Assessing computer fluency among adult learners in accelerated degree programs at a Midwestern liberal arts college

by

Malcolm Graeme Armstrong

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Program of Study Committee:
Nancy J. Evans, Major Professor
Constance Hargrave
Daniel Robinson
John Schuh
Mack Shelley

Iowa State University
Ames, Iowa
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ABSTRACT

With the introduction of the personal computer as a commodity item, many institutions have committed large capital investments to infrastructure and equipment to evolve into technology-oriented campuses. Those levels of institutional investment may not be matched by the performance capabilities of adult students attending such institutions. This study explored that phenomenon in an accelerated degree program at a Midwestern liberal arts college, with findings indicating reluctance among males to ask for assistance with PC problems and that writing skills were more developed as students progressed through the college experience using IT. Furthermore the study found the household income among participants to be in excess of statewide median income levels reinforcing the link between demographic variables and adult student computer fluency.

CHAPTER 1

INTRODUCTION

"There is no reason for any individual to have a computer in his home."
Ken Olsen, President of Digital Equipment, 1977.

The evolution of information technology (IT), especially the integration of personal computers into households, is an undeniable reality. As nations grapple with globalization and all of its complexities in knowledge-powered economies, many educators are moving to a point of greater interconnectedness in an information society. As rapidly as IT evolves, it becomes increasingly important to be cognizant that the majority of children will mature into adulthood utilizing IT for their daily functions. One piece of that maturation process will be the need for adults to be able to use a personal computer with a proficient level of fluency. The recent speed with which IT, and in particular personal computers, has evolved may have outpaced the opportunity for some adults to catch up, and therefore reach a proficient level of computer fluency.

Ideally, adult students entering higher education will have come from a background where personal computer access has been possible or facilitated, therefore enabling the student to develop proficient levels of computer fluency. With a proficient level of computer fluency, adult students will be better positioned to undertake studies, especially in programs where the integration of technology into the academic curriculum has occurred. Examples of needed skills may be general word processing skills to write a paper, conceptual skills enabling a student to develop a spreadsheet to model an answer, or even uploading and listening to MP3 files through a personal computer (PC).

It follows therefore that the adult student who has had limited access to a PC enters higher education with a disadvantage that may exacerbate the already complex at-risk factors

that can seriously limit degree completion among adults. In the future, for adult students to complete undergraduate studies it will be increasingly necessary to enable them to navigate the life course with personal computer fluency as the entry-level benchmark. With evolved fluency skills, adult undergraduate students are likely to be better positioned to engage in the educational process.

Problem

Against a backdrop of worldwide exponential growth in the information technology sector, higher education has emerged into the 21st century with "more capacity than any rational analysis would have said was needed" (Zemsky & Massey, 2004a, p. 57) to deliver both online and hybrid educational course content. Recent trends show that higher education has invested heavily "in both hardware and software" to meet the perceived demand "for e-learning products" (Zemsky & Massey, 2004a, p. iii).

This phenomenon is not unique to computer technology. In Iowa during the 1990s there was a massive investment into the Iowa Communications Network (ICN). This initiative was to lay a statewide fiber optic network connecting all 99 counties in Iowa (www.icn.state.ia.us/about_icn). Construction of the ICN enabled educational delivery via digitally networked technology for distance learning statewide. The original initiative obligated the state community colleges to fund 20% of the installation (Iowa Issue Review, 1992). For some community colleges that heavy financial burden would impinge on the ability of the institution to further provide telecommunications equipment, educational systems, and motion-ready classrooms (Porter, 1992). In simple terms, building the ICN did not mean people would be able to use the ICN, it merely developed the infrastructure. This example serves as a metaphor for the investment in IT; that investing in infrastructure alone isn't enough, students also need to be able to understand how to use the IT.

As a society we appear to have moved a long way from the point in the early 1980s where ownership of a personal computer was often viewed as a luxury and unaffordable for many. Over the last 20 years, almost symbiotically, as the field of IT has grown so has the body of research and knowledge centered on the use of IT in the continuing higher education sector.

There is evidence to support the current perception that "Western society creates so much prosperity that everyone can own his or her own computer" (Easterbrook, 2003, p.139). Experiences at home set the expectancy of ownership at an early age; 91% of all children and adolescents [aged 5-17] use a computer, and 62% have access to the *Internet* (DaBell, 2006). However, a sizable proportion of the population [38%] does not. Access to both computers and the *Internet* differs depending upon ethnic background; only 87% of Black Americans in the same demographic category have access to a PC and fewer [48%] use the *Internet* (p. 62). In Spanish-only speaking households this figure drops off even more dramatically to 80% with PC access and 29% using the *Internet* (p. 62).

Over the past decade the ratio of computers to students in high schools has moved from 12.1:1 in 1998 to a much more accessible 3.8:1 in 2005 (Wells & Lewis, 2006). This dynamic has been enhanced by the growth in *Internet* access among high schools, meaning that now 94% (Wells & Lewis) of public schools have it. Only ten years ago this figure was 14% (Wells & Lewis), so adults who were 18-years old then are potentially re-entering education now with a high school experience characterized by limited access to PCs and the *Internet*.

Sources show that 64% of all adults own a computer and have access to the *Internet* (WOW!, 2003). In my opinion, this picture is slightly flawed, for although we currently have

many adults without access to either a PC or the *Internet* (36%), it was less than a decade ago when the picture looked a lot gloomier (WOW!).

The non-traditional student body has evolved into the largest sector of the higher education market, and has been projected to further increase by 13% between 2002 and 2008 (DeGabriele, 2001). Recent research has shown "that over 75% of adults seeking higher education are employed while studying part-time" (Capelli, 2003, p. 243). U.S. Department of Education figures show that 7.1 million adults are engaged in higher education (DaBell, 2006), with over a third of that number aged 25 or older attending community colleges.

A low level of technical literacy in the midst of widespread use of technology can be attributed to the unacknowledged "paradox" about which Pearson and Young (2002, p. 71) talked. The paradox positions the USA's unmatched economic power in the form of increased domestic computer ownership matched against slower strides in computer fluency among domestic *Internet* users from all age groups. This paradox is exacerbated by the demographics of age, gender, ethnicity, socioeconomic status (SES), and educational background (McConnaughey, Lader, Chin & Everette, 1997) because the dynamics of these variables can affect computer literacy for each adult student. The digital divide exists; the gaps between "certain groups of Americans have increased" (DaBell & Chapman, 2006, p. 2), and are fairly quickly getting wider. Blacks and Hispanics now lag further behind Whites in their levels of PC ownership and on-line [*Internet*] access (DaBell & Chapman; McConnaughey et al.).

Wonderful stories offer anecdotal evidence of how the digital divide and, to a similar extent, technical illiteracy plays out. Tapscott (1998) talked of:

> The help desk that reported that someone thought the mouse was a foot pedal and couldn't get it to work. The secretary who was asked to copy a disk and came back

> with a photocopy? The man confronted with the computer message "press any key to continue," couldn't find the "any" key on the keyboard. Another "hit" the keyboard so hard he broke it. When asked by a [technical] support line if she had windows, one woman replied, "No, we have air conditioning." One person was found deleting files on a disk using white-out. Another, when instructed to "insert the disk and close the door," inserted the disk and then closed her office door. There are hundreds of stories. (p. 41)

To avoid just these kinds of inept and somewhat embarrassing scenarios in the future, I envisage that a proficient computer fluency level will be not only highly desirable for all adult students, but a must.

We are seeing a nationwide convergence of issues based around IT integration in higher education. First, Ausburn (2004) noted that there has been a tremendous increase in the number of adult students attending continuing education (CE) at institutions of higher education (IHEs). The participation of adult learners at IHEs has increased to the point where 30% of all undergraduates [4 million] are aged 25 or over (Paulson & Boeke, 2006). There is an emergence nationwide of many for-profit degree completion institutions making heavy investments in marketing and using hybrid or online technologies to improve student access rates. A study conducted by the Sloan Consortium showed that "about 3.2 million students [of all ages] took at least one online course during the fall of 2005" (Foster & Carnevale, 2007).

As an advocate of technology use in colleges, I find this trend professionally affirming. To be part of the higher education sector while it is undergoing a period of extraordinary change as it continues to blend the increase of adult students with the ability to deliver IT-focused programming to this dominant group is satisfying. At this point of

increased participation by adult students attending IHEs, the current educational research has suggested that higher education needs to develop "sharper critiques and longer-range proposal[s] than are required under normal cultural conditions" (Brameld, 1999, p. 14) to react to this growing trend.

Secondly, the exponential advances in technology require the field to evolve constantly, which invariably requires continuous and sometimes greater investments of capital to keep pace with the changes resulting in more widespread use of that technology (NCES, 2006). Many organizations, including higher education, will purchase new computers about every three years to avoid obsolescence.

A third point is that although computer ownership has increased, this increase has not necessarily resulted in greater computer access amongst all groups (DaBell & Chapman, 2006; McConnaughey et al., 1997), the very paradox that Pearson and Young (2002) outlined. A fourth concern is the increase in technology delivery methods in higher education (Levenburg & Major, 1998).

The convergence of increased participation by adult students, advances within the IT sector, increased computer ownership, and enhanced delivery systems potentially could interact to give society a stronger cohort of computer fluent adults, but the previously cited evidence suggests that this may not be the case.

Purpose Statement

The purpose of this quantitative study was to use the framework of computer fluency defined by the policy report of the National Research Council: *Being Fluent with Information Technology* (1999) to evaluate intellectual capabilities, conceptual knowledge, and appropriate technical skill-sets (NRC, 1999) of adult students participating in an accelerated (10-week-long) and/or hybrid degree program at a mid-western liberal arts college to

understand and assess the demographic factors that contribute to higher levels of computer fluency among the population of adult students enrolled in the program. The framework of the report often referred to as the *FITness Report*, can be found in Appendix A. [see Table 1.1]

Throughout the study, the dependent variable of "technical literacy" was defined generally as computer fluency (a higher level of computer competency), and the independent variables of adult students that were examined were ethnicity, age, socioeconomic status, gender, educational background, and personal circumstance. To facilitate collection of targeted data, I developed a survey instrument (Appendix B) intended for adult students attending accelerated degree completion programs to identify their individual levels of computer fluency in terms of the NRC definition.

Site Selection

I am a full-time employee of a mid-western liberal arts college, and for very practical reasons (i.e., access to students, knowledge of the program, support from administrators), and in particular the convenient location, I used the institutional adult learning program students at this college for the survey response group.

The site hosts a successful midweek and weekend accelerated degree completion program. Midweek classes may be Web-supported, and the weekend classes are partially Web-based using hybrid delivery systems. This program requires students to use personal computers and information technology as a part of the learning process. Adult students engaged in Web-based or Web-supported learning are likely to demonstrate some level of computer fluency because of the need to integrate that technology into the curriculum. This combination of adult students who are somewhat computer fluent practitioners and a convenient location made this site highly desirable for the research that was conducted.

Research Question

Are there significant differences in computer fluency among adult students that can be attributed to the demographic variables of age, ethnicity, SES, gender, educational background, and personal circumstance?

Theoretical Framework

Computer fluency is a term used to describe a higher cognitive level of computer competency. The 1999 NRC definition of computer fluency was a collaborative statement that looked beyond simple technical literacy and "defined the level of understanding of information technology sufficient for lifelong self-education" (Lowell & Snyder, 1999, p. 2). To define understanding it was necessary to explore the three variables; "intellectual capabilities, conceptual knowledge and appropriate skills sets" (NRC, 1999, pp. 2-3). The NRC utilized an expert group made up of five computer scientists and two educational scholars who collaboratively developed the term "computer fluency" and its attributes. Computer fluency initially was described as an advancement of the already established and understood acquired skills connotation, which implied a personal competency with a few of today's computer applications, such as word processing and email (NRC).

The acquisition of computer fluency is enhanced by the pedagogical approach that seeks to balance each of the three elements of computer fluency, enabling the individuals to continue learning over a lifetime. It is a reasonable construct for this study. The NRC definition was written in anticipation that these "three interrelated dimensions" (NRC, 1999, p. 7) would continue to "advance along a continuum" in much the same way that lifelong learning does [see Table 1.1].

Table 1.1
The NRC FITness component identifiers

Intellectual capabilities	**IT conceptual knowledge**	**Appropriate IT Skill-sets**
Sustained reasoning	Computers	Setting up a PC
Managing complexity	Information systems	Using basic OS features
Test a solution	Networks	Using WP to create a text doc
Manage problems in fault situations	Digital representation of information	Using graphics
Org and navigate structure	Information organization	Connecting to a network
Collaborate	Modeling and abstraction	Using the *Internet* to find resources
Communicate to other audiences	Algorithmic thinking	Using a PC to communicate with others
Expect the unexpected	Universality	Using a spreadsheet to model simple processes
Anticipate change in technologies	Limitations of IT	Using a database to set up and access information
Think about IT abstractly	Societal Impact	Use instructional materials

Source: Being Fluent with Technology, National Research Council, 1999. National Academy Press.

The concept of lifelong learning is especially important, considering the pace of evolutionary change at which IT is moving. Many IT innovations are very new, and by definition they may not be deeply understood because of their recency. A consequence of this speed of evolution is that it will be necessary for our workforce in the 21st century to be prepared constantly to acquire new skills to match the anticipated changing face of IT.

The theory of andragogy (Knowles, 1980) provided a seminally supportive conceptual understanding of the field of lifetime learning, and in particular adult learning. Andragogy refers to the process of instruction for adults that sets them aside as a group from traditional-age learners. Over the course of this study I will be working with adult students who are matriculating towards graduation. As a group many of the adults are united by the basic needs for: new knowledge to improve job search possibilities; personal growth through professional development; opportunities to improve job and career aspirations; and the

physical need to stay healthy and to develop self-esteem (Knowles). It is by pursuing education that many people satisfy these personal needs (Knowles).

Building on the concept of lifelong learning, it is important to remember that when adults enter higher education they are often doing so in a transitional state. This process aligns with the theory of transition (Schlossberg, 1984), which identified four factors that influence how individuals will cope with the transition: the situation, the self, the supports, and the strategy (Figure 1.1). Transition theory has applicability for adult students who may use personal computers in on-line, hybrid, and personal environments as a support and strategy through the process.

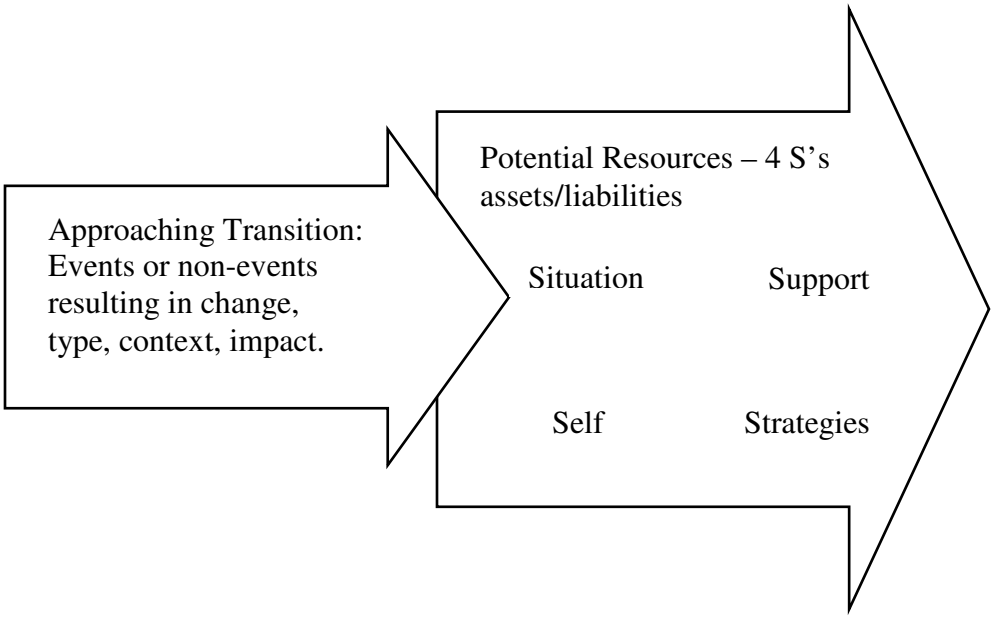
I expected to find that many of the study participants would be experiencing their own period of personal transition. It will be important to remember continually that this dynamic may play a role in the success of adult students engaged in degree completion programs. In the methods section in Chapter 3, I discuss the inclusion of a personal circumstance question that was incorporated into the survey instrument to acknowledge this component.

Schlossberg's (1984) model (Fig. 1.1) clearly demonstrates how social "environment has an impact on transition problems [and how it] builds on occupational environment factors affecting personality and learning" (p. 5). For many adult students, being among fellow adult learners is a welcomed opportunity to learn in such a socialized environment.

To understand further the components of the transition model in Fig 1.1 through the lens of situational factors that Schlossberg (1984) described, listed variables are outlined in Table 1.2. This table identifies situational triggers, previous experience, and concurrent stress. All these variables are echoes of the incentives for adult learning that Knowles (1980) described when he talked of the uniting factors for adults undertaking education. It is

important to remember that as adults approach a transition that results in change, one option may be to return to college. For returning adult students, their personal level of computer fluency may be influential in their success.

Figure 1.1
The transition process[1].



[1]Source: Schlossberg, N. (1984). *Counseling adults in transitions*. New York: Springer.

The interaction effect of the situational factors may result in change. For example the decision to return to college to effect a personal change combined with personal characteristics of self-efficacy using technology for that person can potentially lead to success in that transition. Schlossberg (1984) identified support from family, friends, and networks as a component of the transitional process. An extension of that network may be the classroom colleagues and students with whom the returning adult student connects, essentially developing a social learning network within the educational environment.

The premise of social learning (Bandura, 1977) evolved from the perspective that we can learn by observing others, and that modeling others' behaviors can have a direct and

positive influence. This study takes into account that many of the adult students who are engaged in study are either in full-time or part-time employment. The workplace may provide the opportunity for exposure to other computer-fluent individuals, meaning that social learning is not only possible in the classroom, but also in the workplace.

Table 1.2.
Factors demonstrated in the transitional process[2]

Situation: Trigger Timing Control Role change Duration Previous experience Concurrent stress
Support: Types (intimate, family, friends, institutional) Functions (affect, affirmation, aid, honest feedback) Measurement (role dependent, stable & changing support)
Self: Personal characteristics (SES, gender, age, heath, life stage) Psychological characteristics (ego development, outlook)
Strategies: Coping responses (info seeking, direct action, inhibited action) Categories (modify situation, control meaning, manage stress)

Source: Schlossberg, N. (1984). *Counseling adults in transitions:* New York: Springer.

The combination of workplace and classroom can create opportunities for social learning for adult students. When students identified themselves in this study as coming from widely differing occupations, it was possible to see if career and job backgrounds impact or shape individual levels of computer fluency. Further, this study will allowed me to test the proposition that personal circumstances may interplay in the demonstrated levels of computer fluency among adult students.

Significance of the Study

The significance of this study is that it may allow educators to apply sound andragogy principles in continuing education settings to address better generational access dichotomies in performance. Significant differences in computer fluency among adult students in this study attributable to the demographic variables identified in the research question, could lead to the development of early interventions for academic success.

