resources such as a help line, and chatroom. The home cluster was missing a strong parental computer advocate and computer knowledgeable siblings. She had one class in elementary school and few peers or teachers that supported computer use. Later when collaborating at a classmate’s house, and then after high school, with her fiancé and his friends.
she watched and learned how to play online in chat rooms. The lack of access to warm experts within the social environment of computing impaired her ability to have the experiences necessary to develop computer skills and confidence.

Computer Anxiety Case Two: Susan

Susan had access to a computer at home in the 1st or 2nd grade, when her father brought home a computer. He was a professor and needed the computer for work as well as use by the family. Her mother used it for typing her sisters’ papers. Despite the availability of a knowledgeable parent, Susan did not learn how to use the computer from her father. She restrained herself from using the computer and only later, in the 6th grade, started using it for writing stories.

There were additional factors influencing the home environment of computing. When Susan was 10 years old, her father moved out of the house. Susan would occasionally go to her father’s new home and play on the computer. However, she was more interested in other things such as playing outside or doing other things with her friends.

While in school, Susan had limited computer instruction. She did not recall any significant teacher, other adult, or friend that taught, encouraged, or collaborated with her about computers. At the time of the interview, she was taking a required computer course at the university and having a hard time in the course. Like her home and school environment, Susan did not have a relationship with her peers that encouraged collaboration on the computer. This further reduced her opportunity to improve her computer skills and confidence.
Others such as the Geek Squad, a computer technical support company, and Dell Technical Support, gave her assistance but little knowledge sharing. Figure 12 illustrates how Susan interacted with the four clusters of sociocultural environments and the knowledge resources within each environment.

The combination of lack of parental support and advocacy at home, limited computer instruction and collaboration at school, few opportunities to collaborate with peers using the computer, and dependence on a company employee for technical support, Susan has not developed the computer skills and confidence necessary for using computers as expected of a preservice teacher today.
Figure 12. Graphic representation of the sociocultural factors contributing to Susan's computer experiences.

**No Computer Anxiety Case One: Barbara**

Barbara had a sociocultural environment that supported computer learning at both home and school. When her father bought a computer for the family, although he was not a computer user, he emphasized to all of the eight children in the family the importance of computers for the future. Barbara depended on her older brothers and sister for computer support, and played with her younger siblings. When Barbara transferred in the sixth grade, the...
teacher provided supportive, positive instruction that built her computer skills and enhanced Barbara’s social connections with other students in the class. Her classmates became her informal computer instructors as they collaborated on the computer. As she progressed through the grades, the school curriculum, faculty, and staff expanded her skills and enhanced her confidence. The school was a positive environment for students and learning how to use computers. Barbara interacted with her peers using the computer together. They played games, used AOL, instant messaging, and chatted online. Others that affected her computer learning experiences were friends of Barbara’s siblings and technical support at the help desk. These friends often dropped by to play on the computer and share information about the latest “cheat” on a game, or something new online. The help desk, for either the computer manufacturer, software, or other computer component, provided troubleshooting advice. However, Barbara rarely used technical support since she relied on her older siblings for help. Figure 13 shows Barbara’s four clusters of sociocultural environments, and the knowledge resources within each environment affected her computer learning experiences.

Each cluster has a large number of connections and interactions. Home has a strong parental advocate of computing plus multiple siblings who interact with Barbara on the computer. In the school cluster there are multiple classes with supportive teachers within a computer-friendly environment. Barbara interacted with peers playing games and going on the internet. Her other cluster included a variety of people who were friends of her siblings as well as the Help
Desk. It was a rich and varied environment that provided multiple knowledge sharing opportunities and where she developed computer confidence.
No Computer Anxiety Case Two: Elizabeth

Elizabeth had a supportive environment for computer use at home and school. At home, her father was an experienced computer user at work who brought home a computer. He encouraged Elizabeth to use the computer, taught her and her siblings how to run the hardware and software, and was available if they had any questions. Elizabeth and her sisters played games, went on AOL, and chatted online together. Her older sister is now a major in Management Information Systems and Elizabeth uses her for all her technical support questions.

School had classes with educational computer games and computer applications used in classes such as English or French. Teachers were helpful and classmates collaborated and helped each other when working on the computer. Computers were used throughout the school.

Elizabeth relied less on her peers for her computer collaboration and support since she depended on her family for these. She does have a close friend in college that she consults if she needs help. Otherwise, she contacts her sister for help.

Others that were part of her computer experiences were online help and technical support at the help desk. Elizabeth goes to online help if she needs a question answered, and will call the help desk, for either the computer manufacturer, software, or other computer component, if she needs technical
support. A map of the four clusters of sociocultural environments for Elizabeth is in Figure 14.

Figure 14. Graphic representation of the sociocultural factors contributing to Elizabeth's computer experiences.

Elizabeth had a strong and diverse collection of computer knowledge resources within her sociocultural environment. Her father was both an advocate of computing, as well as a teacher and supporter of her use of computers while
her siblings modeled and collaborated with her computer use. Her computing skills and confidence were further developed at school in multiple courses where teachers helped her learn new skills and encouraged collaboration with classmates. Peers such as a college friend were consulted when needed, and others resources such as the help desk was consulted only when she could not contact her older sister. Elizabeth had developed computer confidence and skills within a network of computer knowledge resources within her sociocultural environment.

After analyzing each case, next it is necessary to consider the sub-questions in order to answer the main research question.

Sub question 1. How do preservice teachers with computer anxiety compare to preservice teachers with no computer anxiety in life experiences and background in relation to computer use?

In order to understand the differences between these two sets of cases, the similarities will be first discussed. Therefore, this section starts with a examination of the parallels among the four participants. The section that follows will detail the differences in life experiences and background in relation to computer use by the group with computer anxiety versus the group with no computer anxiety. Similarities between the cases found in the data collected from the Student Profile Questionnaire are summarized in Table 19.
Table 19. Summary of Student Profile Questionnaire data for cases.

<table>
<thead>
<tr>
<th>Year</th>
<th>Own Computer?</th>
<th>Years Using a Computer</th>
<th>Family income range</th>
<th>Computer in home during P-12</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbara Jr.</td>
<td>Yes</td>
<td>10 or more</td>
<td>$30,001 - $80,000</td>
<td>Yes</td>
</tr>
<tr>
<td>Elizabeth Jr.</td>
<td>Yes</td>
<td>10 or more</td>
<td>$80,001 - $100,000</td>
<td>Yes</td>
</tr>
<tr>
<td>Susan Jr.</td>
<td>Yes</td>
<td>10 or more</td>
<td>$30,001 - $80,000</td>
<td>Yes</td>
</tr>
<tr>
<td>Vanessa Sr.</td>
<td>Yes</td>
<td>10 or more</td>
<td>$10,001 - $30,000</td>
<td>Yes</td>
</tr>
</tbody>
</table>

_Similarities: Computer Anxiety and Without Computer Anxiety_

_Computer Use – Home:_ All four participants had access to a computer at home at some point while enrolled in grades P-12. In all cases, the parent brought the computer into the home. Vanessa’s mother purchased a computer while she was in the 8th grade. Susan’s father brought home a computer when Susan was in the 1st or 2nd grade. Barbara’s father brought home a computer when she was 11 or 12 years old, and Elizabeth’s father bought a computer as a family Christmas present when she was in early elementary school. Given the current age of the students, (Barbara and Elizabeth are 21 years old, Vanessa is 27 years old, and Susan is 26 years old), and the time period when a computer was brought into the home, each participant has been using computers for 10 or more years.

_Computer Use - School:_ All four participants had access to computers at school, although it varied by grade level and extent. Vanessa used computers at school in the 3rd or 4th grade, using games such as Word Munchers in a computer
room. At her school Susan took a 10th grade seminar on internet research.

Barbara learned how to use computers at school in the 6th grade, took a computer fundamentals class in the 8th grade, and then a class on creating web sites in the 11th grade. The school librarian showed students how to find different web sites and gave them help with their homework. Elizabeth used computer games at her school in 3rd or 4th grade and 7th and 8th grade. She also used computers at school for classes in English.