The study findings have potential benefits for educators; in particular, curriculum designers, lecturers, teaching faculty, and program developers. For any of the prior-mentioned groups, being able to develop a linear regression model to assist future predictions for likely levels of computer fluency among non-traditional students could be highly advantageous.

Definition of Key Terms and Acronyms

This section provides definitions of terms and acronyms that were used throughout the study. For many terms there is a high level of interchangeability, and where applicable this is noted in this section.

Andragogy - the theory of adult learning developed by Malcolm Knowles (1980) that places a strong emphasis on the self-direction and responsibility that learners take. The theory has a strong focus on process, and less on the content being taught.

Computer fluency - a term applied by the National Research Council to best capture "the ability to reformulate knowledge, to express oneself creatively and appropriately, to produce and generate information" (NRC, 1999, p.6) using computer technology. The term is used interchangeably with literacy throughout this study.

Information Technology (IT) – any hardware or software operated by an institution to

accomplish a function, irrespective of the technology vehicle involved, whether computers, telecommunications, or other.

Adult learner – used interchangeably with non-traditional students, and to a lesser extent older learners. Throughout this study, I used adult learner as the term defining a person not considered a typical undergraduate college student (usually aged 17-23).

Personal computer (PC) – any variation of desktop, laptop, notebook, or personal digital assistant (PDA) used by an adult student for educational coursework.

MP3 file - MP3 is an acronym for MPEG-1 or MPEG-2 audio layer 3. MP3 is the extension for MPEG audio layer 3. Layer 3 is one of three coding schemes (layer 1, layer 2, and layer 3) for the compression of audio signals.

Summary

Coinciding with the marked increase in technology investments, there has also been a huge increase in the population of adult learners attending degree-granting institutions. Given that non-traditional students "now make up the majority of learners in higher education," (Ausburn, 2004, ¶ 1) and that information technology is widespread (NCES, 2005), persistence and degree completion have the potential to be enhanced through the utilization of accelerated learning and hybrid technologies. The opportunity to teach using multiple delivery methodologies opens up access to groups of adult students who were unable to take face-to-face classes or commit to semester length coursework.

In the context of these differing markets—on-line, hybrid, and F2F—it is not only socioeconomic variables that impact adult learners. Overall we have more participants, large investments in IT infrastructure, evolved teaching methodologies utilizing IT— all adding greater possibilities and potential to enhance the nontraditional student degree completion experience. In this study, I demonstrate how the intersection of demographic variables; age,

ethnicity, SES, gender, educational background and personal circumstance impact the computer fluency of those participants.

By providing a broader understanding of the contextual issues surrounding IT evolution, hybrid learning platforms, and the increased participation of adult students in higher education, this study furthered the body of knowledge surrounding the intersection of these variables. In Chapter 2, a review of the current literature provides a foundation to deepen that understanding. In particular, review in the key areas of fluency, andragogy, access, transformative learning, and under-represented student population positions this study to build on the existing literature.

CHAPTER 2

LITERATURE REVIEW

During the development of the dissertation line of inquiry, it became apparent that in some areas of information technology (IT), the research, development, and implementation of emergent technologies are happening at lightning speed. In many cases cutting-edge technological advancements have not allowed the literature based around that emergent technology to catch up. One example of this would be integration of MP3 files into online learning modules and podcasts; there is a lot of it happening, but very few studies assess the operationalization of that emergent technology. This point was reinforced by Kim and Bonk (2006) who found the following looking at online teaching and learning in higher education:

> Technology has played and continues to play an important role in the development and expansion of online education. Accordingly, many universities have reported an increase in the use of online tools. Over the past decade, countless efforts have sought to integrate emerging *Internet* technologies into the teaching and learning process in higher education....although some discussions in the literature relate to effective practices in the use of emerging technologies for online education, empirical evidence to support or refute the effectiveness of such technologies, or, perhaps more importantly, guidance on how to use such tools effectively based on empirical evidence, lacking. (pp. 23-24)

The majority of the literature reviewed for this study, especially based around IT, was written or published between 1998 and 2006. For more depth on adult learning theory and its evolution, I was able to draw on literature spanning a quarter century, going back to Knowles (1980) and more recently Brookfield's (1998) work. For social learning and transition theory, Bandura (1977), Vygotsky (1978), and Schlossberg (1984) were some of the oldest, but still

relevant, sources consulted. Framing a literature review based on the holistic picture of all the literature reviewed, I have found the breadth available has enabled me to develop a compelling argument in support of this research.

Early into this review of literature it will be important to outline the difference between computer fluency and computer literacy. This section is framed by work done predicting the future trends and the upcoming second wave of online learning using IT (Toffler, 1991). More recently, projections on the rate of growth for online learning (Martyn, 2003) and research on the expansion of e-learning in the context of a global society (Marginson, 2004) demonstrate this evolving trend. The failures and successes of the global phenomenon of online learning are explored by Zemsky and Massey (2004a).

In this review, I seek to further understand how adults learn, and how age, ethnicity, SES, gender and educational background impact personal computer fluency, drawing on studies and recent datasets (NCES, 2004, 2006, 2007; NPEC, 2004, U.S. Department of Commerce, 2001). Many adults are challenged to be able to attend college and this access issue is understood well (O'Banion, 1997). One successful strategy is to undertake either online or hybrid classes; this topic is built on by Irvine (2000) and Zull (2002). The *Internet* pedagogy that enables adults to be successful is the central topic of Furr's (2002) contributions to the literature.

All of the technology options for degree completion are explored: the shifting emphasis of technology in the curriculum (O'Banion, 2003); e-learning (Zemsky & Massey, 2004a); fully in-class, Web-supplemented, Web-enhanced, Web-hybrid, and fully online (Mullinex & McCurry, 2003). Considering these options as shifts in societal learning, I looked at Cahoon's (1997) study on workplace socialization built on Bandura's (1977) earlier work. Recent research in the field of transformative learning (Zull, 2002) has explored the

concept of enhancing personal computer fluency. The enhancement of learning was examined by Tapscott (1998).

In the concluding section of this literature review, I examine the benefits adult students gain when they do have access to continuing higher education. Brookfield (1995) identified IT as holding the promise of the future for adult learners, and more recently Hopey (1998) evolved a short list of educational benefits for adults using IT to learn. These readings and supporting articles provide a context to understand better the dynamic aspect of adult students using IT in support of degree completion. They support and produce a compelling argument for this study, that of assessing the computer fluency of adult learners.

Computer Fluency versus Computer Literacy

In 1983, *Time Magazine* recognized the evolving global technology shift, and named the personal computer as "The Machine of the Year." Since then the evolution in the field of IT and the growth in online education has been occurring "at an astounding rate" (Martyn, 2003, ¶1). The rapid and divergent evolution of information technology (U.S. Census Bureau, 2001) has brought the sector to a position of market saturation. Projections by the International Data Corporation that "90% of all higher education institutions will have e-learning programs" (Martyn, 2003, ¶ 1) have given the impression that most Americans either have access to or own a personal computer (PC). Data from 2000 show that "2 in 5 households had *Internet* access" (U.S. Census Bureau, 2001, p.1), and therefore for many this is not the case.

There still exists a digital divide between the "information haves" and "information have-nots" (Atwell, 2001, p. 253). This dichotomy is discussed as an almost sociocultural evolution, describing the first digital divide as one of access especially among under-represented student populations and those from lower socioeconomic status (SES). Atwell

summarized the second divide as one of technology, acknowledging that although many more students now have access to a personal computer there may be very "little educational computing going on" (p. 256). It does not necessarily follow that the students who have access to personal computers in the home are going to be any better prepared from a literacy perspective to utilize PCs in college. This condition is further elaborated upon by NRC (1999), which recognized that "many people approach computers tentatively and with little confidence, even if they have been using computers for years" (p. 5). The paradox means more infrastructure, more citizens, more access, and more computers but still not more computer-literate citizens. As we move through and adapt to this technological and social transformation, it would appear we are experiencing the digital divide that Toffler (1991) outlined, the social gap between those who have access to and use computers and the *Internet*, and those who do not. In particular, Toffler (1991) described this third wave as the concept of a third technological revolution, following the agricultural and industrial revolutions.

Some experts in the field posture that aside from the digital divide we are currently experiencing a second wave of online learning, after the first wave of Internet adoptions in the late 1990s (Kern, Ware, & Warschauer, 2004). The waves can be defined by the context of users in combination with computer system device (Wayne, 2007):

- First wave: one device, many users (e.g., mainframe systems)
- Second wave: one device, one user (e.g., the personal computer)
- Third wave: many devices, one user (e.g., combination of smart-phone, MP3 player, and laptop)

- Fourth wave: many devices, many users (e.g., pervasive computing systems with multiple interconnected devices embedded in a room and available for anyone to use). (p. 16)

Many start-up companies and organizations exited almost as quickly as they got into the market with the advent of the dot.com boom and subsequent dot.com bust. From institutions of higher education, unlike corporations, there has been a strong commitment to stay the course. Many will argue that as a field, higher education has not failed. Irrespective of personal points of view, it is important for the benefit of future generations to balance this argument with a willingness to examine why many ventures into e-learning did fail. Marginson (2004) identified points that should be considered by educators as they strive to improve the technological and online learning experience.

- Higher education provided largely or completely online is different from face-to-face programs.
- Online education has an important role as a complement to the traditional face-to-face (F2F) education.
- The fuller pedagogical [and andragogical] potentials of online technologies have yet to be explored; in particular, providing online programs solely in English language considerably narrows the potential market.
- The lead times to establish viability in a global market for online education were longer than expected.

It is important to recognize that Marginson (2004) concentrated his research on the viability of on-line learning in the Asia Pacific market. His points, however, fit in a broader global perspective. A broader perspective is akin to the technological determinism that

Friedman (2005) talked of: “If we create an Internet where people can go open an online store ... they will open that online store” (p. 374).

A similar approach for technological determinism can apply to online and hybrid technologies in higher education: If we create institutions where adult students can study partially or fully online they will use them. This is exactly the point that Zemsky and Massey (2004a) made: “If we build it, they will come” (p.iii).

In recent years the enterprises that set out to provide online and hybrid learning for adult students have not always paid off. Good examples of these failed enterprises include:

- NYU invested $21.5million over three years in an online division (Marginson, 2004). With only 166 students at the end of 2000 it was closed as a separate division of NYU.
- U.S. Open University closed in 2002 after only three years of operation, having invested $27 million on the venture, during which enrollment peaked at 1,500 students (Meyer, 2006).
- Maryland spent $40 million for distance learning at UMUC (Marginson, 2004). UMUC Online folded and merged into another division in 2001.
- Temple University discontinued distance education in 2001 (Marginson, 2004).
- UK e-University was given a three year £62 million government grant to provide degrees in a global market (Marginson, 2004). UK e-University collapsed in 2004 with only 900 students out of a projected 5400 students enrolled over a four-year period.

Suggested reasons for recent failures have been that they were due to using “flawed models” (Greenagel, 2004, p. 1) or even “the absence of positive role models and clear best

practices" (Tinkle, 2005, p. 18). Another perspective to consider is that, although the institutional closures demonstrate that e-learning might have failed, "online higher education has not failed" (Marginson, 2004, p. 99). Online learning still has an important role as an alternative to F2F education. As long as there are adult and "working students," online education will have a role (p. 100), and for some the "lure of anywhere-anytime learning will prove irresistible" (Zemsky & Massey, 2004a, p. 59).

In their recent work, Zemsky and Massey (2004b) looked a lot deeper into reasons for the boom and demise of the dot-com world. They speculated that there were two main reasons for the boom: first, entrepreneurs were quickly trying to get a market foothold before other players did, and, second, it generated a huge anticipation for the production and supply of Internet-based services. Furr (2003) considered that the boom was an opportunity to deliver quality content and not merely a "quick-fix" (p. 2). To continue to deliver and maintain quality will require educators to use a process of continuous improvement, "transforming pedagogy through experimentation and the development of interactive modalities [as] an ongoing process [rather] than a finite stage in realizing the potential of *Internet* technologies" (Furr, 2003, p. 2). The implication from Furr's ideas is that you cannot just do on-line learning: you have to re-do, re-assess, and review online learning as an ongoing process. This requires "a commitment to organized quality processes that transcend curricular innovation [and] stress technology as an important tool for improvement" (Zemsky & Massey, 2004a, p. 57).

It does not appear that higher education as a sector comprehended that assessment would need to be a continuing improvement process while information technology constantly evolved. Experts and advocates at the time stated, "The necessary expertise was in hand or soon would be" (Zemsky & Massey, 2004a, p. 57). Data supplied by the *Weather-Station*

Project show that "large amounts of time, effort and capital [were] committed to e-learning development" (p. 57). The inference is that the commitment to e-learning development needs to be matched by a commitment to the continuous improvement of e-learning. This will be especially important for continuing education (CE), where the increased participation rate of adult students (DeGabriele, 2001) brings potentially more adults into online and hybrid learning institutions.

Andragogy and the Impact on Personal Computer Fluency

Educators nationwide are learning to deal simultaneously with the ever-increasing participation rates of adult students in higher education (DeGabriele, 2001) and the increased participation of users expecting and wanting to learn primarily through the use of Internet technology deliverables. This dilemma has been recognized by leaders in higher education: "Three-fourths of academic leaders at public colleges and universities believe that online learning quality equals or surpasses face-to-face instruction" (Ruth, 2006, p. 22). In the United States, the number of domestic computer users continues to increase, "up from 42% of households with one or more computers in December 1998, to 51% by August 2000" (U.S. Department of Commerce, 2001, p. 1). A more recent survey undertaken by Market Segment Research reported that 64% of the population owns a personal computer (WOW!, 2003, p. 222). The number of domestic owners has far exceeded the earlier projected 2003 level of 56% household penetration rate that Morrisette reported (1999, ¶ 5). The global picture of meteoric expansion is similar; currently there are 525 million PCs in use, with the expectancy that another 150 million more will be added by 2010 (BBC News, 2004), netting 675 million.

The continued increase in available PCs has not been mirrored by advances in the computer fluency of users. When you consider that "hundreds of millions of dollars [are]

spent each year on technology initiatives" (Mott & Granata, 2006, p. 48), it would be reasonable to expect to see advances in the way users develop their technology skills. Prolific levels of PC ownership are actually showing a low level of technical literacy. Pearson and Young (2002) described this as the "unacknowledged paradox" (pp. 70-71). This issue had been identified first two years earlier when the U.S. Commerce Department (2000) acknowledged that the digital divide remained. The paradox of technical literacy also can be exacerbated by the social setting, especially where people live or work (Williams, 2003), because the variables of access and SES and educational background potentially can affect the computer fluency of each person.

Recent data show computer access and usage patterns are increasing (NCES, 2006) and are matching the business growth model (Hisrich & Peters, 1998) that other emergent technologies—in particular VHS video recorders, cassettes, DVDs, CDs, cell phones, and personal computers—have demonstrated previously. There is also a growth in the range of delivery modes for the information technology we use: "interactive television, video and audio conferencing, Web technology, multimedia simulations, optical storage technology (CD-Rom and CDI), video-based telecourses" (Levenburg & Major, 1998, p. 1), and more recently video-streaming, MP3 files, and pod-casting. The mere fact that many of those mature technologies can be written about and quoted without the use of a parenthetical explanation demonstrates how mainstream some of these evolved technologies have become.

The current explosion of Internet usage within the United States is moving at a lightning pace, and much data exist to document the trend (NPEC, 2004; NCES, 2006, 2007). One estimate of "two million new Internet users per [calendar] month," (NPEC, p. 83) reaffirms the impact. A 2003 survey found that 91% of all students in K-12, and 97% of the high school students sampled were using computers. Data for access were similar with 57%

of all K-12 students and 79% of high school students using the Internet (NCES, 2006). This phenomenal growth is rapidly approaching the point where over half the population of the country will be online; a point validated by the last census which reported that "51 percent of households had a computer" (U.S. Census Bureau, 2001, ¶ 2).

Alvin Toffler (1970) stated, "The illiterate of the 21st century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn" (p. 367). While some might argue this statement has generic applicability for all in the job market, I find it to be particularly relevant in the context of technological evolution in the twenty-first century. Toffler's (1970) comments seem appropriate in light of the constant learning of new technology-based skills that adults will need to undergo, followed by periods of unlearning as emergent technologies break through and replace older inferior ones (Dychtwald, 1999). If Toffler (1970) was correct, we can project that adult learners with developed computer fluency skills are likely to be more adaptive, and those who are not will be challenged.

Even though the perception still exists that older mature students cannot learn (Dychtwald, 1999) [you can't teach an old dog new tricks], it is hard to argue with the data. An AARP study completed in 2001 found that 61% of those in the 50-64 age group, a considerable sub-set of nearly 25 million adults, consider themselves "online" (www.aarp.org/olderwise, ¶ 2). Similar analysis from the U.S. Census Bureau, however, showed that in the 55-64 age group only 31% considered themselves "online"(2001, p. 6). Irrespective of the discrepancies in the data, there is obviously a large group of older adults embracing technological change and using it daily.

Access for Under-Represented Adult Student Populations

For many adult students one or a combination of factors—low literacy rates, restricted access, the digital divide (those who have Internet access versus those who do not),

educational background and lower socioeconomic status (SES)—are barriers to inclusion and advancement. This scenario is especially true for students whose families earn under $20,000 per year. This group includes "students in poverty, students whose parents have less than a high school credential, Black (non-Hispanic) and Hispanic students and students in households where Spanish is the only language spoken" (NCES, 2005, p. 3). All of those factors can be disadvantageous toward student participation in higher education (NCES, 2005). Nowadays just wanting to be enrolled in online learning is not enough, especially when adult students from an "advantaged background are twice as likely to be using Internet technologies as those from these lesser advantaged backgrounds" (NCES, 2005, p. 3). For adult learners, the incorporation of technology into any curriculum should be seen as more "than just making it work" (Fidishun, 2000, p. 2). The process of including technology actually needs to help students become self-directed, as Knowles (1998) noted, as well as enable reflection on the learners' experiences and allow them to apply knowledge.

Using online and hybrid learning technologies is conducive to providing an environment that is "free of racism, ageism and sexism" (O'Banion, 1997, p. 72). The anonymity that arises out of learning in a virtual classroom whether it is synchronous or asynchronous allows adult students to participate equally regardless of race, ethnicity, gender, disabilities, cognitive style, or personality traits (Irvine, 2000). In earlier studies, Irvine (1999) observed this pedagogy to be less teacher-centered (1999) because many of the non-verbal indicators and conventions are lost in the virtual message. Since then, Martyn and Hura (2004) have extended the dialogue further along gender lines, acknowledging there are few documented gender differences in learning. Their research did find that, "males show more favorable attitudes toward computers" (p. 26). More recently, changes in that trend are

appearing, especially among females' use of e-mail, "consistent with their stronger motive for interpersonal communication" (p. 27).

The prejudices and biases that can exist in a traditional F2F classroom setting potentially can be avoided to a large degree with online instruction. As Zull (2002) described, "A computer cannot tell if a student is black or white, male or female, young or old, fat or thin, ugly or pretty, tall or short, dirty or clean, passive or aggressive" (p. 72). In her research on virtual harassment, an alternative perspective was offered to this argument; "on the Internet, as in life men dominate discussions about women" (Ferganchick-Nuefgang, 1998, p. 3), implying that even online classroom discussions may experience gender bias. Although the computer cannot tell, as Zull stated, the active learner can, and it is easy to understand how strong participants, in particular males, could dominate discussion groups and list-servs. It is important to remember here, that as in the traditional classroom a key to success in the virtual classroom is moderating the discussion.

Adult students are often learning from a position of physical anonymity when engaged in on-line learning. However, a question that might need to be asked is: Does it make the personal attributes such as age, ethnicity, and gender immaterial to the instructional design process for online technologies? Early into his book, Zull (2002) talked of "learning how to learn" and "teaching" (p. 19); in both cases he believes being successful is up to the student. This concept seems to build upon earlier work by Bloom (1956) who included learning how to learn as one of the six major categories in his taxonomy of significant learning. Furr (2003) further developed the idea, advocating that what has to happen is to enable scholarly inquiry in an online environment. If educators and teachers are successful at doing that, then I agree with Zull; they are doing their part. The research areas that Zull identified do not reveal evidence that using technology in the classroom or in support of the

classroom demonstrates any significantly different student outcomes. As Levenburg and Major (1998) described it when discussing the 248 reports they studied, technology is a "neutral factor, in terms of academic achievement" (p. 1).

Reflecting on his involvement with Internet-based classes since 1992, Furr (2003) identified five stages of Internet pedagogy—class management, interactivity, digital texts, multimedia, and deep reading. A comparison of Furr's model of Internet pedagogy with Bloom's taxonomy of significant learning (as cited in Fink, 2003) is presented in Table 2.1. Course management using Internet technology becomes just as crucial when setting the tone and context for a hybrid/online course as having the foundational knowledge in a traditional F2F class. Interactivity through online and hybrid course facilitation is similar to integration in a F2F situation.

Table 2.1
Comparison of educational goals

Stages in Internet Pedagogy	**Bloom's Taxonomy of Significant Learning**
Class management	Foundational knowledge
Interactivity	Integration
Digital texts	Learning how to learn
Multimedia	Application
Deep reading	Human dimension/caring

Adult students who are already mature and utilizing digital texts demonstrate that the learners have the capacity to learn how to learn. In a similar way, use of multimedia shows a technological application of the knowledge. Furr (2003) discussed Internet pedagogy evolving into deep reading for the student, not a deeper humanistic care as promulgated by Bloom (as cited in Fink, 2003).

There are already well-established "significant learning differences" (O'Banion, 1997, p. 87) between genders and also among cultural groups. This point has an impact for online and hybrid course delivery, although as previously stated, adult students do enter this type of learning from a position of physical anonymity (Zull, 2002). Educators in the Midwest, for example, are facing rapidly changing regional demographics, including a 32% increase in the Latino/Hispanic populations (U.S. Census Bureau, 2000). For those institutions that show a marked change in multicultural enrollments, the challenge may be to find a delivery methodology that works across all or many cultural groups. It also will be important for faculty not to stereotype all learners within a cultural group as having similar learning preferences (O'Banion, 1997), irrespective of the age of the student.

Technology Options for Degree Completion

E-learning describes the opportunity to integrate Internet-based technology with pedagogy. In the area of e-learning, Zemsky and Massey (2004a) identified that the use of online technology fitted into three defined categories: e-learning as a distance concept, e-learning as a facilitated transaction, and e-learning as electronically mediated learning. Mullinix and McCurry (2003) talked in detail about how using differing areas of technology can combine to facilitate an effective course through influence and expectations; defined learner expectations, instructor expectations, and institutional expectations. Their technology continuum (Figure 2.2) also demonstrates the broad reaching scope of technology options for

educators. It demonstrates a range from the traditionalist perspective for fully in-class learning all the way through to the modernist perspective, which embraces technology and is fully on-line.

Figure 2.1
The technology continuum for course delivery

Fully in-class (F2F)	*Web*-supplemented	*Web*-enhanced	*Web* hybrid	Fully online

Source: Mullinix, B.B., & McCurry, D. (2003). Balancing the learning equation: Exploring effective mixtures of technology, teaching and learning. *The Technology Source*.

To consider how technology can work with adult learners, it is important to understand that there are a variety of technology-based methods for course delivery shown in Fig 2.2. Irrespective of the methodology for course delivery, an adult student is going to need to have computer fluency skills to successfully navigate all except the F2F course. The pedagogical perspective for each technology category is defined as:

- Fully in-class: usually referred to as "face-to-face" (Mullinex & McCurry, 2003, p. 1) with a total focus on contact hours, and to a limited extent supporting the learning experience with technology.
- *Web*-supplemented: "as the Web use increases the classroom time remains constant" (Mullinex & McCurry, 2003, p. 2). Web-supplemented courses are on-campus courses that include supplemental, online materials. Many faculty take advantage of this format to "enhance and enrich the student's learning experience" (http://www.pct.edu).
- Web-enhanced: This format for "learning helps teachers reflect on how to use the Web purposefully and intentionally to access information and human resources in a manner that is conducive to learning" (http://www.ed.psu.edu). The enhancement is

demonstrated by the addition of Web resources that are added by instructors to their preferred methods of teaching.

- Web hybrid: "In hybrid courses instructors blend in-class experience with the online delivery of course material in order to manage their total time spent preparing for the class, as well as to balance the two learning environments" (Mullinix & McCurry, 2003, p. 2).
- Fully online: This is a learning environment where student and instructor are unlikely to meet. All materials are posted electronically via a personal computer and all communication, coursework, and discussion happens through a virtual portal. There is confusion about this terminology, even among higher education faculty and administrators; when asked, many would reply that it depends what you mean by online learning (Anelle, 2005).

Previous studies have shown that the use of technology balanced with the need to maintain instructional effectiveness is a dilemma that has not been lost on educators; "Eighty four percent of campus leaders indicated [that] more effective use of technology in teaching and learning was the most important issue on their campuses" (O'Banion, 1997, p. 65). Recent data showed that 81% of institutions of higher learning surveyed have or are "offering at least one fully online or blended [Web hybrid] course" (Abboud, 2004, p. 2). A majority of the group (67%) stated they "thought online education is a critical long-term strategy for their institution" (Abboud, p. 2). This finding is compelling when you consider that four out of five leaders in higher education not only think it is important to integrate this technology into curriculum, but that they also see it aligning with long term institutional goals (Neuhauser, 2004; Tinkle, 2005).

O'Banion (1997) recognized the importance of the shifting emphasis during the previous decade. He identified many educators who recognized and embraced the new emergent technologies.

- Heterick talked of technology as "the primary vehicle by which institutions of higher education are going to re-engineer the teaching and learning process" (1992, p. A17, cited in O'Banion, 1997, p. 64).
- Privater saw this new technology as creating "new philosophies, new concepts and new ideologies" (1993, p. 13, cited in O'Banion, 1997, p. 64).
- Baker saw that technology gave an opportunity to "create what we want, not settle for what we have" (1994, p.1, cited in O'Banion, 1997, p. 64).

O'Banion's (1997) summary point is that the critical mass of innovation will "serve to influence the rest of higher education in the coming years" (p. 65) because so many educators have met the evolution of technology with arms outstretched.

Although not considered cutting-edge technology, hybrid delivery models are being used by an increasing number of colleges (Young, 2002). Some already have reported extremely high attrition rates in degree completion courses by adult students using blended and/or online learning models. The University of Phoenix Online in 2004 could demonstrate only that 2% of adult students who started at the institution completed and graduated in a four-year period (http://www.nces.ed.gov/ipeds/cool/index.asp). This kind of statistic understandingly brings out the critics of blended and online learning who might support the perspective that learning is social and that "computers are used individually, therefore they inhibit learning which is done socially" (Tapscott, 1998, p. 136). However, advocates who are excited about hybrid delivery have gone as far as to say that it is "the single greatest unrecognized trend in higher education today" (Young, p. 2). Both perspectives reinforce the

need for adult students to be computer fluent, so that they can engage competently in the learning process using either hybrid or online technologies.

Social and Transformative Learning

A prior qualitative case study looking at "how adult learners developed personal computer skills in the context of the workplace" (Cahoon, 1995, p. 7) described how individual, workgroup, and organizational learning evolved as a result of the work place socialization process. Most of the participants in Cahoon's study agreed that informal and somewhat vicarious learning through mutual problem solving and coaching had been the preferred resource for personal skill development.

The workplace socialization process that Cahoon (1995) discussed built on Bandura's (1977) earlier work on social learning theory. Observing colleagues and modeling behaviors is the crux of Bandura's theory. He found that through "observing others one forms an idea of how new behaviors are performed ... this coded information serves as a guide to action" (p. 22). Adults observing colleagues using personal computers in the workplace, can create an opportunity for social learning and enable adults to transform their personal computer fluency.

The concept of transformative learning was built upon by Zull (2002), who broke the transformational learning experience into three separate pieces. Zull identified the three key areas where information in the brain changes into understanding: "transformation from past to future, transformation of the source of knowledge and thirdly transformation of power" (p. 33). Zull was building on Kolb's (1981, pp. 232-255) "learning styles," which should come as no surprise as the two worked side by side for a decade (Zull, 2002). The past to future element of Zull's theory may be considered in terms of reflective learning (Brookfield, 1998;

Knowles, 1998). The concept of reflection is situated in concrete experience, which helps explain how the reflective process also can be transformational.

Differences in Learning and Success with Technology across the Lifespan

Having discussed what technology is and in particular e-learning, it is important to go back to the starting comment and remember that just because it has been said, "if we build it they will come" (Zemsky & Massey, 2004a, p. 57), this programmatic design philosophy does not necessarily translate into success. There is a litany of examples that will bear testament to the experiences of adult learners using computers to support their learning (Tapscott, 1998). The intuitiveness that evolved through childhood, which allows many of today's millennial students (b.1982-2003) to easily learn technological interaction, is sadly missing from the many senior citizens, baby boomers (b.1946-1964), and to a lesser extent the generation X'ers (b.1965-1980). The latter groups simply did not grow up with technology in place, and because of their time of entry into the world they often demonstrate inability for intuitiveness with IT (Howe et al., 2003).

For the adults who do own or have access to a personal computer their personal comfort level may not extend much beyond playing digitally enhanced games on the screen using a playing console (DaBell, 2006). The significant learning point that Tapscott (1998) discussed was that integration of technology with adult learning does not happen quickly nor is it simply intuitive. It actually occurs slowly over generations, and as O'Banion (2003) remarked about technology; "it is neither a magic bullet nor a broken arrow; it is simply a tool" (p. 70). This is a tool that is used increasingly. Ownership of personal computers by traditional age students is at 33%, educational faculty at 50%, and 55% of all adults own a computer according to census data in 2000 (U.S. Census, 2001). DaBell (2006) suggested this figure is now running at closer to 60%. As more people purchase personal computers to

use outside of the workplace, more institutions will be able to "build a firm foundation for the creation of the learning college" (O'Banion, 2003, p. 71).

It was not that many years ago that we anticipated all of our children "[would] take to e-learning like a duck to water" (Zemsky & Massey, 2004a, p. iii). The reality is that their preference is to be connected with each other, [but] not especially focusing on e-learning (Zemsky & Massey, 2004b). Cahoon (1995) explained that the most skillful adults progressed to adapting computer resources to work requirements. First "the transition from novice to experienced user, a process that a learner may enact many times, depends on self-directed learning and on informal knowledge sharing within work groups" (p. 62). Second, "participants who had already learned to use one or more word processing applications could learn another word processing application far more quickly than a novice" (p. 64) reinforcing the efficiencies of the transformative learning experience (Furr, 2003).

A learning point that evolves from Cahoon's (1995) study is that adult students using online or hybrid technologies may learn at differing rates through situational exposure, hence the need to enact the process many times. Self-directed learners, all categorized as adults by definition of being in the workplace, developed faster when they "asked questions, learned more than one software package and where able to adapt the personal computer to their own needs" (p. 66). Cahoon (1995) found that the learning rates of novice computer users [defined as those who struggle to achieve routine tasks] are different than those of experienced users who can perform tasks with ease. This finding helps to explain how adult students engaged in online learning can be intellectually equal to each other but perform at differing academic levels.

The Benefits and Gains of Adult Learning Using IT

In his paper, "Postscript: An Agenda for Research and Policy" (1995), Brookfield developed thoughts on technical literacy for the adult learner a little further. He identified a key point; that access to "computer technology appears to hold the promise of providing educational opportunities for all those who have previously been prevented from participating in adult education by the constraints of place or time" (p. 9). This comment appears to refer to the concept of using either synchronous or asynchronous instruction for learning. Synchronous e-learning occurs where both the instructor and student connect in real time through the interface of the computer, whereas in asynchronous e-learning the acts of learning and the acts of teaching are not simultaneous. Brookfield's (1995) reference to the promise of educational opportunity connects back to my starting premise, "if we build it they will come" (Zemsky & Massey, 2004a, p. iii). The question remains: Will adult students know how to use it (IT) when they get there?

The investments by educators in IT infrastructure (Zemsky & Massey, 2004a), combined with the increase in adult students attending college (Capelli, 2003; DaBell, 2006; DeGabriele, 2001), opens up the possibility of many adults entering higher education who may not know how to utilize IT. The interaction effect of increased adult participation combined with unfamiliarity with IT could precipitate an increase in drop-outs and lowered persistence rates at colleges as students struggle to grasp and learn new technologies.

Brookfield (1995) had identified years earlier that issues based around "access and equity" (p. 9) were not being addressed by policy makers. This statement reinforced the concept of the haves and have-nots in regard to access to higher education. For many adult students, who now make up the new majority in higher education (Ausburn, 2003), regular uninterrupted access to a PC, and/or the Internet continues to prove to be impractical.

Hopey (1998), in a review of the literature, provided a short list of educational benefits that can be attained by utilizing IT including:

- improved educational attainment and skill acquisition,
- reduced disparities caused by race, income and region,
- improved relationship between learning, assessment and effectiveness,
- provide a relevant context for learning,
- accommodate differences in learning,
- motivate and sustain learning,
- provide greater access to learning opportunities, and
- empower learners.

In the context of this dissertation looking at adult student computer fluency, this list appears to be a blueprint for success. For example, improving educational attainment and skill acquisition likely will contribute towards better-prepared adults; reducing racial disparities will open up access to underrepresented student populations. It has been nearly a decade since Hopey developed the list of benefits and still all those points seem relevant, especially in the area of access.

In a 2002 study looking at the growth of adult student enrollments, Schuetze and Slowey suggested that as a group, adult learners previously had seen limited access to higher education. The barriers to access were a complex "range of social, economic, and cultural reasons" (p. 312). The previous inference was that, as a group, "non-traditional [adult] students in an elite higher education system were, by definition, a minority" (p. 313). This is no longer the case, as the majority of students attending classes are now considered non-traditional or adults (Paulson & Boeke, 2006).

Breaking down the barriers to access is one of the themes in Fidishun's (2000) study. He contemplated that introducing technology into the curriculum is not just about "making it work," but rather that it should be "a perfect path for the facilitation of self direction" (p. 4). The author was quick to point out that self-direction should not to be confused with self-motivation. Fidishun advocated that "to facilitate the use of andragogy while teaching with technology we must use technology to its fullest" (p. 4). This discussion was continued by Frey and Alman (2003), who studied how adult learning theory can be applied to the online/virtual classroom. The co-authors pulled in two key theorists for online learning, namely Knowles (1980) and Mezirow (1990), as foundational to their work. Frey and Alman identified that before adult students could address the issue of learning, "[they] had to master the technology" (p. 9). This statement implies a competent level of computer fluency, which this study examined further.

The literature consistently shows that irrespective of their personal learning styles, adult students as a body increasingly are demanding online technology in the form of "Internet-based instruction," (Cahoon, 2004; Fidishun, 2000). The challenge will be to continue providing quality educational programming through the creation of hybrid and distance learning courses while consistently developing the technological skills and personal level of computer fluency for the students who participate.

Summary

This current review of the literature has demonstrated that there is a wealth of research concerning how adult students learn (Bandura, 1977; Knowles, 1980; Schlossberg, 1989; Vygotsky, 1978), and to a lesser extent how adult students learn using information technology (Irvine, 1999; Levenburg & Major, 1998; Martyn & Hura, 2004), and in particular, how adult students learn using on-line technologies (Cahoon, 1995; Furr, 2003).

As the adult student population becomes even more involved in this field of online and hybrid learning, it is going to be more important to understand the differences in learning (Cahoon; Fidishun, 2000). With this knowledge we can identify best practices to accommodate all adult student populations and enable them to be successful in hybrid and online learning environments. Through this study looking at computer fluency among adult students, I built upon the existing body of knowledge and literature surrounding learning, especially using IT for adult students.

CHAPTER 3

METHODOLOGY, DESIGN, AND METHODS

The purpose of this quantitative study was to evaluate individual computer fluency among a sample of adult students enrolled in an accelerated degree completion program at a small private liberal arts college in the Midwest. The specific purpose of this chapter is to outline and identify the methodological approach, study participants, study design, data collection, data analysis, and the role of the researcher for this study. The study of computer fluency is cross-sectional in nature, and that the results allow generalizability about adult students attending accelerated and hybrid degree completion programs.

Research Design

The method I used was an on-line survey disseminated electronically to all eligible students attending the adult learning program at the host institution. Once I collected data I used inferential statistics to summarize the responses; significance tests to analyze the strength of responses; linear regression and analysis of variance using SPSS to analyze the survey response data and to determine the contribution of demographic variables of age, ethnicity, SES, gender, educational background, and personal circumstance to computer fluency of adult students. All the data provided from the survey instrument were interpreted using statistical treatments outlined in detail in the *Data Analysis* section.

Methods

Participants. All of the prospective participants in the study were classified as adult students meeting at least one of the characteristics defined by the National Center for Education Statistics (NCES) in Table 3.1. All study participants were considered part-time degree seeking students at the site, and currently attending the adult learning program at the site. It was anticipated that the enrollment in the adult learning program would be in the

range of 500-550 students, based on past institutional data. A recent study using a similar student population drew a response rate of 41.9% (Armstrong, 2006). Using that previously achieved response rate as a baseline, I was able to predict that somewhere in the range of 210-230 students would likely complete the survey.

Table 3.1
Characteristics of adult students

- Delays enrollment (does not enter postsecondary education in the same calendar year that he or she finished high school);
- Attends part time for at least part of the academic year;
- Works full time (35 hours or more per week) while enrolled;
- Is considered financially independent for purposes of determining eligibility for financial aid;
- Has dependents other than a spouse (usually children, but sometimes others);
- Is a single parent (either not married or married but separated and has dependents); or
- Does not have a high school diploma or completed high school with a General Education Diploma (GED) or other high school completion certificate or did not finish high school)

Source: National Center for Education Statistics.(2002).*Condition of Education 2002: Nontraditional Undergraduates.* (NCES 2002-012). U.S. Department of Education, pp. 2-3.