*Computer Applications* - The four participants all used Microsoft Word, Internet Explorer, email (although they differed on the type of email used), Facebook, and Google for researching papers. They researched and wrote papers, searched the internet, posted on Facebook, wrote and read email, and did online shopping. In addition, they all knew how to use menus and the basic help command. They all demonstrated sufficient skill and confidence to use a personal computer for basic computer activities, regardless of the computer anxiety level.

*Attitudes and Beliefs* - All of the participants expressed a positive attitude toward computers and using technology in the classroom, although there were some reservations expressed on the effect of computers on social relationships and interpersonal communications. They also expressed a common belief that males are generally better with computers than females and were more likely to consult a male than a female when they needed assistance.
Computer Experiences - When asked to describe their initial computer experiences, participants’ remarks were overall positive. This was especially true when they described the supportive attitude of P-12 teachers. They described the teachers in affirmative terms, with some differences in enthusiasm. Later computer experiences in P-12 were also described in positive terms as well as experiences in other settings with peers.

Differences: Computer Anxiety and With No Computer Anxiety

The purpose of this section is to consider the differences between the two cases with computer anxiety and those without computer anxiety in life experiences and background in relation to computer use. The four clusters of sociocultural environments will organize the discussion: home, school, peers, and others.

Home – While each participant had computer access at some time while enrolled in P-12, there were distinct differences in the level of computer knowledge and support available in the home. Home is a key location for the development of computer attitudes and skills (Facer, Sutherland, Furlong, & Furlong, 2001). As discussed early, “…the home is considered to be a particularly apposite site where technology and education come together” (Selwyn et al., 2006, p. 104). Students with home computers have more favorable attitudes towards computers, especially when the computer experiences at home are more positive than at school (Selwyn, 1998).
The two cases with computer anxiety appear to have fewer opportunities to learn how to use the computer at home. Vanessa had a single mother with no computer experience and a younger sibling with no computer experience. She did not have an environment where she could ask questions, observe her mother or sister using the computer, and learn by modeling their behavior. Vanessa did not have an opportunity for informal learning of computer skills that would give her more diverse experience, build confidence, and form a foundation for learning activities (Cole, 1996; Kafai et al., 2002; Selwyn, 2005).

The computer was located in a breakfast nook, right off the kitchen, where it was “stuffed” in next to the dog cage. While the location was convenient for the family, the size and arrangement restricted collaboration with others. Research suggests that the placement of computer in the home is a sign of the importance placed on the computer by the parents. The location continues to reinforce these values through visibility and ease of access. Just more than half of the computers in the home are located in family-shared places in the home (Facer et al., 2003). If the computer perceived as “disruptive” to the family, such as when playing games, then it is placed away from the public areas of the home. Locations such as a breakfast nook, are somewhat ambivalent locations, which may reflect the new role of the computer in the household (Facer et al., 2003).

Susan had a father who used the computer at work and at home, and a mother that used the computer at home, but during her interview described herself as an isolated, self-directed learner who did not interact with her father or
other family members to learn how to use the computer. This may be a consequence of family dynamics or other household issues, but Susan described herself as learning on her own, rather than getting guidance from her father or sisters. The computer was set up in a coatroom, usable by only one person at a time. Figure 15 shows the relationship of computer anxiety to the computer experts available at home for the two cases with computer anxiety.

**Computer Anxiety: Home**

![Diagram of computer anxiety and experts]

Figure 15. Representation of cases with computer anxiety and computer experts available at home.

The two cases without computer anxiety, Barbara and Elizabeth, had knowledgeable computer users and a strong collaborative environment for computing available at home. While Barbara’s father did not know how to use the computer, he emphasized its importance to her and her siblings. He is an example of an “expectancy socializer,” where parental expectations and attributional patterns have a significant influence on computer anxiety (Cooper,
Barbara explained in her interview that all eight children were computer users. Her older brother, who later majored in electrical engineering, older sister, and other siblings would use the computer for homework and games, and helped Barbara when needed. Unlike Vanessa and Susan, the computer was placed in a garage that was converted into a playroom, where siblings and friends would collaborate on the computer. The parents placed the computer where the children would not distract the household with games and group activities (Facer et al., 2003).

Elizabeth’s father used computer technology at work. He taught Elizabeth and her siblings how to use the computer and would be available to help when needed. Her older sister, now a Management Information System major, was and still is a resource for her, answering questions about the computer and troubleshooting when she has problems with her computer or network. The computer was located in the family room where the children could work on the computer while the parents were nearby. Elizabeth especially enjoyed playing on the computer with her younger sister. Like Barbara, Elizabeth’s father encouraged computer use. His expectations and attributional patterns influenced Elizabeth through his instruction and support, in addition to his actions. Her father’s past workplace experiences with computers influenced his use of computers at home, and with his children (Facer et al., 2003). Figure 16 illustrates the two cases without computer anxiety and the computer expertise available at home.
Figure 16. Representation of the two cases without computer anxiety and the home cluster.

**School** – As discussed earlier, each of the participants used computers while enrolled in grades P-12. However, there are differences between the cases and among the participants with computer anxiety versus those with no computer anxiety. The two participants with computer anxiety had fewer computer-related learning experiences at school. Current research on the relationship of school computer use and computer anxiety is scarce. However, related research on socioeconomic factors and computer anxiety suggest that students with less access to computers at school, and therefore with less experience, have higher levels of computer anxiety (Bozionelos, 2004). However, computer access may not be the sole factor influencing the outcome. The level and type of computer experience at school, along with the teaching style and
student collaboration may be more significant (Kale & Rokopou, 2006; Selwyn, 2005; Selwyn & Gorard, 2004).

Vanessa recalled taking a class in the 3rd or 4th grade where she used Apple II computers in a lab and used Word Munchers to do math problems. The teacher would show the class how to use the program and help students individually if they were having problems and students assisted each other with problems. However, when asked if there were any other grades where she used the computer, she recalled using computers only outside of school. Susan took her first computer class in high school in the 10th grade, when the librarian offered a seminar on using the computer and the internet to do research. She found the experience “very limiting.” Figure 17 shows the relationship of computer anxiety to the sociocultural environment of computing at school for the two cases with computer anxiety.

Figure 17. The relationship of computer anxiety to the sociocultural environment of computing at school for the two cases with computer anxiety.
Barbara and Elizabeth, the two participants with no computer anxiety had more opportunities for computer-related learning in schools. Barbara transferred into her school in the 6th grade without knowing how to use the computer. Through the individual instruction from the teacher and collaboration with other students, she was able to catch up with the rest of the class and become an active computer user. The next year she took a computer fundamentals course. While in the 11th grade, Barbara enrolled in a course to create web sites. She repeated the course and eventually became a teaching aide, where she helped create the school web site. Through the work with her teachers and classmates, she became a confident computer user.

Elizabeth took classes using the computer in the 3rd or 4th grade, as well as in the 7th grade, 8th, and 9th grades. The first class used computer games and the later classes used Oregon Trail, online dictionaries, and word processing software, as well as internet research. While in middle school and later in high school, Elizabeth was constantly using computers for a variety of classes and other activities. There was usually a computer in the classroom and a lab for student coursework. Teachers were available when students had a question, or students would ask friends or classmates. Once she reached high school, students worked on the computers outside of class. By the time she graduated from high school, she was using the computer for a variety of school-related work. Figure 18 shows the relationship of computer anxiety to the sociocultural environment of computing at school for the two cases with no computer anxiety.
Concerning the school environment, when comparing the cases with computer anxiety against the cases without computer anxiety, the participants with computer anxiety had fewer computer classes, less computer use in classes, and lower expectations of computer use. This may have had an impact on both computer experience and computer confidence.

Peers – Among the four participants, peers were a reservoir of knowledge available to expand computer knowledge within a social environment (Selwyn & Gorard, 2004). The number and level of computer interaction with peers was different between cases with computer anxiety and those with no computer anxiety.
The two cases with computer anxiety had fewer computer-using peers and lower frequency of computer use with peers. Informal interaction is an essential part of learning to use computers, especially peer-to-peer coaching from friends and family (Bessiere, Ceaparu, Lazar, Robinson, & Shneiderman, 2002). Vanessa recalled learning how to use America Online and chat online at the home of a high school classmate. Vanessa would type and the classmate would tell her what to do. She later used her former fiancé and his friends, as well as the people met in the chatrooms, as resources to learn more about computers.