I considered any full-time traditional-age residential students who are attending adult learning classes as ineligible, and did not include any of the group in the survey. This screening was done using the proprietary relational database that codes personal data for students differently depending on whether they are full-time or part-time students. I only requested data for degree-seeking adult students who were in the adult learning program because that data collection was unlikely to pull in any traditional-age residential students.

Independent variables

Age. All of the participants in the study were aged between 23 and 65. To be considered an adult student the participant must have been away from the educational milieu, and then returned to it (Brookfield, 2004). We know from the data (NCES, 2004-05) that the older a person becomes, the less likely he or she is to participate in continuing higher education toward degree completion. It was expected that the majority of participants in the study would be aged 25-35, which is the acknowledged target audience of the site adult learning program (Pearson, 2006). Recent findings re-emphasized the importance of identifying the age groups that participate in continuing higher education. The data showed that "more and more adults [are] looking for ways to upgrade and expand their skills in an effort to improve or protect their economic position" (U.S. Department of Education, 2006, p. 8).

Ethnicity. This study was conducted at a Midwest institution, where the local/regional population is predominantly White Caucasian. This study used six groupings to identify ethnicity of participants consistent with the NCES groupings: White, Black, Hispanic, Asian/Pacific Islander, Native American Indians, and more than one race. Coding participants as "Black will include African Americans, the group who are coded Hispanic will also include Latinos, and the group coded as Pacific Islander will include Native Hawaiians" (NCES, 2006, p. iv).

The recent findings of the Secretary of Education's Commission on the Future of Higher Education (2006), more commonly know as the Spellings Report, highlighted the continued dilemma in educational terms for African Americans and Latinos. Both of these ethnic groups consistently lag well behind Whites in access to, and success in, post-secondary education (U.S. Department of Education, 2006).

Gender. Current data indicate that the majority of adults participating in undergraduate educational activities are female. On a national basis, 41.1% of all males and 47.5% of all females participate in adult education (NCES, 2006). The NCES participation rates equate to a ratio of 45.2% male: 54.8% female. These data are supported by findings showing that 56% of adult students are women (NCES, 2002). Institutional data from the test site show that in adult student classes females make up 58% of those in attendance (Pearson, 2006). These data support previous findings (NCES, 2001, 2006; Pearson, 2006) and set up the expectancy for this study that the gender distribution will match or be very similar to these national norms.

Socioeconomic Status. SES is a measure of a group or individual position within a hierarchical structure (Hirsch et al., 2002), and can be determined by looking at one or the composite of all three dimensions: income, education, and occupation (Winkleby et al., 1992). This study sought to identify all three dimensions using the reported demographic data on the survey instrument.

Household Income. Many research reports have shown a connection between SES and access to higher education, more recently reflecting that "access and achievement gaps disproportionately affect low-income and minority students" (Brodie et al., 2000; Tett, 2006; U.S. Department of Education, 2006, p. 8). The original premise for identification and selection of study participants for the purposes of this study was that they displayed at least one of the characteristics of adult students previously listed in Table 3.1. A recent conversation with the director of the site adult learning program confirmed that the majority of adult students are in full-time employment, working a minimum of 35 hours per week (Pearson, 2006). It was important to identify the household income of each participant so that

SES could be compared against the nationally reported median earnings (Table 3.2), and federally-defined low-income levels (Table 3.3).

Table 3.2
Education and training pay data 2004

Category	Educational background	Median Earnings in 2004
1	Less than high school	$23,176
2	High school graduate	$31,075
3	Some college no degree	$36,381
4	Associate degree	$38,597
5	Bachelors degree or higher	$50,394

Source: Bureau of the Census, Bureau of Labor Statistics, *Education & Training Pay 2004*.

The data in Table 3.2 show very clearly and strongly the connection between educational background and median earnings. The further a person progresses through K-12, and on into postsecondary education, the higher the reported median earnings for adults in that sector.

Educational Background. Brookfield (1998) discussed adult students in terms of being away from the education milieu, which results in delayed enrollment into higher education. For an adult student to be admitted into the adult learning program at the targeted site the individual will need to have earned a high school diploma, or completed a GED or equivalent high school completion certificate. Many of the adult students transferred into the site program with prior earned 2-year or 4-year institutional credit. It was therefore reasonable to expect that most adult students attending the site adult learning program have had some experience in continuing higher education. These differences are reflected in the groupings laid out in Table 3.2, which, although consistent, sometimes are problematic in that they do no fit perfectly with the actual backgrounds of students.

Table 3.3
Federal low-income guidelines
(Effective February 2006 until further notice)

Size of Family Unit	48 Contiguous States, D.C., and Outlying Jurisdictions	Alaska	Hawaii
1	$14,700	$18,375	$16,905
2	$19,800	$24,750	$22,770
3	$24,900	$31,125	$28,635
4	$30,000	$37,500	$34,500
5	$35,100	$43,875	$40,365
6	$40,200	$50,250	$46,230
7	$45,300	$56,625	$52,095
8	$50,400	$63,000	$57,960

Notes: For family units with more than 8 members, add the following amount for each additional family member: $5,100 for the 48 contiguous states, the District of Columbia and outlying jurisdictions; $6,375 for Alaska; and $5,865 for Hawaii.
The term low-income individual means an individual whose family taxable income for the preceding year did not exceed 150% of the poverty level amount.
The figures shown under family income represent amounts equal to 150% of the family income levels established by the Census Bureau for determining poverty status. The poverty guidelines were published by the U.S. Department of Health and Human Services in the *Federal Register*, Vol. 71, No. 15, January 24, 2006, pp. 3848-3849.
Source: http://www.edu.gov/trio.html (retrieved January 15th, 2007).

The groupings are listed in Table 3.4. It was be necessary to modify the original NRC questions so that the instrument asked participants to define their personal level of education that had been completed.

Table 3.4
Groupings for adult students by educational background

1. Have earned a high school diploma, GED, or equivalent
2. Some college, including vocational technical
3. Bachelor's degree or higher

From: National Center for Education Statistics (2006). *Participation in adult education.* (NCES 2002-071). U.S. Department of Education, p. 129.

Occupation Groups. The third piece of the holistic picture to demonstrate SES for the adult students in the study was the inclusion of a question that identified participants by occupational groups. The occupational groups were identified for the 2000 Census, and were

used entirely with the inclusion of two extra codes, 15 and 16 (Table 3.5), reflecting the full-time homemaker and also survey respondents who were unemployed at the time.

Table 3.5
Occupational groups and titles for survey instrument

Occupational Codes	Occupational Group Titles
01	Management, Business and Financial Workers
02	Science, Engineering and Computer Professionals
03	Healthcare Practitioner Professionals
04	Other Professional Workers
05	Technicians
06	Sales Workers
07	Administrative Support Workers
08	Construction and Extractive Craft Workers
09	Installation, Maintenance and Repair Craft Workers
10	Production Operative Workers
11	Transportation and Material Handling Workers
12	Laborers and Helpers
13	Protective Service Workers
14	Service Workers, except Protective
15	Homemaker (see note 1)
16	Currently not working (see note 1)

Retrieved March 15th, 2007 from http://www.census.gov/.html
Notes:

1. The inclusion of (14) *Homemaker* and (15) *Currently not Working* are occupational codes for the benefit of this study only. They are not Occupational Codes obtained from the Census 2000 classification system.

Personal Circumstance. I acknowledged in *Chapter 1* that many of the adult participants in the study may be experiencing their own transition (Schlossberg, 1989). This transition may have been the trigger to motivate them into an IHE, or possibly a situation that has occurred more recently since they enrolled in an adult learning program.

It was proposed to include an optional question on the instrument to ask if the participants are: widowed; recently divorced; recently married; or have recently changed

employment. I understand that these may be considered intrusive questions, and I did set them up as optional on the survey. By enabling the participant to opt out, any adult feeling uncomfortable about responding to the personal circumstance question could still complete the remainder of the instrument.

Dependent Variable

Technical literacy was described by the NRC in 1999 as computer fluency; this is the combination of intellectual capabilities, conceptual knowledge, and appropriate technical skill-sets. This component was the dependent variable throughout this study. As responses were evaluated I broke out adult student computer fluency into three separate components:

1. Computer fluency I—The adult student had demonstrated intellectual capabilities
2. Computer fluency II—The adult student had a grounded conceptual knowledge
3. Computer fluency III—The adult student had demonstrated technical skill-sets

The summation of all three fluency criteria were used to determine the level of overall fluency.

Instrumentation

To accurately assess the computer fluency of adult students attending the adult learning classes, I modified and combined two existing instruments. The two instruments were developed by Lowell and Snyder (1999) for a pilot course, Fluency with Information Technology [CSE 100], based on the NRC, 1999 Being Fluent with Information Technology [FITness] model. Two instrument administrations were conducted: prior to the course beginning, a pre-test, and at the completion of the course, a post-test. The instruments measured previous computer experience, self-rated abilities, level of confidence [with software], attitude towards computers, and overall reaction to the course of the students in the course (Lowell & Snyder, 1999).

There are two reasons why I blended both existing instruments into one. First the combination of both pre-test and post-test instruments used in the CSE 100 instruments did not include all of the desirable demographic information that are outlined in the *Independent Variables* section of this chapter (pp. 43-47).

A second reason reflects the age of the original instruments. Two key narrative questions were originally written in 1999 to address the adult student's intellectual capability with Internet technology. Although the questions were appropriate at the time of the original NRC study (1999) and subsequent CSE 100 (1999), they do not match the exponential evolution of the Internet and connected terminologies since that time. As such, I adjusted the narrative questions to bring the instrument into line with the current state of Internet technology and current vocabulary.

The original instruments were available through the Office of Educational Assessment Website and found in the archived copies of the reports. The content validity of the original instruments was established by conducting the pre-test with a small sample (n=23), and the post-test with a slightly larger group (n= 40). In both cases the data reflected percentages of students and average scale scores. I approached the designers of the instrument through their Washington, DC location and was given permission to use the instrument in a modified form for this research. The CSE 100 instrument designers are agreeable to sharing their intellectual property to further develop the dialogue in this area. A copy of the instrument used in this study can be found in Appendix B. Every student was asked to complete the survey instrument online, which was designed to explore and measure the three components of fluency; "intellectual capabilities, conceptual knowledge, and an appropriate technical skill-set" (NRC, 1999, p. 7).

The survey instrument was structured so that early questions in the survey were based around student personal and academic status (Appendix B, Q.1-4), confidence with IT (Q. 5-9), and moved into a final section designed to solicit both respondees' concept knowledge with fault finding when using a PC, and individual technical skill-sets (Q. 10-15). The later responses (Q.16-22) were designed to elicit demographic data on age, ethnicity, gender, SES, educational background, and personal circumstance of the sample group.

Pilot test of instrumentation. Prior to the instrument being disseminated it was very important to verify both internal and external validity through field-testing. A paper version of the instrument was field tested in four ways. First, I engaged the students in HgEd 615H Dissertation Seminar in a dialogue of the instrument's face validity. This was done by sending the hard copy draft of the instrument out to all respondents (n=8) as an attachment by e-mail on 11/24/06. The following week the group was scheduled to meet and I collected feedback on 11/28/06.

Three other opportunities for feedback were via the dissertation seminar course instructors, the host-site volunteer readers, and the POS committee. Corrections were made after the dissertation proposal meeting and prior to the next pilot test. I received feedback from my major professor once these corrections had been made, which offered a third level of critique to the process.

The fourth and final pilot test of the instrument was administration to co-workers and colleagues who work in the adult learning program at the site (n=9). For this administration, the instrument was coded into an online version and send out as a link. This pilot test also served as a field test, ensuring that I had correctly identified e-mail addresses, timing of the instrument availability, and clarity of instructions. The opportunity for small group discussion to further polish the finished product followed.

Data Collection

All responses to the online survey instrument were captured, saved, and stored within the proprietary software for later retrieval for statistical analysis. Previous surveys of adult students at the site (Pearson, 2006) have reflected the dynamic nature of transitional adult students. On occasion up to 10% of the surveys sent out as e-mails have been returned, showing the account users as no longer active with their *Internet* service providers (ISP's). To enhance the survey response rate, a hard copy of the survey instrument was mailed out to the non-respondents' home addresses. A small dissertation grant was applied for and awarded, which then enabled me to cover the cost of the online survey, data housing, and postage for follow-up surveys, including stamped addressed envelopes.

It was expected that the busy lifestyles of adult students would impact their ability to complete the survey. For many, there may have be a perception that this survey would be just "another piece of busy work." The combination of lifestyle and busy work apathy was expected to produce as high as 60% non-responses to the survey. I realized that if over half the intended response group did not participate then it might raise questions about generalizability of the data for the remainder of the group.

Response bias was also a concern; if adult students had undeveloped computer fluency it was possible they would abort an attempt to complete the survey or not even attempt it. The online software allowed me to track this, to see if adult students aborted or failed to complete the instrument. One way I addressed this potential dilemma was to place questions in the survey based around confidence with IT much later in the instrument (Appendix B, Q.14-17). This placement of questions was expected to draw respondents into the survey rather than put them off from participation, and for same reason participant demographic data were placed at the end of the instrument.

Data Analysis

The primary goal of statistical analysis was to address the research question: Can differences in computer fluency among adult students be attributed to the demographic variables of age, ethnicity, SES, gender, educational background, and personal circumstance? A secondary goal of the statistical analysis was to use the data to test the null hypothesis; i.e., that there are no significant differences in computer fluency among adult students that can be attributed to the demographic variables of age, ethnicity, SES, gender, educational background, and personal circumstance. Questions 1-9 in the survey provided quantitative data about the demographic variables for each participating adult student. To identify differences in computer fluency among respondents it was also necessary first to look at the differing computer fluency components.

- Computer Fluency I, looking at intellectual capabilities, was based on responses to question 16, 17, 20, and 21.
- Computer Fluency II, looking at grounded conceptual knowledge, was based on responses to questions 10, 11, 12, 18, and 19.
- Computer Fluency III, looking at technical skill sets, was based on responses to questions 13, 14, and 15.

It could be hypothesized that any of the adults who aborted the survey do not demonstrate a computer-fluent technical skill set. The data provided from the survey instrument was interpreted through the following methods:

- The application of inferential statistics to summarize the characteristics of the instrument responses (Abrami, Cholmsky & Gordon, 2001; Agresti & Finlay, 1997; Kratwohl, 1998), reflecting a sample of the entire population. I also used chi-squared (χ^2) tests to compare the frequency distributions of the subject group with the reported

national norms (Agresti & Finlay, 1997; Kratwohl, 1998). Details of the chi-squared testing process can be found in Appendix C.

- Significance tests to analyze the "strength" of the instrument responses against the null hypotheses, H_0 (Abrami et al., 2001, Agresti & Finlay, 1997; Kratwohl, 1998, p. 466). I anticipate a reasonable sample size in excess of 200 respondents. To avoid bias in the data analysis and decision making process, I set the significance level (α-level) on the tests for significance at p=.05 (Agresti & Finlay, 1997; Kratwohl, 1998).
- Linear regression, to examine if linear relationships exist between any of the instrument responses (Abrami et al., 2001; Agresti & Finlay, 1997; Kratwohl, 1998).
- Analysis of variance (ANOVA), to look for any significant relationships between each of the independent variable categories of age, ethnicity, gender, SES, educational background, personal circumstance and the dependent variable of computer fluency (Abrami et al., 2001; Agresti & Finlay, 1997; Kratwohl, 1998).

Researcher Interest and Role

I had been employed for eight years at the institution where the research was conducted, and had taught as an adjunct instructor at the institution for six years. I was also very familiar with the administrative setup and organization of the adult learning program. A benefit from having had an association with the program was ease of access to the administrative staff through already established channels, familiarity with the culture of the adult learning program and open lines of communication with the director.

As I moved into the data analysis stage of this study this could potentially have been problematic, especially if the department personnel were anticipating viewing datasets, and expecting access to the research material that may not have been ready for distribution.

The survey instrument cover page, submitted to as part of Human Subjects approval, detailed that respondent data would be shared by the PI with the host site staff only after all data analysis has been completed. It was anticipated that the sharing of information would be at the completion of the dissertation, and this was communicated to the department personnel at the host site.

Ethical Considerations

Prior to using the instrument and ultimately beginning the research phase of this dissertation, I needed to ensure I had Institutional Research Board (IRB) approval from ISU. Qualification for testing on human subjects was completed in spring 2003, and I then needed to ensure that approval was extant.

Prior approval through the IRB at the host site was required, which necessitated me to gain approval from the host site IRB before requesting approval from ISU. The research approval process was outlined formally after discussion with my major professor and at a later meeting with the host site IRB Chair. Before submission of an application to the host site IRB, it was necessary to ensure that the director of the adult learning program would allow access to the student body to conduct the survey, and after an explanatory meeting this permission was duly granted.

Summary of Methodology

This quantitative study relied on responses from adult students attending accelerated degree completion evening classes at a Midwest college. The instrument was expected to be completed by 200-230 adult students. The researcher used inferential statistics to evaluate the demographic data and used regression analysis to determine the connections between the demographic variables and computer fluency. Results of the study are presented in Chapter 4.

CHAPTER 4

RESULTS

Implementation of the study was planned to begin once the survey had been developed, IRB and host site IRB approval gained, and finally after Program of Study (POS) committee review. This chapter details the process through which the instrumentation generated data, and how data were analyzed to give meaning to the central research question; "Are there significant differences in computer fluency among adult students that can be attributed to the demographic variable of age, ethnicity, SES, gender, and educational background?"

Responses

Following approval by the Principal Investigator's (PI's) POS committee on August 27, 2007, the host site was approached and it released to the PI a dataset of students matching the established criteria. An estimate based on historical data at the host site anticipated that there would be in the range of 500–550 adult students enrolled in the program for the 2007-2008 academic years. A pre-notice e-mail describing the upcoming survey was sent out to all students listed in the dataset on September 14. At that time 7 students responded and asked to opt out. A further 15 names were found to have undeliverable e-mail addresses and were expeditiously mailed out a paper copy of the instrument. From this initial mailing to undeliverable email addressees, three more names were found to be undeliverable both electronically and by traditional means: these were also removed from the list of eligible participants. After this screening the group of eligible survey participants was solidified at $N = 465$. The size of the dataset was slightly smaller than expected. This reflected a downward enrollment trend in the host site program.

On September 20, 2007, the survey instrument, the first piece of the tailored design strategy (Dillman, 2000) was opened up to participants, and remained open until October 8, 2007. There were in excess of 200 on-line responses (n = 228). This compared favorably with the projection for 210-230 respondents based on previous research done with this student population (Armstrong, 2006). The group was sent intermittent reminder e-mails, and a final e-mail reminder notifying the students of the instrument closing date. After a 19-day period of incoming data from online survey responses, those outstanding participants listed in the dataset who had still not replied were targeted to be mailed a paper copy of the instrument (Appendix B) on October 8, 2007; this strategy was modeled on a bimodal method advocated by Fraze, Hardin, Brashears, Haygood, and Smith (2002). The targeted mailing included a pre-paid self-addressed envelope. This intended mailing date proved to be badly timed; it had inadvertently been scheduled for distribution on a federal holiday, and consequently post offices were closed and unable to provide service. Due to work commitments, the PI was out of town for a further three days at a conference and the prepared mailing consequently sat un-mailed until October 12. An outcome of the PI's absence was a small disconnect between the online survey closing and the arrival of the individualized mailing. The opportunity for responses to this mailing from all survey non-respondents was finally closed on October 26, 2007. A further 26 respondents completed and returned a paper copy of the instrument. Total responses for the instrument were n = 254 (i.e, 228 + 26). The response rate for completed instrumentation was calculated using the simple formula: r = (n/N) = 54.62%.

The bimodal survey methodology was intended to reduce both cost and time (Hardin, 2002). The tailored design advocated by Dillman (2000) was used to maximize the response rate of students through this carefully planned mixed mode design. In particular, as Dillman

suggested, the deliberate effort to increase the number of contacts result in an increased response rate, with pre-notice contact appearing to have the strongest response rate impact with students. E-mail pre-notice was preferred over surface mail as this has produced higher response rates. The PI's design methodology outlined an expectancy based on previous surveys of a similar student population to be in the range of 40%, and consequently a response of 54.6% certainly exceeded the methodological design expectation.

Summary Statement of Generalizability

The size of the sample that responded to the cross-sectional survey instrument was sufficient for the PI to apply inferential statistics to the response data. The group (*n*) will allow me to make generalizable statements based on the sample. This group represents over half (54.62%) of all students enrolled in classes for the 2007-2008 academic year at the host site.

Overview of Demographic Variables

The demographics section of the instrument requested information about the independent variables of age, ethnicity, gender, socioeconomic status, family educational background, and personal circumstance. The survey questions soliciting these responses were written using the guidelines developed by Anderson and Kanuka (2003) and, as recommended, placed at the end of the survey. The design for these demographic responses is built on the original NRC survey instrument developed by Lowell and Snyder (1999).

Age

Discussion in the research methodology section (Chapter 3) identified that the majority of study respondents would be aged between 25-35 years old, which would closely parallel the acknowledged target audience of the site. The data show (Table 4.1) this is in fact the case, with the largest group of survey respondents categorized 25-34 (39.20%). It might

be anticipated that adding an age group on either side (i.e, 16-24 and 35-44) of this range would account for the largest critical mass of students, but the data show this is not the case.

If we look at age groups 25-34 and include 16-24 and 35-44, this represents 200 students, 80.70% of the survey sample. In comparison the three largest groups (25-34, 35-44 and 45-54) encompass 224 of all survey respondents, or 89.60%. It can be seen that the distribution of respondents by age is skewed to the right, showing that a greater number of older students are participating in the program. Older students are engaged in continuing higher education (NSSE, 2006). The survey response data are representative of recent U.S. Department of Education (2006) findings showing "more and more adults are looking for ways to upgrade and expand their skills … one-third of our estimated 14 million undergraduates are over the age of 24, and 40% are part-time" (p. xi).

Table 4.1
Distribution of Respondents by Age Group

Age Groups	Percentage	n
16-24	9.20%	23
25-34	39.20%	98
35-44	31.60%	79
45-54	18.80%	47
55-64	1.20%	3
65 or older	0.00%	0

There were no respondents over the age of 65 and only 3 students reported being over age 55. This indicates that an undergraduate degree completion program is not a choice often made by the over-55-year-olds in this market demographic.

Ethnicity

A total of 244 students responded to the question on ethnicity. The results (Table 4.2) show a preponderance of adults who identify as White, non-Hispanic (93.44%). It is important to review these data in context; regionally this is not a new phenomenon. The PI selected a site for the survey located in the Midwest, an area of the country that historically includes an overrepresented group of White non-Hispanics. Recent data from the State of Iowa (http://www.silo.lib.ia.us) show how close the survey results are to the actual data statewide. Statewide data have been included as an extra column [IA Data] in Table 4.2, to compare the results to a larger sample.

Table 4.2
Breakdown of Survey Respondents by Reported Ethnic Group

Ethnicity	Percentage	n	IA Data[1]
White, non-Hispanic	93.44%	228	91.0%
Black, non-Hispanic	0.82%	2	2.5%
Hispanic	1.23%	3	3.7%
Asian / Pacific Islander	2.46%	6	1.5%
More than one racial /ethnic heritage	0.41%	1	1.0%
Other	1.64%	4	0.3%

Source: 1) U.S. Census Bureau, Population Division, (301) 457-2422, Released May 17, 2007 http://www.census.gov/popest/estimates.php
Prepared By: State Library of Iowa, State Data Center Program, 800-248-4483, http://www.iowadatacenter.org

The survey responses indicate that all ethnic groups are underrepresented except for those who identify as White, non-Hispanic; Asian / Pacific Islander, or Other; these groups are marginally overrepresented in the survey responses (93.44% White, non-Hispanic; 2.46% Asian /Pacific Islander; 1.64% Other) compared to the statewide data (91.0% White, non-Hispanic; 1.5% Asian / Pacific Islander, 0.3% Other). While the sample of students who responded to this question closely resembles Iowa students, it also shows that the host site

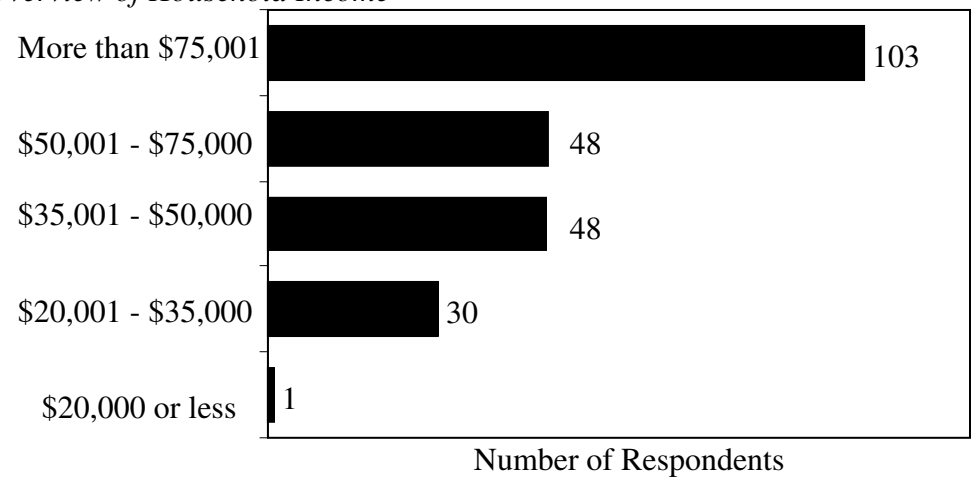
program lacks an ethnically diverse student body. The case has been made previously that in situations where the quantitative data can be collapsed into larger categories, it should be (Page, Cole & Timmreck, 1994). This strategy can obscure the fact that one variable has much more variance than is demonstrated when one or more are collapsed into a category. The underlying result may limit the appropriate statistical significance testing and generalizabilty of the data. The sample does mirror the geographic region and not wanting to limit generalizability, the data have not been collapsed.

Socioeconomic Status

The methodology section explained that SES would be comprised of three variables: household income, educational background (personal), and employment occupation. The content in this section overviews each of those individually reported variables and then summarize the SES for adult students participating in the survey.

Household Income. Only one of the respondents reported a household income level below $20,000. A further 30 students (13.04%) reported earnings ranging between $20,001 and $35,000 (Graph 4.1). The majority of respondents (85.63%) stated their household earnings exceeded $35,001.

Figure 4.1
Overview of Household Income



The largest group by far (103), accounting for nearly half of all respondents (44.79%), declared income levels in excess of $75,001. These figures compare favorably against the 2004 median household income level in the state of Iowa of $42, 865 (http://www.silo.lib.ia.us). There were 24 students (9.44%) who skipped this demographic question which is more participants than skipped any other question on the survey.

Educational Background. Eligibility for the study required each participant to have been enrolled as a part-time student at the host site during the 2007-2008 academic years. Only one of the participants reported (see Table 4.3) having failed to graduate from high school, and another seven adult students (2.94%) identified as having only a high school diploma. The majority of participants (83.61%) reported having some experience in college, and the overwhelming majority (96.67%) reported having either some college or a bachelor's degree.

Table 4.3
Educational Background of Study Participants

Highest level achieved	Percentage	n
Less than high school	0.42%	1
High school diploma or its equivalent	2.94%	7
Some college (including vocational / technical)	83.61%	199
Bachelors degree or higher	13.03%	31

There were 31 students in the undergraduate degree completion program who identified as already having earned a bachelors degree or higher (13.03%). This high number of adults returning to higher education to enhance their personal skills again validates the U.S. Department of Education findings (2006).

Employment Occupation Group. Not all survey respondents replied to this question (*n* = 224). As can be seen in Table 4.4, many of the employment occupation groups were

underrepresented or not represented. No respondents identified as being employed in the following occupation groups: Installation, Maintenance and Repair Craft Workers, Production Operative Workers, Transportation and Material Handling Workers: or Protective Service Workers.

Table 4.4
Breakdown of Employment Occupation Groups for Adult Students

Occupational Group Title[1]	Percentage	n
Management, Business and Financial Workers	52.66%	118
Science, Engineering and Computer Professionals	11.60%	26
Healthcare Practitioner Professionals	3.12%	7
Other Professional Workers	9.82%	22
Technicians	1.34%	3
Sales Workers	3.12%	7
Administrative Support Workers	13.84%	31
Construction and Extractive Craft Workers	0.45%	1
Installation, Maintenance and Repair Craft Workers	Nil	0
Production Operative Workers	Nil	0
Transportation and Material Handling Workers	Nil	0
Laborers and Helpers	0.45%	1
Protective Service Workers	Nil	0
Service Workers, except Protective	0.90%	2
Homemaker	1.80%	4
Currently Not Working	0.90%	2

Retrieved March 15th, 2007 from http://www.census.gov/.html
Notes: The inclusion of *Homemaker* and, *Currently not Working* are occupational codes for the benefit of this study only. They are not Occupational Codes obtained from the Census 2000 classification system.

There are only one or two students identified as Construction and Extractive Craft Workers; Laborers and Helpers had one; Service Workers, except Protective, and Currently Not Working had two each. Over half of the respondents (52.66%) are employed in the Management, Business and Financial Workers group. Three other areas that show strong representation are: Science, Engineering, and Computer Professionals (11.60%), Other Professional Workers (9.82%), and Administrative Support Workers (13.84%). Six students (2.7%) identified as currently not working or are engaged full-time as a homemaker, while

the remaining 97.3% of participants are working full-time or part-time in employment outside the home. These data closely match the State of Iowa (http://www.silo.lib.ia.us) unemployment statistics for the region.

Summary of Socioeconomic Status. The cross-sectional results for SES (household income, educational background [personal], and occupation) indicate that 85.63% have household earnings exceeding $35,001; 96.67% report having either some college or a bachelor's degree; and 97.3% of participants are working full-time or part-time in employment outside of the home. Cross tabs for the three components show that nearly half of the study participants (n = 107) are employed in the Management, Business, and Financial Workers sector and have some previous college experience, and a further 19 are in the field with a baccalaureate already earned. This same occupational group accounts for 120 participants who declared a household income in excess of $35,000.

Gender

There were 161 respondents who identified as female (66.52%), and another 81 who identified as male (33.48%). These data compare to findings showing that nationally 56% of all adult students are women and 44% of all adult students are male (NCES, 2002). Women are therefore overrepresented in this study. Males are underrepresented in the 45-54 yrs age bracket (12 of 45), and females are underrepresented in the 25-34 yrs bracket (60 of 97).

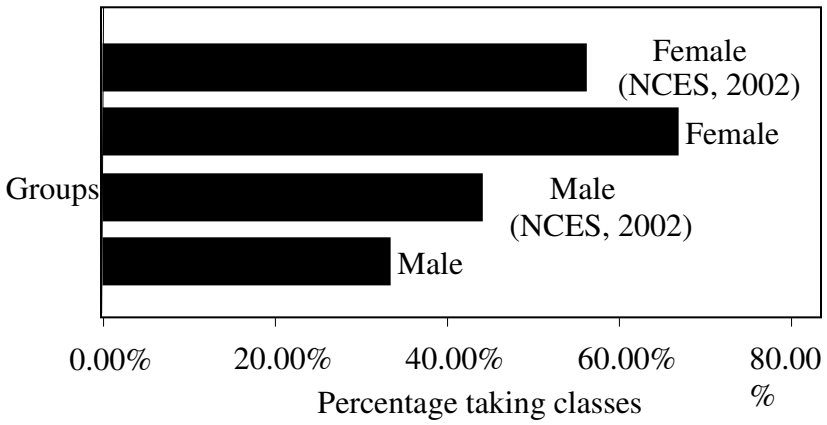
Table 4.5
*Crosstabulation of Respondents: Gender * Age Group*

	16-24yrs	25-34 yrs	35-44 yrs	45-54 yrs	55-64 yrs
Male	7	37	24	12	1
Female	15	60	52	33	1
Total	22	97	76	45	2

In the online learning environment the distribution of male/female students nationwide is fairly balanced (Charny, 2000). The data suggest that females are

overrepresented in the survey responses (see Figure 4.2) when compared with national cross-sectional surveys for gender participation (NCES, 2002) in the classroom. This finding supports the previous observation that females were overrepresented in the study.

Figure 4.2
Responses by Gender for Adult Students Attending Classes



Family Educational Background

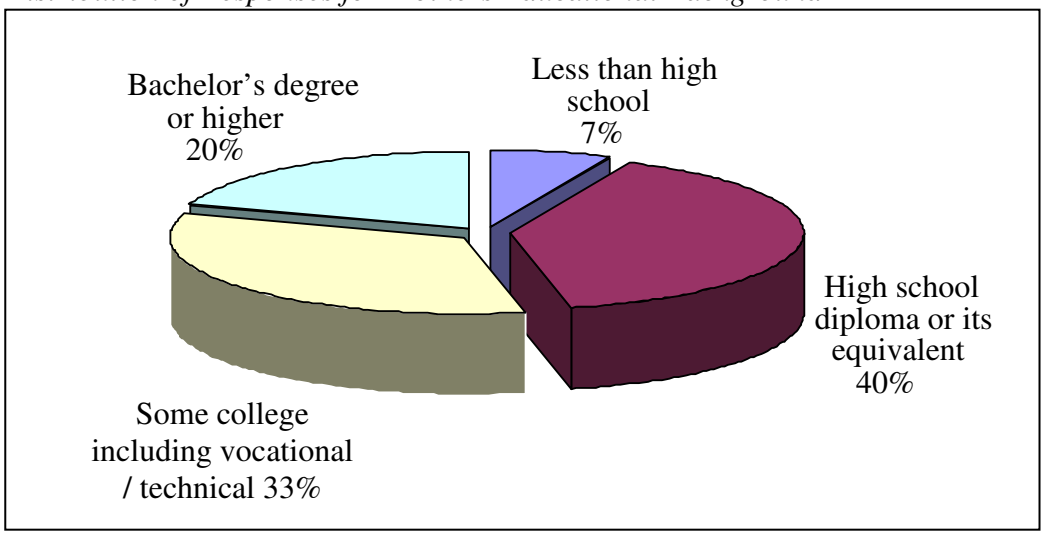
There were 225 survey participants who chose to respond to this question (88.58%); the results can be found in Table 4.6. Very few of the respondents reported having a parent who had not graduated from high school (F = 15, M = 21). The modal response was that mother and father had both graduated from high school (F = 90, M = 87): this figure represented 40% of respondent mothers (see Figure 4.3) and 40% of respondent fathers (see Figure 4.4).

Table 4.6
Educational Background of Parents

Educational Background	Mother	Father
Less than high school	15	21
High school diploma or its equivalent	90	87
Some college, including vocational /technical	75	61
Bachelors degree or higher	45	53

There is a small but noticeable difference between mothers who had some college including vocational technical and fathers who had some college including vocational technical. A larger group of respondents (n = 75, 33%) reported that their mothers had experienced higher education in some form. In contrast, only 61 (27%) of the respondents indicated that their fathers had any form of higher education.

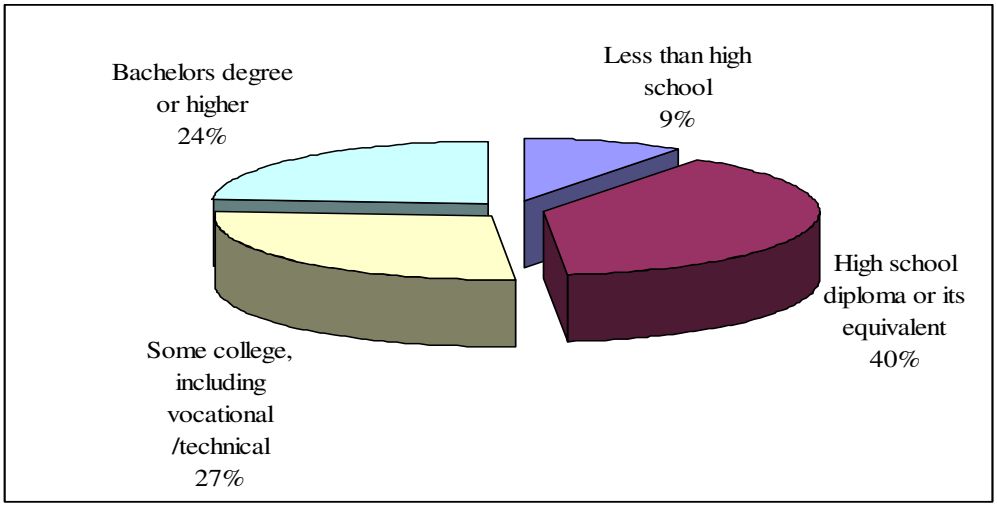
Figure 4.3
Distribution of Responses for Mothers Educational Background



For men, approximately one in four (24%) and for women, one in five (20%) had parents who had earned an undergraduate degree. Similar sized groups had completed some college or had earned a college degree: 120 respondents' mothers (53%) and 114 respondents' fathers (51%). In general terms one in every two students came from a background where either mother or father had some or more college experience.

The overwhelming majority of adult students come from a family background where one or both parent(s) had successfully graduated from high school or gone on to continuing higher education (Female = 93.34%, Male = 91.5%).

Figure 4.4
Distribution of Responses for Fathers Educational Background



Personal Circumstance.

Nearly three-quarters of the respondents (72.62%) stated that none of the listed situational triggers apply to them (Table 4.7). This leaves approximately one-quarter who have had a significant situational change in their life (27.28%). The largest of these subgroups are adult students who reported that they have changed employer within the past 12 months (10.71%). Another 1 in 10 adult students has either been divorced in the past three years (3.17%) or added a child to the family (6.75%). In general terms, 1 student in 4 reported a change in personal circumstance through marriage, divorce, the addition of children, or a new employer (26.19%).

The data are supportive of Schlossberg's (1984) premise that many adults are experiencing a transition, which can trigger re-entry to higher education. Although the students did not acknowledge on the survey instrument that these personal circumstances were the reason they began attending college, the fact that they had re-entered higher education is certainly data that can be seen as supportive of Schlossberg's hypothesis.