Susan had few friends outside of school and those she did have, especially in elementary and middle school, were not computer users. She was more interested in other activities. It was later in high school that she started using the computer as a more common activity. At that time, she had one peer who would use the computer, but Vanessa considered it an activity for one person, so she would take turns with her friend. Figure 19 illustrates the computer using peers for the two cases with computer anxiety.
Figure 19. Cases with computer anxiety have fewer computer-using peers and less frequency of contacts with peers using computers.

Barbara and Elizabeth, participants with no computer anxiety, had more peers that used computers and had more frequent contact with those peers. Barbara played on the computer with a variety of friends from the neighborhood and school. She had another group of girls and boys from her school that she played computer games with, and kept in touch using email and IM. She described how they would bring along sisters or brothers or other friends to play on the computer. Like Barbara, Elizabeth had a group of friends who would all play on the computer together, playing games such as Roller Coaster Tycoon, sending emails and IMs, and chatting with each other. When she had a question, she would ask a friend. Figure 20 illustrates the cases with no computer anxiety and their peers.
Figure 20. Cases with no computer anxiety had more computer using peers and more frequent contact with those peers.

*Others* – Barbara and Elizabeth, the two cases with no computer anxiety, reported using a help desk or some form of technical support for assistance. The two cases with computer anxiety rarely used the services available at a help desk or technical support line. Susan used “Geek Squad” to set up her laptop, but not for technical assistance. Vanessa reported being highly frustrated when calling technical support for an ink jet refill. She found chatrooms helpful for technical support. This disparity may be due to the nature of telephone technical support today. Users are often frustrated by long hold times, difficult to understand foreign accents, and confusing instructions (Wertsch, 1991a). To have a successful resolution of a problem, it is often necessary to call repeatedly and be persistent. Successful help-seeking strategies can help deal with a computer problem. The cases with computer anxiety may have fewer opportunities to develop such help-seeking skills.
Sub question 2. What is the pattern in the background and experiences of computer use between students with and without computer anxiety?

The four participants in this study had distinctive patterns in the background and experiences of computer use when grouped according to having computer anxiety or no computer anxiety. First, the two cases with computer anxiety had fewer computer-knowledgeable people from which to draw expertise and guidance. Parents and siblings were especially important as introducers and coaches of computer technology. Vanessa and Barbara either did not have or did not use these knowledge resources within the home.

Second, the two cases with computer anxiety had significantly less computer collaboration with family, classmates, and friends. Such collaboration provides informal learning opportunities that may be crucial to developing computer skills and confidence (Ploetzner, Dillenbourg, Preier, & Traum, 1999). Vanessa and Susan learned how to use the computer essentially on their own, largely through trial and error. This pattern of computer self-instruction is in contrast with the two cases with no computer anxiety, Barbara and Elizabeth. Both women had a network of computer support, instruction, and collaboration over a period of several years with family, classmates, peers, and teachers.

Third, while all four cases had access to computers at home and school, the two cases with multiple computer courses in several grade levels, had no computer anxiety, while the two cases with computer anxiety had only one course in computers while enrolled in P-12. Computer courses at school appear
to offset the lack of computer expertise and guidance at home while
supplementing and reinforcing computer use at home and with peers.

Fourth, in the two cases without computer anxiety, the father strongly
encouraged computer use. Barbara’s father purchased the computer, brought it
home, and reminded her repeatedly that computers were important. Elizabeth’s
father also purchased and brought home the computer. He taught her how to use
it and was available when she or her siblings needed help. Vanessa did not have
a father at home; her mother brought home the computer and since she did not
know how to use it, Vanessa taught herself. Susan’s father brought home the
computer, but he did not teach Susan how to use it, did not help her when she
had a question, and at the age of 10, moved out of the house. While Susan
continued to use a computer at his home, she did not get assistance from her
father. These patterns of differences may give some insight into the possible
sociocultural influences on computer anxiety.

Sub question 3. What sociocultural factors influence computer anxiety?

The results suggest a number of sociocultural factors have influenced
computer anxiety among the cases in this study. In sociocultural theory, reality is
constructed as a result of social interaction with adults, symbolic and physical
tools called artifacts, and more capable peers. Learning is socially and culturally
situated in daily life. It is the consequence of the active interaction between
individuals, groups, cultural artifacts, which contribute to the social formation of
the individual mind (Daniels, 1996; Engeström et al., 1999; John-Steiner & Mahn,
and results in the realization of socially valued goals (Vygotsky, 1978). As learners receive assistance from more capable peers, parents, teachers and other significant people within small groups or dyads in their Zones of Proximal Development (ZPD) (Alfred, 2002; John-Steiner & Mahn, 1996; Putnam & Borko, 2000; Rogoff, 1990; Whipp et al., 2005), the knowledge, skills, and information needed by the learner is appropriated through guided participation in shared activity (Cooper, 2006; Habib, 2000; Kiesler & Sproull, 1987). The combination of modeling, feedback, support, and instruction and learning opportunities within “a community of practice” reduces isolation and anxiety of the learner. The social environment of computing is the community of practice for computing (Sun & Zhang, 2006). It is within this environment that the individual is socialized into the culture of technology (Selwyn, 2004b).

In this study, the social environment of computing was found to be focused on four clusters, home, school, peers, and others. Among those cases with no computer anxiety, learners received assistance from more capable others within dyads or small groups in their ZPDs in higher amounts than those with computer anxiety. This appears to be influenced by parents as expectancy socializers, their perceptions of the value of computers, ascribed household roles, cultural traditions of teaching and learning, collective and individual tendencies, gender roles, and the view of technology and intelligence. Among those cases with no computer anxiety, the parents expected their children to use computers,
and emphasized their importance for future success. By having these expectations, parents were more likely to support computing by having the hardware and software at home, placing the computer in appropriate location and computer use at school. For Barbara and Elizabeth, the cases with no computer anxiety, the older siblings provided the knowledge and skills for guided participation in shared activities, and like peers, were able to share knowledge in a small group setting. Among all the cases, the relationship with the parents appeared to be a factor in the differences of computer anxiety between the two groups. This was especially true for the father. In the cases with computer anxiety, there was no active involvement of the father in the teaching or support of the home computer. The father was either not in the household or unavailable. The family environment and subsequent divorce may have negatively influenced the learning relationship between Susan and her father. The two cases with no computer anxiety had fathers who strongly encouraged computer use, and in one participant’s case, taught her how to use the computer. Parental influence with computers appeared to be different with mothers. The participants described their mothers as being less interested in computers, with little or no computer knowledge when the computer was initially brought into the household, and developing few computer skills.

At school, the influence of sociocultural factors came in different forms. Among cases with no computer anxiety, there were opportunities for guided participation with a classroom or lab setting using the teacher as a warm expert.
As students gained mastery over the skill, then students would assist each other through peer-to-peer, or small group activities. Especially important were educational games such as “Oregon Trail,” which encouraged small group interaction, and learning. Cases with computer anxiety may have been influenced by not having as many school-related computer activities or did not take advantage of them.

Sociocultural factors influencing computer anxiety among peers was similar to home and school. Noticeable in the peer cluster was the influence of the masculinisation of the computer. When a participant could choose who to ask for help or assistance, the gender preference was to choose a male. Both participants with computer anxiety and with no computer anxiety had this preference. However, among those students with computer anxiety, there appeared to be fewer people from which to choose help and less personal confidence in computer abilities so the males became more important as experts. This may undermine computer confidence and increase dependence of the women in this study.

The influence of sociocultural factors in the Other cluster is somewhat more diverse since this category includes online and telephone technical assistance, onscreen help commands, friends of siblings, and persons in chatrooms. Participants with no computer anxiety used help resources with minimal frustrations or problems. This may be influenced by factors such as gender roles (i.e. women are more patient), or attributional style. Using people in
chatroom as knowledge resources is influenced by the perception of online relationships, and possible safety and dangers on the internet. Friends of siblings are available only when siblings are both computer literate and have relationships with peers to share computing activities. They are also influenced by the attitudes of parents toward computer play and where the computer is located.

*How are typical preservice teachers in a Midwestern metropolitan university with computer anxiety different from those with no computer anxiety and why?*

After discussing the cases, and using the three sub questions to do a cross-case analysis by the grouping of with computer anxiety and with no computer anxiety, it is possible to describe and discuss the differences between the two groups of preservice teachers as they presented themselves in this study. The study considered the differences between the two cases with computer anxiety and the two cases with no computer anxiety using the following factors: life experiences and background in relation to computer use, the pattern in the background and experiences of computer use, and the sociocultural factors that influence computer anxiety. Figure 21 is a summary of the factors contained within the four clusters of the sociocultural environment that distinguish the two cases with computer anxiety and the two cases with no computer anxiety.
A significant difference between the cases with computer anxiety and with no computer anxiety is the availability of home resources needed to support computer learning and use. Access to such resources has long been the focus of research about the “digital divide.” The digital divide is the inequality in the
ability to access or use computer technology primarily because of socioeconomic status (Selwyn, 2004b; van Dijk, 2006). Previously researchers focused on how socioeconomic status impacted the ability to purchase computer hardware and software. In order to overcome the digital divide, government and organizations installed computers in schools and community centers. However, using computers is more than having hardware and software available (Warschauer, 2003).

Mediating factors such as parental involvement, sibling collaboration, and the location and configuration of the computer appear to influence computer confidence and attitudes. The context of computing includes the availability, quality, support, and environment that meets an individual’s own perception of what is needed (Selwyn, 2004b). It appears from this study that for those participants with computer anxiety did not receive those resources. For those participants with no computer anxiety, the context of computing provided positive and relaxed initial computer experiences that have been shown to decrease the tendency to develop computer anxiety (see Figure 2) (Beckers & Schmidt, 2003; Gos, 1996; McInerney et al., 1994; Rosen et al., 1987). Results from previous studies have suggested that students using home computers have better computer attitudes (Selwyn, 1998) and parental support at home was more significant than home access when measuring computer self-efficacy and value beliefs (Vekiri & Chronaki, in press). However, until this study, the relationship between the home computing environment and computer anxiety has been
unexplored. This current study furthers the understanding of the relationship between the home computer and computer attitudes by detailing the sociocultural learning environment within the home.

The results suggest a variety of factors may be responsible for the differences in the home environment for computing. Household socioeconomic data reported by the participants are not delineated by computer anxiety level so that high or low income is associated with either computer anxiety or no computer anxiety (see Table 13). However, the lowest reported income range for within the cases, $10,001 – $30,000 is for a participant with computer anxiety, Vanessa, and the highest, $80,001 - $100,000, is for a participant with no computer anxiety, Elizabeth. Research on the relationship of family income, computer ownership and computer anxiety shows that individuals raised within higher, better educated, socioeconomic families are more likely to receive encouragement and support of their families (Attewell & Battle, 1999; Bozionelos, 2004; Gonzalez-DeHass, Willems, & Holbein, 2005). Lower income families may have less experience and fewer resources from which to help students (Vekiri & Chronaki, in press).

Home is also a place where positive and negative feelings about computers may be learned (Selwyn, 1998). The role of the mothers in relation to the home computing is especially interesting. All of the participants described their mothers as not having computer skills when the computer first arrived in the home, and even now having limited computer skills. None of them described
their mothers as the primary resource for computer knowledge. This may be the result of widespread gender bias regarding women, age, and computers, (Cooper, 2006; Cooper & Weaver, 2003). All of the participants expressed the belief that men are better at computers than women. The participants relied on a father, male friends, a fiancé, male friends of the fiancé, or brother when needing computer expertise at home, with peers, and at school. In this study the mothers were not models for computer use, but reflected a cultural stereotype. Some researchers suggest that for women in the household, the computer is not considered a natural extension of domestic responsibilities. When using a computer, these women have feelings of guilt that they are not meeting the needs of another family member, or are struggling with issues with ownership and control (Burke, 2003). In this study, for the two cases with computer anxiety, one was raised in a female head-of-household family and the other mother became a head-of-household after divorce. This may have influenced the attitudes and time the mothers shared with their daughters.

Research shows that the majority of computing takes place at home, and home computer uses are recreational such as games or online activities (Selwyn, 2004b; Vekiri & Chronaki, in press). Unlike these earlier studies, the cases in this study described their use of home computers as a mixture of recreational and work required for school.

The school environment had differences between the two groups, with the cases depicting computer anxiety having fewer computer classes and less
expectations of computer use throughout the school. Research on the relationship between computer anxiety and school computing is unclear. Recent research by Meelissen and Drent (2008) suggests that computer attitude is more influenced by student factors not related to school than by school-related student factors. The two school-related factors influencing computer attitudes among girls in the study were the teaching approach and the computer experience of the female teachers (Meelissen & Drent, 2008). Among the cases in this study, the two with no computer anxiety had more opportunities to use computers at school, as well as see female teachers using computers. However, additional research will be required to understand if these factors are more important than others found in this study such as additional coursework and increased peer interaction.

Differences between participants with computer anxiety and with no computer anxiety were found in the peer computing environment. Those with no computer anxiety had a higher frequency of computer interaction with peers, friends of peers, and siblings of peers. Within these peer groups, students exchange what Selwyn calls, “corresponding levels of cultural capital” (2004b, p. 353), that is the technological knowledge, skills, and socialization learned from family and others that give them the ownership of technology (Selwyn, 2004b). Peers interact with each other, building social groups, exchanging “social capital,” or social obligations and contacts. A student builds a network of peers and other contacts with computer knowledge that can be called upon for help or
advice when needed and encourage computer use (Selwyn, 2004b). This study provided insight into how these networks of peers may interact with computer anxiety. Further study is needed to understand how such networks can be used to improve computer attitudes.

The computer environment of the “others” cluster is more varied because it contains the factors that are not within the other clusters. Both the cases with computer anxiety and without computer anxiety used help commands and help desks. Further study is needed to understand help-seeking strategies and how this impacts computer use. One of the cases with computer anxiety did use people in a chatroom as her computer knowledge resource rather than face-to-face peers. This reflected her overall small use of peer or family-related social resources for computer help and knowledge. Further study is needed to understand if this type of online peer support is used frequently and for what purposes. One case with no computer anxiety identified friends of siblings as part of her computer social group. This indicates a wide network of people within her social community of computing, and contributes further to her computing resources.

This section has presented a response to the main research question by summarizing the results from the three sub questions and then discussing these results using the sociocultural clusters of home, school, peer, and others. Also discussed was the relationship with current research, and how this study
expands on or differs from these studies. Additional recommendations are made for further research.

Summary

The four cases, the two cases with computer anxiety, Vanessa and Susan, and the two cases with no computer anxiety, Barbara and Elizabeth, were analyzed and discussed using the three sub questions to address the main research question:

How are typical preservice teachers in a Midwestern metropolitan university with computer anxiety different from those with no computer anxiety and why?

1. How do preservice teachers with computer anxiety compare to preservice teachers with no computer anxiety in life experiences and background in relation to computer use?

2. What is the pattern in the background and experiences of computer use between students with and without computer anxiety?

3. What sociocultural factors influence computer anxiety?

The results were reviewed for each using a map of computer learning experiences within the sociocultural environment. The experiences were grouped into four clusters of sociocultural environments: home, school, peers, and others. The two cases with no computer anxiety were compared to the two cases with computer anxiety with similarities and differences explained. Distinctions between the cases with no computer anxiety and the cases with computer anxiety were detailed and possible explanations provided. Finally, the theoretical
framework of sociocultural theory was reviewed and discussed as a way to explain differences between the two cases.