Table 4.7
Situational Changes of Respondents

Options	Percentage	Count
Recently divorced (inside the past 3 years)	3.17%	8
Recently widowed (inside the past 3 years)	0.40%	1
Recently added a child to the family	6.75%	17
Recently changed employer (in the past year)	10.71%	27
Recently re-entered the workforce (in the past year)	0.79%	2
Recently married (in the past year)	5.56%	14
None of the above	72.62%	183

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Summary of Demographic Variable Data

Four-fifths (79.47%) of survey respondents are in the 25-54-year age range, with predominantly more (38.84%) aged 25-34. The overwhelming majority identified as White, non-Hispanic (83.44%), closely matching the profile of the region where the study was conducted. Most students come from a household where the joint income exceeds $35,000 (96%) and nearly all are engaged in either full-time or part-time employment outside of the home (97%). Two-thirds of students attending classes at the host site identified as female (66%) and one-third male. Both gender groups reported similar family backgrounds with 53% stating mothers, and 51% reporting fathers had gone on to higher education.

Overview of Survey Responses

The research design and methodology section indicated that the data would be captured, stored, and interpreted using a categorization in three differing sections: intellectual capabilities (Computer Fluency I), conceptual knowledge (Computer Fluency II), and technical skill-sets (Computer Fluency III), as originally defined by National Research Council (Table 1.1, 1999).

The NRC developed this framework (1999) to show the level at which an adult student has demonstrated intellectual capabilities related to computer usage. This was interpreted from responses to questions 10, 11, 14, and 15 of the survey instrument (Appendix B, 5-6).

Handling PC glitches. When requested to describe how they would react to an oft-experienced PC application glitch (Table 4.8), the majority of respondents (65.8%) agreed or strongly agreed that they would ask someone for help. One in four (25.3%), however, expressed no interest in seeking support and disagreed with this as a strategy. In the middle of this group were 20 respondees (8.43%), who stated they were unsure if they would ask for help. Looking at this response by gender, it can be seen that 114 females agree or strongly agree they would seek out help versus 43 males (Table 4.9). This response is slightly overrepresented by female respondents (72.6%) in the context of overall survey response identified by gender (male = 33.48%, female = 66.52%).

Table 4.8
Student Responses to a Theoretical Computer Application Glitch

Answer options	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
Ask someone for help	15	45	20	126	31
Use the "online" help function	13	32	15	122	57
"Click around" and figure it out	4	10	16	135	74
Look for a copy of the user manual	72	89	23	50	5
Google the inquiry, as a plea for help	50	59	31	76	25
Call your help desk (if you have one)	54	53	29	71	33

Crosstabs for the group (Table 4.9) show that 27 of 79 (29.2%) males disagreed or strongly disagreed that they would ask for help, whereas only 33 of 158 (20%) females

disagreed or strongly disagreed that they would seek out help. In general terms nearly half the respondents who stated they disagreed with seeking out help were males (27 of 60).

Table 4.9
*Crosstabs for Gender * Ask for help for a Theoretical Computer Application Glitch*

		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree	Total
Gender	Male	9	18	9	36	7	79
	Female	6	27	11	90	24	158
Total		15	45	20	126	31	237

Considering that males were underrepresented in the study, this figure is higher than might have been expected. The difference between responses of males and females on this question is significant; females were more likely to ask for help, F (4, 236) = 2.508, p = .04. The sample group sizes were unequal so post hoc testing using Tukey's HSD was ruled out and Scheffe's S method was not employed as SPSS required three or more groups for testing.

Many adult students affirmed that using an already available online help tool might be a resource, and nearly three-quarters of the group (n = 179) indicated that they agreed or strongly agreed with this strategy (74.58%). A greater number agreed that to "click around" and figure it out (209, 87.08%) was also a possible approach. Only 14 students disagreed with this approach. The strongest indicator for students seeking out online help is occupational group, F (4, 237) = 2.821, p = .03. Further analysis of results showed 95 of 125 students in the field of Management, Finance and Business Workers; 22 of 29 from Science, Engineering and Computer Professionals; 14 of 22 other professional, and 26 of 31 Administrative Professional Workers stated they agreed or strongly agreed with this approach.

One possible explanation of this phenomenon is that those students employed in professional occupations with evolved in-house corporate and institutional technical support

have better organic online help capacity than adult students who do not work in those occupational groups. This idea will be discussed in further detail in the Conclusions and Recommendations section in Chapter 5.

The strategy to use readily available online tools was revisited when survey participants were asked if "they would look for a copy of the user manual." Over two-thirds (67.08%) replied that they disagreed or strongly disagreed with this strategy. In contrast to the previous question, only 55 students responded that they either agreed or strongly agreed with looking at the PC operating manual (22.91%).

Table 4.10
Crosstabs for Occupational group * User manual

Occupational group	User manual				
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Management, Business and Financial Workers	45	49	10	19	2
Science, Engineering and Computer Professionals	7	10	4	7	1
Healthcare Practitioner Professionals	2	0	2	3	0
Other Professional Workers	8	8	2	3	1
Technicians	0	1	0	2	1
Sales Workers	0	6	0	1	0
Administrative Support Workers	8	11	4	9	0
Construction, and Extractive Craft Workers	0	0	0	1	0
Laborers and Helpers	0	0	0	2	0
Protective Service Workers	0	1	0	0	0
Service Workers, except Protective	1	0	0	1	0
Homemaker	0	2	2	1	0
Currently not employed	0	1	0	1	0
Total	71	89	24	50	5

It can be interpreted from the responses to this question that the students demonstrated a deeper understanding of how to utilize all resources available, and are able to

discern that online tools may be more practical and quicker solutions. Responses to this suggestion differed by occupational group (Table 4.10), where again the influence of this variable to the response differences was significant, F (4,238) = 2.474, p = .05.

When asked if Google™, the most used on-line search engine (Vise, 2005), was an option, the largest number of responses (n = 76) agreed that it was an option they would use; however, survey responses were varied. Although 42.08% of survey respondents agreed or strongly agreed that they would use Google™ for assistance, 51.92% were either unsure or disagreed with this strategy.

It is possible that some respondents have differing preferences for a particular online search engine. Or they may be provided with other proprietary software at their companies. The ability of adult students to afford a personal computer connected with Internet service providers at home seemed to impact responses. The household income of respondents had a robust relationship with the willingness to use Google™ for assistance, F (4, 223) = 3.910, p =.004.

A total of 80 females stated they disagreed or strongly disagreed with using Google™ as a search tool to identify a help source, in contrast to 27 males. Again gender is a significant indicator of this response, F (4, 234) = 2.693, p = .03. More females are likely to seek out assistance in other ways, whereas males appear to have more faith in the technological support that online tools could give them. One other significant difference was found with regard to this question: fathers' educational background (Table 4.11) is highly significant, F (4, 224) = 1.789, p = .001. The data show that the higher the education level of the student's father, the greater the proportion of students who agree or strongly agree that they would Google™ an inquiry.

Table 4.11
Crosstabs for Fathers highest education level * Google inquiry

	Google inquiry				
Fathers highest education level	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Less than high school	2	6	5	5	1
High school diploma or its equivalent	22	28	16	25	7
Some college, including vocational technical	11	13	6	28	5
Bachelors degree or higher	13	11	1	15	11
Total	48	58	28	73	24

A total of 104 respondents agreed or strongly agreed they would seek out assistance from their company help desk. The responses were significantly different with regard to two variables: occupational group, F (4,232) = 2.884, p = .02 (Management, Business and Financial Workers, and Administrative Support Workers) and gender, F (4,230) = 2.363, p = .05. Only 5 out of 78 male respondents strongly agreed they would call the help desk, in contrast 24 females agreed that they would. It was notable that personal circumstance has almost no effect on the question responses, p = .995.

Table 4.12
Crosstabs for Gender * Call help desk

		Call help desk					Total
		Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree	
Gender	Male	20	17	15	21	5	78
	Female	33	34	13	49	24	153
Total		53	51	28	70	29	231

Using new applications. Although many respondents appeared conflicted as to a strategy for sorting out an application glitch, this was not the case when they were asked about comfort levels using new computer applications (Table 4.13). The overwhelming majority (93.07%) were either comfortable or very comfortable trying out a new application

on a personal computer. It was notable that not a single student commented that they found computers difficult to work with.

Table 4.13
Comfort Level of Adult Students Using New Computer Applications

Answer options	Percent	Count
I feel very comfortable about trying to learn a new application on the computer	57.56%	141
I am comfortable about trying to learn a new application on the computer	35.51%	87
I am fairly neutral about using computers to learn a new application	3.26%	8
I feel a little intimidated trying to learn a new application on the computer	3.67%	9
I find computers very difficult to understand and frustrating to work with	0.00%	0

The only significant differences in responses to this question were found among occupational groups, F (3, 241) = 4.339, p = .005, and gender, F (3, 240) = 4.195, p = .006. There were just 9 of the 240 respondents who expressed any concern, and stated they were a little intimidated using a PC to learn new applications (3.67%). Closer examination of the data showed that from the 9; 2 of 5 homemakers, 3 of 32 administrative support workers, and 2 of 23 professional workers stated they were a little intimidated. It is plausible that the small group of homemakers reflect a phenomenon that as a group not active in the workforce they do not have constant exposure to new software applications, hence the differences in responses.

Printer failure. Survey participants were asked how they would go about fault finding if a printer connected to a PC failed to print. Many were comfortable stating (Table 4.14) that they would first check a printer paper tray for paper (50.62%), and another 21.99% opted to use the pull-down menus on the desktop PC to check the status of the print command. A smaller group showed a lack of sophistication with information technology and announced

they would likely "hit" the print button again (15.35%). This should not be construed as an incorrect answer but as reflective of a less-developed intellectual response to the problem.

Table 4.14
Responses on the Fault Finding Process when a Printer Fails to Operate

Answer options	Percent	Count
From the pull down menus I would select settings Printers & Faxes and see if the print job was saved on the list	21.99%	53
First thing would be to check the printer tray to see if it was out of paper or jammed	50.62%	122
I would first check to see if the printer cable was connected properly to the PC, then hit the print button again	12.03%	29
I would select the print function again on my PC, to make sure I did "hit" the key correctly	15.35%	37

One in ten adults approached the dilemma from a mechanistic perspective (12.03%), and decided they would prefer to check all connectivity cables first. A one-way ANOVA model failed to identify any significant indicators of the respondent's course of action. These results failed to disprove the null hypothesis that there is no linear relationship between the demographic variables and adult student responses to fixing a printer jam.

Web address viability. The final question on the instrument related to intellectual knowledge was developed on the premise that the respondents might one day need to correctly find a link to a Website from a Web address that has proved un-workable; the results are shown in Table 4.15. The overwhelming majority of students (n = 219) stated they would look for and use a search engine to confirm that the Web link they were given was accurate. This is an important point, for it confirms a level of knowledge and intuitive responses among the respondents. There was not one single adult who responded to the survey who stated they did not know what to do, and only 1 (0.41%) was sufficiently alarmed by the scenario that they would consider a "hard reboot" of the system before moving

forward. Approximately 1 in 10 students (8.72%) recognized the value in the institutional Website in support of the problem-solving process.

Table 4.15
Responses to Options Available to Ascertain the Viability of a Web Address

Answer options	Percent	Count
By using a search engine I might be able to find a current and accurate Web address	90.87%	219
It cannot be done, I would power down my personal computer	0.41%	1
I would go to the institution Web-site	8.72%	21
I wouldn't know what to do and would probably drop the class	Nil	0

Summary of descriptives for Computer Fluency I. Most adult students demonstrated comprehension of a complex problem, and 65.8% agreed or strongly agreed that they would ask someone for help if a personal computer glitch occurred. One area for concern is the 87.08% who admitted to "hunt" and peck technology looking for a response (Table 4.8). Where to go to fix a complex problem brought about more divisive responses, 42.08% would agree or strongly agree to use Google™ for assistance. In contrast, 51.92% are unsure if this was a correct response (Table 4.8). Students were confident overall with handling fault finding, and only a small group reported that they felt even the slightest intimidation working with computers.

A question based around responses to a small printer jam solicited similar reported levels of confidence: 50.62% were comfortable enough to say that they would first check a printer paper tray for paper (Table 4.14). A compelling aggregate response was to "the validation of an unworkable Web address," where over 90% of adult students recognized the benefit of using a search engine like Google™ for assistance. Every student had a response to the problem (Table 4.15).

To assess overall conceptual knowledge, the data were interpreted from responses to questions 4, 5, 6, 12 and 13. Survey participants were asked to use a Likert scale to self-evaluate their skills in mathematics, research, and writing: results are shown in Table 4.16. In the area of mathematics, as might be expected, many adult students rated their skills at a level that could be better. In fact, 37.25% stated they were either not good at math or could be better.

Table 4.16
Participant Self-Evaluation of Mathematics, Research and Writing Skills

Answer options	Not good at all	Could be better	Good	Better then good	Very good
Mathematics	14 (5.73%)	77 (31.55%)	72 (29.51%)	56 (22.95%)	25 (10.26%)
Research skills	3 (1.21%)	37 (14.92%)	95 (38.31%)	74 (29.84%)	39 (15.72%)
Writing	4 (1.64%)	36 (14.75%)	84 (34.43%)	70 (28.69%)	50 (20.49%)

A combined 52.46% rated themselves as good, or as better than good, with only 25 students (10.26%) considering themselves very good. Two variables proved to be significant predictors of high self-efficacy in math; ethnic/racial background, F (4, 236) = 2.366, p = .05, and gender, F (4,238) = 2.637, p = .04.

Table 4.17
*Crosstabs for Ethnic/Racial background * Math skills*

	Math skills				
Ethnic/Racial background	Not good	Could be better	Good	Better than good	Very good
White, non-Hispanic	11	67	69	55	23
Black, non-Hispanic	0	1	1	0	0
Hispanic	1	1	1	0	0
Asian / Pacific Islander	0	3	2	0	1
More than one ethnic/racial heritage	0	1	0	0	0
Other	1	2	0	0	0
Total	13	75	73	55	24

Crosstabs for ethnic/racial background (Table 4.17) show that 88 of 89 students (98.87%) who reported as better than good or very good at math identified as White, non-Hispanic. From all other ethnic/racial backgrounds only one student rated their math skills as very good.

A different picture emerged when the math skills data were looked at by gender (Table 4.18). In this case 62 females reported that they thought their math skills were not good or could be better, whereas only 25 males said the same. Males were less likely to identify as needing improvement in this area. This is consistent with earlier data interpretation in Computer Fluency I, where males showed a reluctance to seek out help.

Table 4.18
*Crosstabs for Gender * Math skills*

	Math skills					Total
Gender	Not good	Could be better	Good	Better than good	Very good	
Male	2	23	22	18	14	79
Female	11	51	51	38	9	160
Total	13	74	73	56	23	239

In contrast, the responses to the question on research skills were much clearer; only 3 students did not rate their personal research skills as at least good (1.21%). This also might have been anticipated, when we recall that over 90% of students reported feeling comfortable using a search engine (Table 4.9) and that nearly 75% of students were comfortable using an online help function (Table 4.6). The overwhelming majority of students rated their research skills as good or better (n = 209, 83.87%), and again gender is a strong predictor of this conceptual knowledge, F (4, 238) = 2.933, p = .02. Overall 92.5% of male respondents (n = 75) and 82.35% of female respondents (n = 130) rated their research skills as good, better than good or very good. Adult students demonstrated a high comfort level using a search engine to support their personal research.

In the area of writing, a skill that will be required for the majority of college courses, student self-assessment is similar to their research responses. Only 4 students considered their writing poor, and a somewhat larger group (n = 36, 14.75%) felt it could be better. A large number of students (n = 204) assessed their writing skills as good, better than good, or very good (83.61%) and from that group (n = 50), 20.49% considered their writing very good. Differences in responses to this skill were significant based on students' differing educational levels, F (4,239) = 3.326, p = .01. The majority of students (n = 171) with some college, including vocational/technical, rated their writing skills as good, better than good, or very good. We can be surmise from these responses (Table 4.19) that the further an adult student progresses in the undergraduate educational process the higher the likelihood of a strong comfort level with their writing. It was noticeable that one variable that does not seem to affect a student's self-rating of writing skill is household income, F (4,225) = .266, p = .89.

Table 4.19
*Crosstabs for Educational level of respondent * Writing skills*

	Writing skills				
Educational level of respondent	Not good	Could be better	Good	Better than good	Very good
Less than high school	0	1	0	0	0
High school diploma or its equivalent	0	4	2	1	0
Some college, including vocational technical	3	28	74	59	38
Bachelors degree or higher	1	3	6	10	10
Total	4	36	82	70	48

Personal computer usage was reviewed next (Table 4.20). The majority of adult students reported not using a PC in a classroom or on campus (59.1%), but 75 stated they used it either weekly or 1-2 times a month (32.61%). Very few students use a PC daily in a

classroom although gender differences were significant, F (4,232) = 2.378, p = .05. Only 10 respondents stated they would use the PC in classroom 2-3 times a week. These responses appear to indicate that adult students do not bring personal computers into the classroom to enhance study, nor do they use them when they are on campus.

Table 4.20
Usage of a Personal Computer by Adult Students

Answer options	Daily	2-3 times a week	Once a week	1-2 times a month	Not at all
In a classroom on campus	9	10	30	45	136
At your residence for coursework	61	107	38	19	19
At your …for personal projects	105	70	28	29	9
At your … for personal entertainment	120	68	16	21	18
At or in an Internet Cafe	2	1	4	14	219
At your local library	2	5	8	30	196

Closer examination of the data for gender differences (Table 4.21) show that although most do not use a PC in classroom to support studies, there were 11 males who identified as using them daily or 2-3 times a week. This group was over-represented, in contrast to females where 14 identified using them daily or 2-3 times a week. Males reported as more likely to use a PC in a classroom.

Table 4.21
*Crosstabs for Gender * Campus classroom use*

	Campus classroom use					Total
Gender	Daily	2-3 times a week	Once a week	1-2 times a month	Not at all	
Male	6	5	12	9	48	80
Female	3	11	16	36	87	153
Total	9	16	28	45	135	233

A very different story evolved when students were asked if they used a PC at home or in their residence; 206 students use a PC for coursework (84.42%) and from that group 25% reported using the PC on a daily basis. The response by ethnic/racial background is interesting although not significant, F (4, 240) = 2.20, p = .07. Could it be that differing

ethnic/racial backgrounds are limited because of household income in their ability to purchase and therefore use a PC at home? Data in Table 4.22 show that most Black, non-Hispanic and Hispanics as well as 25 White, non-Hispanics (10.9%) reported earning $35,000 or less. Crosstabs for Classroom use * Ethnic/Racial background * Household Income show that only 1 of 16 White, non-Hispanics reporting earning under $35,000 a year reported using a PC in a classroom 2-3 times a week or daily. It is significant that there are 15 White, non-Hispanics who reported earning over $75,000 a year and using a PC in the classroom 2-3 times a week or daily. The data show that the groups who can afford to purchase a PC are more likely to report using one in the classroom, than those with lesser financial resources.