Conclusions and Recommendations

Preservice teachers are challenged by the continuing requirements to integrate computer technology in the classroom (National Council for Accreditation of Teacher Education (NCATE), 2006). Education colleges are attempting to address this need by requiring technology literacy and educational technology courses. Most students today appear to be computer literate because they can use the internet, or use word processing to create a report. However, for many of these students their computer abilities are limited by computer anxiety. If educators are to keep up with the rapidly changing field of educational computing, they need the ability to learn and apply new skills in the classroom. The National Educational Computer Standards for Students revised for 2007 (International Society for Technology in Education, 2007) in additional to standards requiring students learning about technology operations and terminology, include several standards that emphasize higher order thinking skills using the computer such as critical thinking, problem solving, decision-making, research and information fluency, as well as creativity and innovation. As these new standards are implemented, preservice teachers will be moving from the university into the classroom. Computer anxiety impedes their ability to adapt, change, and meet the challenges of technology in the classroom.
Significantly, teachers with computer anxiety are more than an individual’s problem, computer attitudes are shared with the students in their teaching and how they use computers in the classroom.

This study provides a detailed explanation of four female preservice teachers and the four clusters of sociocultural learning environments they have encountered as they have learned how to use computers. The qualitative methodology provided essential insights into the development of personal computer experience and knowledge in relation to their level of computer anxiety. While findings and recommendations for further research have been introduced in the previous sections, the following is a summary of these with further review.

The cases with no computer anxiety and those with computer anxiety have differences that appear be related to computer anxiety levels. First, the cases with computer anxiety had fewer social resources in the sociocultural environment of computing. This may have been the result of environmental factors such as home or school dynamics, cultural beliefs, or unknown circumstances. Further study is needed to understand how such social networks are created and maintained.

Second, home computing environment, especially the relationship of the father to computing, and the availability of the computer in the home environment, appears to be related to computer anxiety level. Further study is
needed to understand how the home environment is related to computer anxiety and the role of parental involvement, especially as expectancy socializers.

Third, the strong association of males with computers influenced all the cases in the study. Further study is needed regarding how these attitudes are learned and how women, especially in the earlier years, can be more widely accepted as “computer smart” as men.

Fourth, the school computing environment may offset socioeconomic differences in computing resources and the effect on computer anxiety. The digital divide is complex and dimensional. Research by van Dijk and Hacker (2003), Selwyn (2002), Tien and Fu (2008) suggest that knowledge resources, such as those discussed in this study, are essential for overcoming differences in computer use between socioeconomic groups. When a student has little or no support for the use of computers and learning resources at home, school is even more important for the development of computer attitudes and skills. The results from this research provides important insights into the possible influence of the school computing environment on computer anxiety. Further study is needed on the relationship of the sociocultural environments of school and home.

A significant challenge is to improve the results of technology education and curriculum so preservice teachers will be prepared to use technology in the classroom upon graduation. Further research is needed to understand how social networks may be used within a sociocultural environment in a teacher education program to reduce computer anxiety among preservice teachers. In addition,
longitudinal studies are needed to help understand the impact of such sociocultural environments on preservice teachers as they move into classroom teaching. Such studies should provide additional information that may improve the results of computing in education.

…when I saw my teacher showing us how to do make the web pages, I wanted to be like her. I was like, this is what to do, you know, I really found my niche and I wanted to teach students that. --- Barbara
REFERENCES


Loyd, B. H., & Gressard, C. P. (1984a). *The effects of sex, age, and computer experience on computer attitudes.* ERIC.


Price, J. Willis & D. Willis (Eds.), *Technology and teacher education annual* (pp. 167-172). Charlottesville, VA: Association for the Advancement of Computing in Education.


Rosen, L. D., & Weil, M. M. (2000). *Measuring technophobia: A manual for the administration and scoring of the Computer Anxiety Rating Scale (Form C), the Computer Thoughts Survey (Form C) and the General Attitudes Toward Computer Scale (Form C)* (Manual).


Sun, H., & Zhang, P. (2006). The role of moderating factors in user technology acceptance. *International Journal of Human-Computer Interaction, 64*, 53-78.


APPENDIX A. OHIO TECHNOLOGY STANDARDS FOR STUDENTS

COMPARED TO NATIONAL EDUCATION TECHNOLOGY STANDARDS

FOR STUDENTS
## Ohio Technology Standards for Students Compared to National Education Technology Standards for Students

<table>
<thead>
<tr>
<th>Ohio’s K-12 Technology Academic Content Standards</th>
<th>ISTE The National Education Technology Standards for Students</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard 1 Nature of Technology</strong>&lt;br&gt;Students develop an understanding of technology, its characteristics, scope, core concepts and relationships between technologies and other fields</td>
<td><strong>Standard 1: Basic operations and concepts</strong>&lt;br&gt;Students demonstrate a sound understanding of the nature and operation of technology systems. Students are proficient in the use of technology.</td>
</tr>
<tr>
<td><strong>Standard 2 Technology &amp; Society Interaction</strong>&lt;br&gt;Students recognize interactions among society, the environment and technology, and understand technology’s relationship with history. Consideration of these concepts forms a foundation for engaging in responsible and ethical use of technology.</td>
<td><strong>Standard 2: Social, ethical, and human issues</strong>&lt;br&gt;Students practice responsible use of technology systems, information, and software. Students develop positive attitudes toward technology uses that support lifelong learning, collaboration, personal pursuits, and productivity.</td>
</tr>
<tr>
<td><strong>Standard 3 Technology for Productivity Applications</strong>&lt;br&gt;Students learn the operations of technology through the usage of technology and productivity tools</td>
<td><strong>Standard 3: Technology productivity tools</strong>&lt;br&gt;Students use technology tools to enhance learning, increase productivity, and promote creativity. Students use productivity tools to collaborate in constructing technology enhanced models, preparing publications, and producing other creative works.</td>
</tr>
<tr>
<td><strong>Standard 4 Technology for Communication Applications</strong>&lt;br&gt;Students use an array of technologies and apply design concepts to communicate with multiple audiences, acquire and disseminate information and enhance learning.</td>
<td><strong>Standard 4: Technology communications tools</strong>&lt;br&gt;Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences. Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.</td>
</tr>
<tr>
<td><strong>Standard 5 Technology for Information Literacy</strong>&lt;br&gt;Students engage in information literacy strategies, use the Internet, technology tools and resource, and apply information management skills to answer questions and expand knowledge.</td>
<td><strong>Standard 5: Technology research tools</strong>&lt;br&gt;Students use technology to locate, evaluate, and collect information from a variety of sources. Students use technology tools to process data and report results. Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks.</td>
</tr>
<tr>
<td><strong>Standard 6 Design</strong>&lt;br&gt;Students apply a number of problem-solving strategies demonstrating the nature of design, the role of engineering and the role of assessment.</td>
<td><strong>Standard 6: Technology problem-solving and decision-making tools</strong>&lt;br&gt;Students use technology resources for solving problems and making informed decisions. Students employ technology in the development of strategies for solving problems in the real world.</td>
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</table>
Ohio Technology Standards for Students Compared to National Education Technology Standards for Students
(continued)

<table>
<thead>
<tr>
<th>Ohio's K-12 Technology Academic Content Standards</th>
<th>ISTE The National Education Technology Standards for Students</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standard 7 Design World</strong></td>
<td><strong>Standard 4: Technology communications tools</strong></td>
</tr>
<tr>
<td>Students understand how the physical, informational and bio-related technological systems of the designed world are brought about by the design process. Critical to this will be students' understanding of their role in the designed world: its processes, products, standards, services, history, future, impact, issues and career connections.</td>
<td>Students use telecommunications to collaborate, publish, and interact with peers, experts, and other audiences. Students use a variety of media and formats to communicate information and ideas effectively to multiple audiences.</td>
</tr>
</tbody>
</table>

**Standard 5: Technology research tools**
Students use technology to locate, evaluate, and collect information from a variety of sources. Students use technology tools to process data and report results. Students evaluate and select new information resources and technological innovations based on the appropriateness to specific tasks.

**Standard 6: Technology problem-solving and decision-making tools**
Students use technology resources for solving problems and making informed decisions. Students employ technology in the development of strategies for solving problems in the real world.

Indicates direct alignment between Ohio Standards and technology-related national standards
Indicates correlation between Ohio Standards and technology-related national standards
Indicates connection between Ohio Standards and technology-related national standards

Adapted from Ohio Department of Education
### COMPUTER ANXIETY RATING SCALE (Form C)

The items in this questionnaire refer to things and experiences that may cause anxiety or apprehension. For each item, place a check under the column that describes how anxious (nervous) each one would make you at this point in your life.