Table 4.22
Crosstabs for Ethnic/Racial background * Household income

	Household income				
Ethnic/Racial background	$20,000 or less	$20,001-$35,000	$35,001-$50,000	$50,001-$75,000	More than $75,000
White, non-Hispanic	1	24	44	45	102
Black, non-Hispanic	0	2	0	0	0
Hispanic	0	2	0	0	1
Asian / Pacific Islander	0	1	3	0	0
More than one ethnic/racial heritage	0	0	0	1	0
Other	0	0	1	1	1
Total	1	29	48	47	104

This point would certainly reinforce what we know of the access issues in regard to under-represented families (NCES, 2005). Crosstabs of ethnic/racial background and household income for this question showed a higher income level among White, non-Hispanics is a determinant of PC usage in the classroom.

A small number of students (38) stated they use a PC 1-2 times a month or not at all to complete coursework from home. In contrast, when asked if they use the PC for personal projects at home the number increased significantly: 43.5% of adults acknowledged they log

on daily for personal projects and 84.2% report using the PC once a week or more. Here again gender is a strong indicator, F (4, 236) = .713, p = .01, as is household income, F (4,225) = 2.53, p = .04. The majority of males responding to this question (n = 66. 82.5%) stated they use a PC from home 2-3 times a week or more. In contrast only 68% of females (n = 107) stated they did the same. The data show males are more likely to use a PC at home for personal projects.

The data also indicate that households with greater levels of income are more likely to purchase home PCs and to afford monthly internet access. It can be inferred that increased personal compensation enables greater levels of internet access. Only 9 students did not use a PC from home, suggesting they did not own a PC. This fits with what is known about levels of personal computer ownership identified in Chapter 2 (WOW!, 2003). Even more students identified that they use the PC for personal entertainment, with nearly half (49.38%) acknowledging they use it daily. Responses to this question by Gender, F (4, 241) = 3.598, p = .007, and Age Group, F (4, 239) = 2.563, p = .039 were significant.

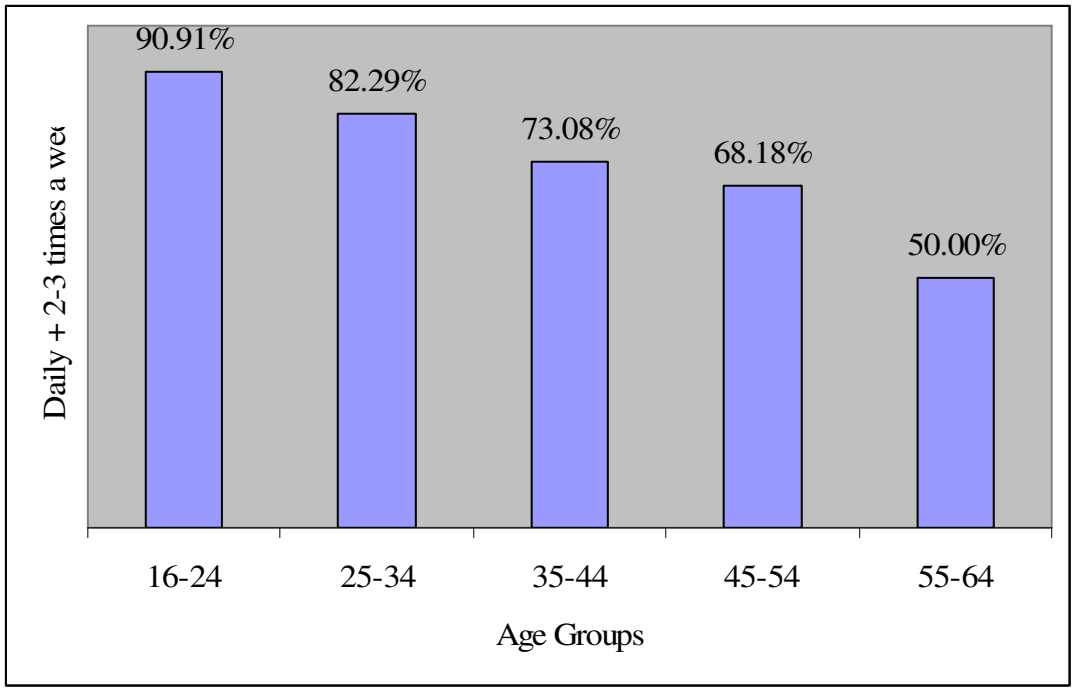
Crosstabs showed that among females, 43 of respondents (27.04%) reported using a PC at home for personal entertainment once a week or less often; in comparison, only 11 males (13.5%) said the same. Looking at this phenomenon by age group (Table 4.23) showed that in the 25-34 age group 79 students reported using a PC for home entertainment 2-3 times a week or more; as the age group of the student increases, the usage pattern decreases. The older the age-group of the student, the larger the proportion who identify as not using a PC at home for entertainment at all. It is reasonable to infer from the data that either as student mature in age they are less likely to use a PC at home for entertainment, or alternatively as the literature tells us, that older adult students did not grow up using PCs in he same way that younger generations have (DaBell, 2006).

Table 4.23
*Crosstabs for Age group of respondent * Use at home for entertainment*

	Use at home for entertainment				
Age group of respondent	Daily	2-3 times a week	Once a week	1-2 times a month	Not at all
16-24 yrs	15	5	0	2	0
25-34 yrs	51	28	7	6	4
35-44 yrs	36	21	5	10	6
45-54 yrs	17	13	4	3	7
55-64 yrs	0	1	0	0	1
Total	119	68	16	21	18

Data in Figure 4.5 demonstrate that when the usage is grouped [respondents who stated usage was either daily or 2-3 times a week], the distribution is skewed left, indicating that younger respondents are more likely to use a PC for personal entertainment on a regular basis.

Figure 4.5
Age Group Distribution of PC Use for Personal Entertainment



One student reported using an Internet café on a daily basis, and only 2 used an Internet café more than 2-3 times a week. The majority never use a PC at or in an Internet café (91.25%). Household income; F (4,223) = 2.96, p = 0.4, and Occupational group, F (4,236) = 46.23, p = .002, are significant indicators of these responses. The crosstabs in Table

4.24 show that usage is connected to having the financial acumen to use an Internet café; however, the number of responses is very small, with only a total of 18 (4.16%) of all respondents stating they use an Internet café more than 1-2 times a month across all household income groups. Due to sparse data this was tabulated in three categorical columns.

Table 4.24
Crosstabs for Internet Café usage Household income*

	$20,000 or less - $35,000	$35,001-$75,000	More than $75,000
Daily	0	0	2
2-3 times a week	1	0	0
Once a week	0	2	1
1-2 times a month	3	4	5
Not at all	26	45	92
Total	30	51	100

When asked about library usage, 30 students (12.44%) stated 1-2 times a month as the norm, and only 45 students said they used a public library for Internet access at all. Crosstabs in Table 4.25 show clearly that the majority of students reported not using a library at all (n = 41) or that none of the criteria apply (n = 153). This indicates that although changes in personal circumstance may be a trigger (Schlossberg, 1989) to return to higher education, these changes do not necessarily mean that income level will determine if the student will use a public library for Internet access.

The PC usage trends were identified and analyzed in more detail when students were asked in Q.6 the kinds of software applications they used and how often (Table 4.26). A strong finding was the use of word processing and spreadsheet software by many students. This might have been predicted, considering the requirements of many academic courses for students to demonstrate knowledge through cogent responses to problems.

Table 4.25
Crosstabs for Personal Circumstance and use of a Public Library for Internet access

	Daily	2-3 times a week	Once a week	1-2 times a month	Not at all
Divorced in the last 3 years	0	1	1	2	1
Widowed in the last 3 years	0	0	0	1	1
Recently added a child	0	0	0	2	10
Changed employer in the past year	0	1	1	5	17
Re-entered workforce in the past year	0	0	0	0	2
Married in the past year	1	1	1	1	10
None of these apply	1	2	5	19	153
Total	2	5	8	30	194

A majority (56.55%) of students reported using word processing software on a daily basis: a further 22.13% used it 2-3 times a week. These data account for 78.68% of all respondents: attending an institution of higher learning, the need to utilize word processing software to develop written responses is not unusual. Overall 99.17% of all respondents use word processing at least 1-2 times a month, with only 3 students responding that they did not use a word processor at all. Responses did not vary significantly by occupational group.

Table 4.26
Usage of Software Applications on a PC by Survey Respondents

Answer options	Daily	2-3 times a week	Once a week	1-2 times a month	Not at all	Response
As a word processor (e.g., WordPerfect, MS Word)	138	54	26	23	3	244
As a spreadsheet (e.g., MS Excel or Quattro Pro)	128	41	24	33	17	243
For its presentation software (e.g., MS PowerPoint)	21	25	22	106	67	241
As a database (e.g., FoxPro, MS Access)	56	25	12	35	112	240
For proprietary software (e.g., Quicken, Turbo Tax)	34	14	16	55	120	239

It can be seen that 128 students (52.67%) state they use PCs daily, and another 16.8% at least 2-3 times a week. Overall, 93.40% of the students use spreadsheets at least 1-2 times a month, although there are 17 who stated they never do. Household Income is significantly ($p < .01$) related to use of a word processor (-.200) and spreadsheets (-.187) and ($p <.05$), with use of presentation software (-.144), as a database (-.144), and for proprietary software (-.138).

Table 4.27
Concept Responses to Primary Research Using a PC

Answer options	Percent	Count
Use Google or some other search engine, and see what the first hits are then check out those sites.	53.49%	130
Access the college library Website, then use the search function in the library to locate texts, novels and other sources	39.92%	97
Check online to see if the subject has been written on before, download the paper and use sections of it in your submission	0.41%	1
Use peer reviewed journals online to find relevant hits and sources	6.18%	15

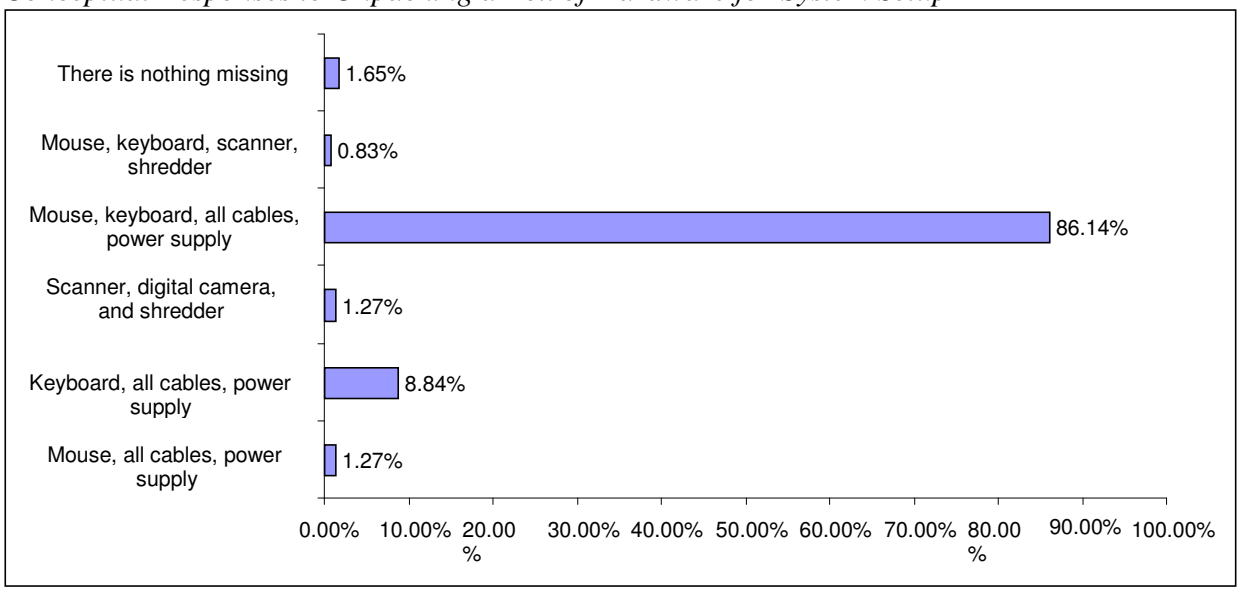
Building on this theme, students were then asked what strategy they would adopt if a professor in one of their classes were to assign a research paper. Table 4.27 shows that more than half of the students (53.49%) would choose Google™ or some other search engine. Another 97 students (39.92) identified the institutional library Website as a choice.
The data were broken down by gender (Table 4.28); a few, mostly males ($n = 9$, 60%), considered the use of peer review articles supportive. The majority of both males and females would use a combination of search engine and institutional library Website to support research, although it can be seen that males reported being less likely to use the college library website. Only one student admitted to considering the use of a previously written paper as a practical response. The fact that only one student acknowledged this response suggested that the behavior of adult students in this sample was ethical; however, it should not and cannot be interpreted as indicative of ethical behaviors for all adult students.

Table 4.28
Distribution of Responses by Gender for Research Sources

	Male	Female	Totals
Use Google	50	79	129
Use college library website	21	75	96
Check online for existing	0	1	1
Use peer review journals	9	6	15
Totals	80	161	241

The final question analyzing adult student conceptualization skills was Q.13, which required the student to look at a list of items, and decide what was missing to enable them to put together a complete working personal computer system: see Figure 4.6. The overwhelming majority of adults (86.14%) identified that a mouse, keyboard, all cables, and power supply were missing from the given list of items.

Figure 4.6
Conceptual Responses to Unpacking a Box of Hardware for System Setup



The second largest group responded in a similar way (8.84%), identifying that power cables were necessary but not including the mouse. In their reply, three students said nothing was missing; i.e., the list as given would have made the system function. Another three thought missing items should include a digital camera, scanner, and shredder. ANOVA

results showed that there were not significant differences with regard to demographic variables.

Summary of Descriptive Statistics for Computer Fluency II. Conceptualizing the use of a personal computer for research is an area where 84% of adult students reported feeling their skills were good or better than good. A similar-size group (83.71%) reported feeling comfortable with their writing skills using a PC. This group of students report using a PC daily to complete coursework from their home (84.42%), and very few do not own a PC with which to do either coursework or personal projects.

The image of adult students sitting in trendy Starbucks and Caribou Coffee locations completing coursework was eschewed by responses indicating that 91% of students do not use Internet cafés for study. This may be the case for traditional-age students, but the data do not support that this is the case for adult students. We do know that the majority of students are familiar with word processing (56.55%) and spreadsheet (52.67%) software, and similar-sized groups explained they were not familiar with PowerPoint, databases, and proprietary software packages. The comfort level that adults expressed with some software tools indicated that many use Google™ or other search engines for online research. The majority of students (86.14%) were able to correctly conceptualize and list items missing to assemble a complete PC system.

Computer Fluency III

To assess that an adult student has demonstrated technical skill-sets, data were interpreted from responses to questions 7, 8, and 9, and to a lesser extent question 1. These questions supported many of the original NRC (1999) component identifiers: setting up a PC, using the Internet to find resources, using a PC to communicate with others, using spreadsheets, using databases and instructional materials.

Personal Computer usage. Students were asked to share how often they used a PC for a variety of tasks (Table 4.29). Results indicate that 218 students (89.7%) stated they used an Internet browser daily, and every respondent stated they use a PC at least 1-2 times a month. The wide reaching implications here are that all adult students who responded to the survey do use the Internet on a monthly basis, but they don't necessarily use it for research. Only 161 expressed a need to use the Internet for research more than 2-3 times a week.

When that fact is contrasted against responses of the 238 adults who stated they use an Internet browser 2-3 times a week or more, the chasm between Internet use and Internet use for library research is apparent. Adult students do not use an online library with the same regularity as they do Internet research. Gender is the only significant indicator of Web browser use; F (3, 239) = 2.607, p = .052. The data show that no males reported using an Internet browser less than 2-3 times a week. The data suggest that male students are connected online using an Internet browser more often than female students.

Table 4.29
Personal computer usage by adult students for multivariate tasks

Answer options	Daily	2-3 times a week	Once a week	1-2 times a month	Once a year or never
Use an Internet browser	218	20	3	2	0
Research topics online using library resources	16	33	25	98	67
Research topics on the Internet	78	83	36	43	1
Communicate using email	225	10	5	1	2
Participate in on-line discussion groups	13	23	17	61	128
Create pages on the internet	8	8	5	22	200
Write a computer program	10	7	2	8	216

Only 49 out of 243 students (20.16%) reported using an online library more than 2-3 times a week. More alarmingly, 98 students (40.32%) stated they went to the institutional Website only 1-2 times a month, and 67 stated they never do (27.5%). This is alarming because the critical mass of students responding are not located in the geographic area of the host site, but are located in the geographic region of the satellite campuses. This point implies that the adult students are not physically using the library to undertake research either.

PC usage for communications. The most overwhelming response from this question was just how many adult students communicate using email: 92.59% indicated replying to emails daily, and only 3 students stated they did not communicate using email more than once a week. Email use was predicted significantly by age, F (5, 240) = 1.957, p = .086; educational level, F (5, 240) = 3.106, p = .01 and occupational group, F (95, 240) = 2.968, p = .013.

Table 4.30
*Crosstabulation for Age group of respondent * Use of email*

Age group of respondent	Daily	2-3 times a week	Once a week	1-2 times a month	Once a year or never
16-24 yrs	20	1	0	0	1
25-34 yrs	92	2	1	1	0
35-44 yrs	72	3	0	0	1
45-54 yrs	38	2	4	0	0
55-64 yrs	2	0	0	0	0
Total	224	8	5	1	2

The distribution of email use by age had an element of predictability. The youngest age group (16-24), traditionally high volume users of social networking sites (myspace.com, facebook.com) are known to shy away from email; however, 90.09% of all respondents acknowledged checking it daily. The usage of email increased among 25-34 yr olds (95.83%) and 35-44 yr olds (94.73%). The data tailed off in the over 45 category (84.44%), reflecting a

more limited usage trend of older students. Although both of the students aged over 55 reported using email daily, the sample size is too small to consider this response significant.

Data from Table 4.31 show that the students with "some college, including vocational /technical" were more likely to check email daily (94.6%). The holistic picture showed that in all categories the majority of students check email at least once a week, and that the further a student has progressed through the educational process the more likely they are to use and check email on a regular basis.

Table 4.31
*Crosstabulation for Educational level of respondent * Use of email*

	Use of Email					
Educational level of respondent	Daily	2-3 times a week	Once a week	1-2 times a month	Once a year or never	Totals
Less than high school	0	1	0	0	0	1
High school diploma or its equivalent	6	0	0	0	1	7
Some college, including vocational /technical	193	6	3	1	1	204
Bachelors degree or higher	25	1	2	0	0	29
Total	224	8	5	1	2	241

Among occupational groups; Management, Business & Financial workers (96.8%); Science, Engineering & Computer Professionals (93.1%) and Administrative Support Workers (96.77%) all have a very high proportion of students that report using email daily.

Even though this group uses the Internet and email a lot there is no guarantee they are connected in the way that younger generations are (through social networking sites, instant messaging, text messaging, and blogging). Very few adults reported using online discussion groups on a regular basis (5.37%), and a further 9.46% only did this 2-3 times a week. In the light of the WebCT hybrid and Web–supported programs at the host site, this response was a

surprise. This infers that adult students are using technology to support their educational goals, but not necessarily outside of the classroom.