<table>
<thead>
<tr>
<th></th>
<th>Not at All</th>
<th>A Little</th>
<th>A Fair Amount</th>
<th>Much</th>
<th>Very Much</th>
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<tr>
<td>1. Thinking about taking a course in a computer language</td>
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<td>2. Taking a test using a computer scoring sheet</td>
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<td>3. Applying for a job that requires some computer training</td>
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<td>4. Sitting in front of a home computer</td>
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<td>5. Watching a movie about an intelligent computer</td>
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<td>6. Looking at a computer printout</td>
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<td>7. Getting &quot;error messages&quot; from the computer</td>
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<td>8. Using the automated bank teller machine</td>
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<td>9. Visiting a computer store</td>
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<td>10. Being unable to receive information because the &quot;computer is down&quot;</td>
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COMPUTER THOUGHTS SURVEY
(Form C)

Please check the box that indicates how often you currently have each of the following thoughts when you use a computer or think about using a computer.

<table>
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<tr>
<th></th>
<th>Not at All</th>
<th>A Little</th>
<th>A Fair Amount</th>
<th>Much</th>
<th>Very Much</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I am going to make a mistake.</td>
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<td>2. This will be fun.</td>
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<td>3. Everyone else knows what they are doing.</td>
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<td>4. I enjoy learning about this.</td>
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<td>5. I like playing on the computer.</td>
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<td>6. I feel stupid.</td>
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<td>7. People will notice if I make a mistake.</td>
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<td>8. This will shorten my work.</td>
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<td>9. I am totally confused.</td>
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<td>10. I know I can do it.</td>
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APPENDIX C. REQUEST FOR PERMISSION TO REPRODUCE THE INSTRUMENT IN THE DISSERTATION AND RESPONSE FROM DR. ROSEN TO REPRODUCE EXAMINATION COPIES OF THE CARS-C AND CTS-C.
Hi Teresa, I hate to be a killjoy but I can’t have the whole measure printed in the dissertation. If you go online you will see examination copies that have only some items printed. That would be fine with me. sorry

Dear Dr. Rosen,

You always have such interesting research topics on your website -- very interesting work on MySpace! About a year ago we exchanged emails about using the Technophobia Measurement Instruments for a pilot I was doing for my dissertation. The pilot went well and I am well on my way to having my proposal to my committee by next month. I am using your technophobia measurement instruments, and my advisor has asked for a copy of the instruments be included in the dissertation proposal and eventually in the dissertation. I have attached a copy of the form suggested to obtain copyright permission for use in my dissertation. I would greatly appreciate your permission to include the CARS-C and CTS-C in my dissertation. If this is not possible, please tell me what you will consider for inclusion in my dissertation.

Please let me know your decision so I will know how I should proceed. Thank you.

Teresa Hallam
thallam@uakron.edu
Office of Research Services and Sponsored Programs
Akron, OH 44325-2102
(330) 972-7068 Office
(330) 972-6291 Fax

May 17, 2007

Teresa A. Hallam
1426 Sugar Knoll Drive
Akron, Ohio 44333

Ms. Hallam:

Your protocol entitled "Sociocultural influences on Computer Anxiety among Preservice Teachers: An Exploratory Study" was determined to be exempt from IRB review on May 17, 2007. The IRB application number assigned to this project is 20070506. The protocol represents minimal risk to subjects and matches the following federal category for exemption:

☐ Exemption 1 - Research conducted in established or commonly accepted educational settings, involving normal educational practices.

☒ Exemption 2 - Research involving the use of educational tests, survey procedures, interview procedures, or observation of public behavior.

☐ Exemption 3 - Research involving the use of educational tests, survey procedures, interview procedures, or observation of public behavior not exempt under category 2, but subjects are elected or appointed public officials or candidates for public office.

☐ Exemption 4 - Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens.

☐ Exemption 5 - Research and demonstration projects conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine public programs or benefits.

☐ Exemption 6 - Taste and food quality evaluation and consumer acceptance studies.

Annual continuation applications are not required for exempt projects. If you make changes to the study's design or procedures that increase the risk to subjects or include activities that do not fall within the approved exemption category, please contact the IRB to discuss whether or not a new application must be submitted. Any such changes or modifications must be reviewed and approved by the IRB prior to implementation.

Please retain this letter for your files. If the research is being conducted for a master's thesis or doctoral dissertation, the student must file a copy of this letter with the thesis or dissertation.

Sincerely,

Sharon McWhorter
Associate Director

☑ Approved consent form attached

Cc: Susan Olson, Advisor
Rosalie Hall, IRB Chair
An Invitation to Participate in a Research Study

Title of the Study: Sociocultural influences on computer anxiety among preservice teachers: An exploratory study

Introduction: You are invited to participate in a research project conducted by Teresa A. Hallam, a doctoral student in the Department of Curricular and Instructional Studies, at the University of Akron.

Purpose: The purpose of this study is to examine the influence of social and cultural factors on computer anxiety in a select group of preservice teachers.

Procedures: The results from the Student Profile Questionnaire and computer attitude measurements will be analyzed and a group of students will be chosen for further study. If you choose to participate, you will be asked to take part in an approximately one-hour interview about past and present computer experiences, be observed using a computer in a public location, and complete a short daily journal about computer experiences during the study.

Exclusions: All students enrolled in this course are eligible to participate in the study.

Risks & Discomforts: There are no known risks or discomforts to this study.

Benefits: You will receive no direct benefits from your participation in this study, but your participation may help us better understand computer anxiety among preservice teachers.

Right to refuse or withdraw: Your participation in this research is voluntary and you may refuse to participate, or may discontinue participation at any time, without penalty or loss of benefits to which you are otherwise entitled.

Confidential data collection: Any identifying information collected will be kept in a secure location and only the researcher will have access to the data. Participants will not be identified in any publication or presentation of the research results. Your signed consent form will be kept separate from your data, and no one will be able to link your responses to you. All information obtained during the study will be considered protected and privileged.

APPROVED
IRB 5/14/07
Date
The University of Akron
Confidentiality of records: Data will be identified by code number only. Written records collected during the study will be maintained in a locked or secure area. Digital recording and data stored on computers will be password protected and encrypted. All associated forms and data will be destroyed after the end of the research project.

If you have any questions about this study, you may call Teresa A. Hallam at 330-972-7765 or Dr. Susan Olson at 330-972-8223. This project has been reviewed and approved by The University of Akron Institutional Review Board. If you have any questions about your rights as a research participant, you may call the IRB at (330) 972-7666 or 1-888-232-8790.

I have read the information provided above and all of my questions have been answered. I voluntarily agree to participate in this study. I will receive a copy of this consent form for my information.

Participant Signature ____________________________ Date __________

Print Name ____________________________

Please contact me using the following:

☐ Email address: __________________________________________

☐ Phone number(s): ____________________________ ☐ home ☐ cell

______________________________________________ ☐ home ☐ cell

☐ Other: __________________________________________

______________________________________________

APPROVED
IRB
Date 5/14/18
The University of Akron

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APPENDIX E. STUDENT PROFILE QUESTIONNAIRE
Student Profile Questionnaire

Thank you for your taking this survey. Completing this survey should take approximately 10 - 15 minutes of your time.

1. Gender: Male ☐ Female ☐
2. Age: _______

3. Check your student level:
   ☐ Freshman
   ☐ Sophomore
   ☐ Junior
   ☐ Senior
   ☐ Post baccalaureate
   ☐ Other -- List: ________________________________

4. Place a check in the box in front of the specific area of licensure you are currently seeking:
   ☐ Early Childhood Education (Age 3 through Grade 3)
   ☐ Middle Level Education (Grades 4 through 9)
   ☐ Adolescent to Young Adult (Grades 7-12)
   ☐ Family Life (Comp.) – Grades 4 – 12
   ☐ Multi-Age: P-12
   ☐ Intervention Specialist
     ☐ Early Childhood
     ☐ Mild/Moderate
     ☐ Moderate/Intensive
   ☐ Speech Pathology
   ☐ Other -- list __________________________________________

Endorsements
   ☐ Computer/Technology
   ☐ Early Childhood
     ☐ Middle Level
     ☐ Adolescent/Young Adult
   ☐ TESOL/ESL
   ☐ Adapted Physical Education
   ☐ Reading
     ☐ Early Childhood
     ☐ Middle Childhood
   ☐ Other -- list __________________________________________

5. Do you own a computer?
   ☐ Yes
   ☐ No

6. If you answered yes, check the number of years you have owned a personal computer:
   ☐ less than 1 year
   ☐ 1 – 3 years
   ☐ 4 - 6 years
   ☐ 7 – 8 years
   ☐ 9 – 10 years
   ☐ more than 10 years
7. If you answered yes, check the type and operating system closest you the one you own. If you own more than one computer, choose the characteristics for computer you use the most.

- Laptop
- Desktop
- Windows 98
- Windows XP
- Windows Home Edition
- Mac OS 9
- Mac OS xxxx
- Other __________________________

8. If you answered no, how do you have access to a computer? Check the choice that you use most often.

- computer labs at the university
- computer laptops at the university
- family member
- public library
- Other – explain _______________________________________________________

9. If you answered no, how much time does it take to reach the location of the computer you use from your residence?

- 15 minutes or less
- 15 to 30 minutes
- 30 to 45 minutes
- 45 to 60 minutes
- 60 minutes or more

10. On the list below check the length of time you have been using computers:

- Less than 1 year
- 2 to 3 years
- 4 to 5 years
- 6 to 7 years
- 8 to 9 years
- 10 or more years

11. How and where did you learn to use computers?

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

12. How pleasant or unpleasant were your first experiences on the computer? Circle the number to indicate the level of unpleasantness or pleasantness of those first experiences.

13. Describe those first experiences and explain your answer to Question 12.

________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________
________________________________________________________________________

14. Who did you ask for help when you got confused, frustrated, had a question or the computer stopped working? (check as many as applicable)

☐ Mother  ☐ Father  ☐ Sister  ☐ Brother  ☐ Friend  ☐ Neighbor  ☐ Other __________________  ☐ No one

15. What was the approximate income range of your family when you were growing up?

☐ $<10,000
☐ $10,001 - $30,000
☐ $30,001 - $80,000
☐ $80,001 - $100,000
☐ $>100,000

16. Was there a computer in your home when you were in grades P-12? ☐ Yes  ☐ No
17. If the answer is yes, who used the computer in your family when you were in grades P-12? Please list the persons by their relationship to you below (For example, “Mother,” “Father,” and so on) and HOW they used the computer. Use the back of this sheet if necessary.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

18. Describe your most memorable computer experiences – negative and positive. You can use the back of this sheet if necessary.

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

__________________________________________________________________________

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__________________________________________________________________________

__________________________________________________________________________
19. Rate your current level of computer proficiency:

- □ Very high (i.e. I’ve written some programs/scripts or courseware, and/or could teach others how to use computers)
- □ High (I can use computers without referring to manuals/instructions/other help)
- □ Average (I use applications such as word processing, spreadsheets, and/or basic Web searchers)
- □ Fair (I can use applications with assistance)

Thank you for completing the survey!
September 11, 2007

An Invitation to Participate in a Research Study

You are invited to participate in a research project conducted by Teresa A. Hallam, a Ph.D. candidate in the Department of Curricular and Instructional Studies, at the University of Akron.

Title of the Study: Sociocultural influences on computer anxiety among preservice teachers: An exploratory study

Purpose: The purpose of this study is to examine the influence of social and cultural factors on computer attitudes in a select group of preservice teachers.

Procedures: The results from the Student Profile Questionnaire and computer attitude measurements will be analyzed and a group of students will be chosen for further study. If you choose to participate, and you are chosen, you will be interviewed for approximately one hour about your past and present computer experiences, be observed using a computer in a public location, and complete simple student reflections about using the computer for a limited period of time.

Exclusions: All students enrolled in this class are eligible to volunteer to participate in the study. Students will be chosen from the volunteers for further study.

Risks & Discomforts: There are no known risks or discomforts to this study.

Benefits: When the interview and the first part of the simple student reflections are completed, a $25 Barnes and Noble gift card will be provided for participation. A second Barnes and Noble gift card of $75 will be given when the remaining parts of the study are completed. These include an observation of using the computer, completing simple student reflections and reviewing the interview transcript.
**Right to refuse or withdraw:** Your participation in this research is voluntary and you may refuse to participate, or may discontinue participation at any time, without penalty or loss of benefits to which you are otherwise entitled.

**Confidential data collection:** Any identifying information collected will be kept in a secure location and only the researcher will have access to the data. Participants will not be identified in any publication or presentation of the research results. Your signed consent form will be kept separate from your data, and no one will be able to link your responses to you. All information obtained during the study will be considered protected and privileged.

**Confidentiality of records:** Data will be identified by code number only. Written records collected during the study will be maintained in a locked or secure area. Digital recording and data stored on computers will be password protected and encrypted. All associated forms and data will be destroyed after the end of the research project.

If you have any questions about this study, you may email Teresa A. Hallam at thallam@uakron.edu or Dr. Susan Olson at 330-972-8223. This project has been reviewed and approved by The University of Akron Institutional Review Board. If you have any questions about your rights as a research participant, you may call the IRB at (330) 972-7666 or 1-888-232-8790.

I have read the information provided above and all of my questions have been answered. I voluntarily agree to participate in this study. I will receive a copy of this consent form for my information.

______________________________  __________________
Participant Signature              Date

______________________________
Print Name

☐ Email address: ___________________________  ☐ home  ☐ cell

☐ Phone number(s): ___________________________  ☐ home  ☐ cell

☐ Address  Street: ___________________________  Apt: ________

                                City: ___________________________  Zip Code: ___________________________
APPENDIX G. COMPUTER ANXIETY MEASUREMENT RESULTS FOR 115 PARTICIPANTS
## Computer Anxiety Scores & Ratings for Students Completing Packet

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Computer Anxiety Scores & Ratings for Students Completing Packet
(continued)

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</table>

- With No Computer Anxiety: 69
- With Computer Anxiety: 46
- Total Number of Students: 115
- Percentage with Computer Anxiety: 40%
April 28, 2006

Teresa A. Hallam
1426 Sugar Knoll Drive
Akron, Ohio 44333

Ms. Hallam:

The University of Akron’s Institutional Review Board for the Protection of Human Subjects (IRB) completed a review of the protocol entitled “Computer Anxiety among Preservice Teachers: A Pilot Study of the Questionnaires, Surveys and Procedures”. The IRB application number assigned to this project is 20060416.

The protocol was reviewed on April 28, 2006 and qualified for exemption from continuing IRB review. The protocol represents minimal risk to subjects and matches the following federal category for exemption:

(2) Research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: (i) information is recorded in such a manner that subjects can be identified, directly or through identifiers linked to subjects; AND (ii) any disclosure of responses outside the research could reasonably place the subjects at risk of civil or criminal liability or be damaging to subjects’ financial standing, employability or reputation

Enclosed is a copy of the informed consent document, which the IRB has approved for your use in this research.

Annual continuation applications are not required for exempt projects. If you make any changes or modifications to the study’s design or procedures that either increase the risk to subjects or include activities that do not fall within one of the categories exempted from the regulations, please contact the IRB first, to discuss whether or not a request for change must be submitted. Any such changes or modifications must be reviewed and approved by the IRB prior to their implementation.

Please retain this letter for your files. If the research is being conducted for a master’s thesis or doctoral dissertation, the student must file a copy of this letter with the thesis or dissertation.

Sincerely,

[Signature]

Sharon McWhorter
Interim Director

Cc: Susan Olson, Advisor
Department Chair
Phil Allen, IRB Chair
An Invitation to Participate in a Research Study

Title of the Study: Computer anxiety among preservice teachers: A pilot study of the questionnaires and procedures

Introduction: You are invited to participate in a research project conducted by Teresa A. Hallam, a graduate student in the Department of Curricular and Instructional Studies, at the University of Akron.

Purpose: The purpose of this study is to check the accuracy and completeness of the demographic questionnaire, and review the procedures used to administer and score the Computer Anxiety Rating Scale and Computer Thoughts Survey to be used in the full study in Fall 2006.

Procedures: If you choose to participate, you will complete a questionnaire asking for information about yourself, academic major and goals, and your computer ownership and experience. Next, you will complete two measurements called the Computer Anxiety Scale and Computer Thoughts Survey.

The researcher will observe the length of time, procedures, and any problems associated with the distribution, completion, and collection of the materials. The researcher will analyze the results of the survey and assessments to evaluate if the needed information and data are supplied on the forms, or if further refinements are needed. In addition, the researcher will review the explanatory materials and other forms for clarification if needed. After this study, the surveys and assessments should be more accurate and complete.

Risks & Discomforts: There are no known risks or discomforts to this study.

Benefits: You will receive no direct benefits from your participation in this study, but your participation may help us better understand how to measure computer anxiety among preservice teachers.

The University of Akron is an Equal Education and Employment Institution

April 25, 2006
Benefits: You will receive no direct benefits from your participation in this study, but your participation may help us better understand how to measure computer anxiety among preservice teachers.

Right to refuse or withdraw: Your participation in this research is voluntary and you may refuse to participate, or may discontinue participation at any time, without penalty or loss of benefits to which you are otherwise entitled.

Confidential data collection: Any identifying information collected will be kept in a secure location and only the researchers will have access to the data. Participants will not be individually identified in any publication or presentation of the research results. Only aggregate data will be used. Your signed consent form will be kept separate from your data, and no one will be able to link your responses to you. All information obtained during the study will be considered protected and privileged.

Confidentiality of records: Records during the study will be maintained in a locked or secure area and will be destroyed at the end of the research project.

If you have any questions about this study, you may call Teresa A. Hallam at 330-972-7765 or Dr. Susan Olson at 330-972-8223. This project has been reviewed and approved by The University of Akron Institutional Review Board. If you have any questions about your rights as a research participant, you may call the IRB at (330) 972-7666 or 1-888-232-8790.

I have read the information provided above and all of my questions have been answered. I voluntarily agree to participate in this study. I will receive a copy of this consent form for my information.

Participant Signature ________________________________ Date ________________________________

Print Name ________________________________
APPENDIX I. INTERVIEW GUIDE
## Interview Guide

**9. Computer experiences in the past**
- a. Learned how to use a computer?
- b. Problems or questions, were there people could ask or talk to?

**10. Family computer use when younger?**
- a. Who and what for?
- b. If so, what for?
- c. Who used the computer most in household
- d. Who used the computer more, your mom or your dad?

**11. Computer in home when younger?**
- a. Describe how it was used, where it was located, rules (if any) for using it, was it shared and who with?
- b. Hardware, software, and internet connection
- c. Use?
- d. The “computer expert” around house
- e. How did they help?

**12. Any other family and friends that used computers.**
- a. Who where they and what did they do on the computer? (home, work, play)

**13. Computers at primary or secondary schools –**
- a. use, placement, how used, how much, teacher attitude

**14. Influences on feelings about using computers today – anything in the past, growing up**
15. Past experiences and attitudes towards computers.
   
   a. Describe how these are connected to using the computer today.

16. Describe process when learning to use a new program, or solve a problem you may have on the computer.

17. When have questions about using the computers, who is asked?
   
   a. Male, female, relationship

   b. Describe how that person helps

18. Describe the most enjoyable and the most stressful parts about using a computer.

19. If you could change anything about your computer skills or abilities, what would it be?
APPENDIX J. FIELD OBSERVATION GUIDE
### Observation Guide for Computing Environment

1. Where is the computer located?

2. Is the computer in a public or shared place?

3. What behaviors does the participant exhibit when using the computer?

4. Does the participant ask for assistance or have help? If so, what gender?

5. Does the participant use other types of assistance? (onscreen, manual, person, collaborative, directive, etc.)

6. Other observations:

---

**Participant Number:** _____________________

**Date:** _____________________

**Time Begin:** ____________  **Time End:** __________
APPENDIX K. SIMPLE DAILY REFLECTION PROMPTS
<table>
<thead>
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<th>Computer Use</th>
<th>Purpose</th>
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<tbody>
<tr>
<td>Wrote a paper</td>
<td>School, Educ Psych class</td>
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2. **Computer Help**: Did someone help you or show you how to do something on the computer when you used the computer today? If so, who was it and what did they do? Here’s an example:

| Roommate      | Show me how to upload videos to YouTube |

3. **Computer Experiences Today**: Think about how you used computer today. Describe your experiences with computers today and how you felt about it (the good, the bad, & the “ugly”).

4. **Additional Thoughts**: Is there anything you want to add about your experiences today?

**CHECK HERE if you did NOT use the computer today** □
CASE STUDY PROTOCOL

Overview of the Study

The purpose of this study is to conduct an exploratory case study of preservice teachers with computer anxiety and no computer anxiety using sociocultural theory and adult learning theory. Selected preservice teachers at a Midwestern metropolitan university will be studied for possible social and cultural patterns of beliefs, values, performance, and social context in which they use computers.

The following primary research question will guide the study:

1. How are typical preservice teachers in a Midwestern metropolitan university with computer anxiety socioculturally different from those with no computer anxiety? Why?

Three additional sub-questions will be considered in the study:

2. How do preservice teachers with computer anxiety compare to preservice teachers with no computer anxiety in life experiences and background in relation to computer use?

3. Is there a pattern in the background and experiences of computer use between students with and without computer anxiety?

4. What sociocultural factors influence computer anxiety?
Procedures

1. Design Study
   a. Develop relationship of sociocultural theory to computer anxiety and preservice teachers.
   b. Connect sociocultural theory and adult learning theory.
   c. Choose exploratory case study methodology based on literature review and research questions

2. Choose the Data Collection Methods to Support Research Questions.
   a. Select Computer Anxiety measurement instruments (see Appendices J & K)
   b. Create Student Profile Questionnaire (see Appendix I)
   c. Create questions for Interview Guide addressing research questions (see Appendix P)
   d. Create questions for Observation Guide addressing research questions (see Appendix Q)
   e. Create Journal Prompts for student entries (see Appendix R)
   f. Create table to connect the conceptual and theoretical themes, literature citations, interview questions, field observation notes, journal prompts, and research questions. (see Table 3)

3. Data Collection Procedures
   a. Sample Selection
      1.) Participants recruited
2.) Student Profile Questionnaire & Computer Anxiety measurement instruments completed

3.) Student Profile Questionnaire & Computer Anxiety measurement instruments scored and recorded in database

4.) Participants grouped by computer anxiety level.

5.) Participants meeting criteria for age, gender, and major selected from each computer anxiety group.

6.) Case study subjects selected from qualified participants from each computer anxiety group based on responses on Student Profile Questionnaire.

b. Data Collection Plan

1.) Student Profile Questionnaire & Computer Anxiety measurements
   i) Arrangements made with instructor of sections for data collection.
   ii) Forms completed, scored, and recorded. Case study subjects selected and recruited – Week 2

2.) Interviews
   i) Participant Scheduled – Week 3
   ii) Participant interviews completed – Weeks 3-4
   iii) Field Observations – Weeks 6-7
   iv) Interviews transcribed by transcriptionist – Weeks 3-5
   v) Transcribed interviews cataloged in case study database – Weeks 4 – 5
vi) Transcribed interviews sent to participants for review – Weeks 4-5

3.) Journal Entries

i) Send emails to participants with prompts for journaling – Weeks 3-7.


iii) Scanned journal emails cataloged in case study database. Week 9

4. Data Analysis

a. Throughout the data collection include data analysis (Merriam, 2001a)

b. Identify categories, patterns, themes, and concepts in the Participant Interviews, Field Observations, and Journal Entries, based on the literature review, that are related to the theoretical framework of sociocultural theory, adult learning, and computer anxiety.

5. Prepare the Case Study Report

a. Create case study reports for each group of participants, preservice students with computer anxiety, and those with no computer anxiety. Within each report, there will be descriptive information for each case as well as summary information for both groups, and the complete sample.

b. Conclusions will be made from the study, and since it is an exploratory case study, suggestions for future research will be offered.