PC usage of tools and applications. Hardly any students accessed the Web to create Web-pages regularly; 200 replied it was once a year or never (82.3%). There is a significant difference between genders, F (4, 239) = .747, p = .008. Males were overrepresented in this response with one in four responding that they create web pages 1-2 times a month or more (n = 22, 25.31%). Females were underrepresented; only 20 reported creating web pages on a regular basis (12.42%).

The survey questions progressed from inquiring about program applications and PC usage of adult students, to a self-assessment of their technical skills on particular software applications (Table 4.32). Responses to earlier questions in Table 4.16 demonstrated word processing and spreadsheets to be the tools most adult students are familiar with. This theme continued; 108 students (44.08%) rated their skills with word processing as advanced intermediate, and nearly all respondents (99.3%) rated themselves above beginner. Adult student responses appear to reflect that they have high self-efficacy in this area.

Table 4.32
Student Self Ratings with Software Applications

Answer options	No Experience	Beginner	Beginning Intermediate	Intermediate	Advanced Intermediate	Expert
Word processing	0	4 (1.63%)	16 (6.53%)	60 (24.48%)	108 (44.08%)	57 (23.20%)
Spread sheets	3 (1.24%)	21 (8.68%)	25 (10.33%)	69 (28.51%)	89 (36.62%)	35 (15.21%)
Presentation	17 (6.97%)	37 (15.16%)	41 (16.80%)	76 (29.10%)	49 (20.08%)	24 (9.84%)
Databases	19 (7.88%)	64 (26.56%)	47 (19.5%)	55 (22.82%)	38 (15.76%)	18 (7.45%)
Web-browser	17 (7.00%)	22 (9.05%)	28 (11.52%)	57 (23.46%)	63 (25.93%)	56 (23.04%)

The students reported their technical skills using spreadsheets at similar levels: with word processing; only 9.92% rated themselves as a beginner or less. Of interest here was the fact that both mothers' and fathers' highest educational background were significant indicators, F (4, 235) = 2.832, p = .025 and, F (4, 235) = 2.882, p = .023 respectively. In both categories a higher percentage of students who reported that their parents' highest education level was less than high school rated their skills as intermediate, advanced intermediate, or expert. The data indicate that educational background of the parents is not a predictor of individual skills with spreadsheets for students.

Overall 80% of adult students rated their technical skill with spreadsheets to be intermediate or higher, which demonstrates a high level of technical fluency. Of particular interest was the fact that the occupational grouping was a strong indicator; F (6, 240) = 4.129, p = .001. Students employed in the Management, Business & Financial workers, and Science, Engineering & Computer Professionals sector were more likely to rate themselves as skilled at the intermediate level or higher with spreadsheets. It was notable that from the group of Administrative Support Workers, only 71.87% rated their skills at intermediate level or higher.

The use of presentation software [PowerPoint] showed less familiarity, with 17 students having no experience (6.97%) and a further 15.16% considering themselves as beginners. Just under one-third of respondents identified their presentation software skills as advanced or expert (29.92%). None of the independent variables has an impact on students' self-perception in this area.

A similar reply on the self-rating on databases was found; only 64 students (26.56%) considered themselves beginners and a further 19 (7.88%) had no experience. At the more advanced end of the scale, few (7.455) rated themselves as expert and overall just 45.9% of

all survey respondents considered their skill with databases at the intermediate level or higher. More identified as beginner or beginner intermediate (111) in this category than any other: this accounted for 45.05 % of respondents.

The final response on this question asked students to identify their skill sets using a Web browser. Not surprisingly, very few had no experience (7.00%), and the majority (238) identified using a browser 2-3 times a week (Table 4.29). Only a small group (50) considered their skills to be at the beginner or beginning intermediate level (20.57%). The majority of adult students did rate themselves as intermediate or higher, with 176 considering their skills as advanced (72.43%).

The levels of confidence students have with these applications reflected their ability to complete assignments using them (Table 4.33), supporting the earlier finding that 56.55% reported using word processing software on a daily basis (Table 4.16); 156 students (64.19%) stated they were extremely confident in their ability to utilize the application.

Table 4.33
Confidence Levels with Software Applications to Complete Assignments

Answer options	Not at all	Somewhat	Moderately	Very confident	Extremely confident
Word Processing	1	2	13	71	156
Spreadsheets	4	18	39	64	119
Presentations	18	28	41	60	96
Databases	41	44	49	54	57
Web-browsers	32	24	36	57	95

Overall, 222 students (93.45%) out of all respondents stated they were very confident or extremely confident in their ability to use word processing to complete assignments. Only 1 student had no confidence in doing this, and 2 were somewhat confident of being able to "to use word processing for the completion of an assignment." Confidence with spreadsheets

was also high: 48.77% considered themselves highly confident, and another 26.22% were very confident. Only 4 students reported doubting their ability to utilize spreadsheets for an assignment completion. A much larger group of students reported not being confident with presentation software (18), although 64.19% of all respondents stated they were either very or extremely confident with their ability to use presentation software to complete an assignment.

Responses concerning the use of databases were fairly evenly divided: 16.73% had no confidence, 17.93% were somewhat confident, 20.00% reported being moderately confident, 22.03% were very confident, and 23.26% were extremely confident. Table 4.34 shows this breakdown by age groups; greater proportions of adult students are not at all confident or somewhat confident using database software in each successively older age group.

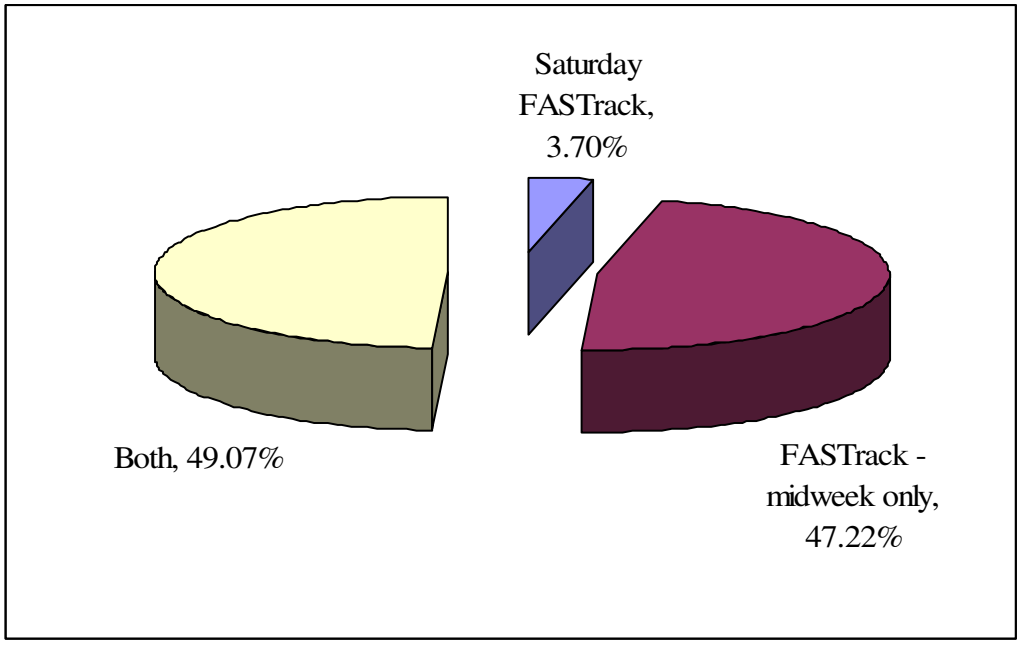
This indicates that older students are less likely to have high confidence embracing and using Web-browsers. In a similar vein to the question asking students to self-assess their technical skill with software applications (Table 4.16), the confidence levels using Web-browsers is high. Overall, 62.29% of respondents are either very confident or extremely confident they can use a Web-browser for an assignment.

Table 4.34
*Crosstabs for Web-browsing * Age group of respondents*

Confidence	16-24 yrs	25-34 yrs	35-44 yrs	45-54 yrs	55-64 yrs	Totals
Not at all	0	11	12	8	0	31
Somewhat	1	9	10	4	0	24
Moderately	4	11	10	10	0	35
Very	8	22	18	9	0	57
Extremely	9	43	28	13	2	95
Totals	22	96	78	44	2	242

The graphic (Figure 4.7) shows that most adults elected to enroll in either midweek classes, or blend both Saturday and midweek classes. These responses indicate that an adult student who shows a preference for both F2F and hybrid learning modalities may have a more developed technical fluency.

Figure 4.7
Breakdown of Instructional Modality Adult Students Selected



The data also show that a very small percentage of students (3.75%, $n = 8$) are taking the hybrid format WebCT classes exclusively (Figure 4.7), supporting findings from an earlier program assessment (Armstrong, 2006). The remaining students identified as attending midweek classes (47.22%) or attending both formats (49.07%).

Summary of Descriptive Statistics for Computer Fluency III. Adult students showed a strong tendency to use technology, and demonstrated high levels of confidence with their technical skill sets. The majority use an Internet browser daily (89.7%), although not necessarily the institutional library resources. A similar-sized majority (92.59%) utilize email technology for communications daily; in contrast, most do not participate in online

discussion groups (52.89%), create Web pages (82.60%), or write computer programs (88.88%).

In general terms, the respondents considered their skills with word processing (99.30%), spreadsheets (80.34%), and Web browsers (72.43%) more evolved than their skills with presentation software and databases. Similar-sized groups reported feeling either very confident or extremely confident with their technical skill sets that they could complete assignments utilizing the differing applications; 93.45% with word processing, 74.99% with spreadsheets, 64.19% with presentation software, and 62.29% with Web browsers. Lesser confidence levels were reported using databases (45.29%).

Enrollment trends at the host site locations do not mirror technical skill sets. Student enrollments are evenly distributed between blended F2F instructional and hybrid learning modalities (47.22%) and using only F2F learning modalities (49.07%).

Regression Analysis

Multiple Regression Analysis of Computer Fluency I

Linear regression models were estimated to determine whether a relationship exists between the independent variables age, ethnicity, SES, gender, family educational background, and personal circumstance and each of the dependent variables, which are the itemized student responses to the survey instrument questions and question subsets. For the tabulated results from each individual regression analysis, $\alpha = .05$. These tables show the model results from each individual regression compiled into a single table. The regression was hierarchical, with each predictor variable entered in a specified order. All variables for Computer Fluency I [intellectual skills] were entered in the order documented in Table 4.35. Age ($p = .028$), Occupational group ($p = .026$), and Gender ($p = .010$) were statistically

significant predictors of Computer Fluency I, and these three significant variables were examined further.

Table 4.35
Linear Regressions for Computer Fluency I

Model		Sum of Squares	df	Mean Square	F	Sig.
Age group of respondent	Regression	15.620	9	1.736	2.135	0.028
	Residual	174.762	215	0.813		
	Total	190.382	224			
Ethnic/Racial background	Regression	4.477	9	0.497	0.777	0.638
	Residual	137.018	214	0.640		
	Total	141.496	223			
Household income	Regression	15.783	9	1.754	1.481	0.157
	Residual	239.174	202	1.184		
	Total	254.958	211			
Respondents Education level	Regression	1.511	9	0.168	1.055	0.397
	Residual	34.205	215	0.159		
	Total	35.716	224			
Occupational group	Regression	211.337	9	23.482	2.162	0.026
	Residual	2334.663	215	10.859		
	Total	2546.000	224			
Gender	Regression	4.802	9	0.534	2.509	0.010
	Residual	45.297	213	0.213		
	Total	50.099	222			
Mothers education level	Regression	7.743	9	0.860	1.064	0.391
	Residual	169.034	209	0.809		
	Total	176.776	218			
Fathers education level	Regression	8.988	9	0.999	1.171	0.315
	Residual	178.309	209	0.853		
	Total	187.297	218			
Personal circumstance	Regression	18.201	9	2.022	0.879	0.545
	Residual	490.202	213	2.301		
	Total	508.404	222			

Regression analysis for Age in Computer Fluency I. Linear regression established that a statistically significant relationship (Table 4.36a) between the students' age and the response that they would seek out a "User manual" (p = .054). ANOVA showed that F is strong (3.748) and that there is a linear relationship between the age of the students and those who selected a "User manual" when a PC computer glitch occurred. Closer examination of

the scatter plots supported this point. The model (Table 4.36b) showed "User manual" accounted for 12.5% of the variance.

Table 4.36a
Coefficients for Age in Computer Fluency I

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.870	.227		8.250	.000
Age group of respondent	.158	.082	.125	1.936	.054[a]

a. Dependent Variable: User manual

Table 4.36b
Model Summary for Age in Computer Fluency I

R	R Square	Adjusted R Square	Std. Error of the Estimate
.125(a)	.016	.011	1.154

a. Predictors: (Constant), Age group of respondent
b. Dependent Variable: User manual

Regression analysis for Occupational group in Computer Fluency I. There is a statistically significant relationship (Table 4.37a) between the students' occupational group and the response that they would seek out a "user manual" ($p = .006$).

Table 4.37a
Coefficients for Occupational group in Computer Fluency I

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	2.091	.102		20.578	.000
Occupational group	.061	.022	.178	2.785	.006[a]

a. Dependent variable: User manual

ANOVA showed that F is very strong (7.759) meaning that there is a strong linear relationship between the occupational group the students are employed in and those who selected a "User manual" when a PC computer glitch occurred. Examination of the scatter plots supported this point. The model summary (Table 4.37b) showed that "User manual" accounted for 17.8% of the variance.

Table 4.37b
Model Summary for Occupational group in Computer Fluency I

R	R Square	Adjusted R Square	Std. Error of the Estimate
.178(a)	.032	.028	1.145

a. Predictors: (Constant), Occupational group
b. Dependent Variable: User manual

Regression analysis for Gender in Computer Fluency I. There is a statistically significant relationship (Table 4.38a) between students' gender and the response that they would "Google the inquiry" (p = .004). ANOVA showed that F is strong (8.453) for "Google the inquiry" meaning that there is a strong linear relationship between the student gender and those who selected to "Google an inquiry" when a PC computer glitch occurred.

Table 4.38a
Coefficients for Gender in Computer Fluency I

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.744	0.315		11.892	0.000
Gender	-0.529	0.182	-0.187	-2.907	0.004[a]

a. Dependent variable: Google the inquiry

Examination of the scatter plots supported this point, and distribution of the dependent variable was even. The model summary (Table 4.38b) showed that "Google the inquiry" accounted for 18.7% of the variance.

Table 4.38b
Model Summary for Gender in Computer Fluency I

R	R Square	Adjusted R Square	Std. Error of the Estimate
.187(a)	.035	.031	1.318

a. Predictors: (Constant), Gender. b. Dependent Variable: Google inquiry

There is also a statistically significant relationship (Table 4.39a) between students' gender and the response that they have developed a "comfort level with new applications" (p = .001). ANOVA indicated that F is very strong (11.288) for "comfort level with new

applications" showing there is a strong linear relationship between the students' gender and those who selected the response "comfort level with new applications." Examination of the scatter plots supported this point. Distribution of the dependent variable was skewed left, indicating that the majority of the students agreed with the statement. The model summary (Table 4.39b) showed that "comfort level with new applications" accounted for 21.2% of the variance

Table 4.39a
Coefficients for Gender in Computer Fluency I

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.979	0.166		5.909	0.000
Gender	0.321	0.096	0.212	3.360	0.001[a]

a. Dependent variable: Comfort level

Table 4.39b
Model Summary for Gender in Computer Fluency I

R	R Square	Adjusted R Square	Std. Error of the Estimate
.212(a)	.045	.041	.699

a. Predictors: (Constant), Gender. b. Dependent Variable: Comfort level

Multiple Regression Analysis of Computer Fluency II

The variables for Computer Fluency II [grounded conceptual knowledge] were entered in the same order that they are documented in Table 4.40, which matches the sequence that the independent variables are introduced in the narrative. Two independent variables; Age (p = .012), and Gender (p = .008), demonstrate a very strong goodness of fit with the model, and both are statistically significant.

I have a 95% level of confidence with the model that the summative responses to questions 4, 5, 6, 12, and 13 (Computer Fluency II,) can be predicted by Age group, F, (16, 214) = 2.045, p = .012 and Gender, F, (16, 212) = 2.14, p = .008. With α = .05, both of these

variables are highly significant predictors of Computer Fluency II, and both of these significant variables were examined further.

Table 4.40
Linear Regressions for Computer Fluency II

Model		Sum of Squares	df	Mean Square	F	Sig.
Age group of respondent	Regression	25.058	16	1.566	2.045	0.012
	Residual	151.668	198	0.766		
	Total	176.726	214			
Ethnic/Racial background	Regression	12.476	16	0.780	1.265	0.223
	Residual	121.416	197	0.616		
	Total	133.893	213			
Household Income	Regression	30.773	16	1.923	1.613	0.069
	Residual	222.913	187	1.192		
	Total	253.686	203			
Respondents educational level	Regression	2.944	16	0.184	1.426	0.132
	Residual	25.549	198	0.129		
	Total	28.493	214			
Occupational group	Regression	538.366	16	33.648	3.783	0.000
	Residual	1752.144	197	8.894		
	Total	2290.509	213			
Gender	Regression	7.227	16	0.452	2.140	0.008
	Residual	41.365	196	0.211		
	Total	48.592	212			
Mothers educational level	Regression	7.560	16	0.473	0.597	0.884
	Residual	153.606	194	0.792		
	Total	161.166	210			
Fathers educational level	Regression	9.941	16	0.621	0.749	0.741
	Residual	160.836	194	0.829		
	Total	170.777	210			
Personal circumstance	Regression	37.566	16	2.348	1.089	0.368
	Residual	424.808	197	2.156		
	Total	462.374	213			

Predictors: (Constant) Math skills, Research skills, Writing skills, Campus classroom use, Use at home, Use at home for projects, Use at home for entertainment, use at an internet café, Use at a public library, Use Word, Use Excel , Use PowerPoint, Use Access, Use Proprietary, Select correct list.

Conversely there appears to be no link at all between either Mother's Educational level, F, (16, 210) = .597, p = .884 or Father's Educational level, F, (16, 210) = .749, p = .741 and Computer Fluency II [grounded conceptual knowledge].

Regression Analysis for Age in Computer Fluency II. The linear regression established that age for Computer Fluency II is significant, just as it was in Computer Fluency I. There is a statistically significant relationship (Table 4.41a) between the students' age and their responses stating they would use a PC "at your residence for personal entertainment" ($p = .002$). ANOVA also showed that F = 11.52 is very strong, and that there is a strong relationship between age and students replying they would use a PC at home.

Table 4.41a
Coefficients for Age in Computer Fluency II

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.266	0.906		1.397	0.164
Age	0.181	0.057	0.251	3.137	0.002[a]

a. Dependent variable: Use at home for entertainment

Table 4.41b
Model Summary for Age in Computer Fluency II

R	R Square	Adjusted R Square	Std. Error of the Estimate
.214(a)	.046	.042	1.230

a. Predictors: (Constant), Age group of respondent
b. Dependent Variable: Use at home for entertain

Regression Analysis for Gender in Computer Fluency II. There is a statistically significant relationship between students' gender and responses that they would use computers (Table 4.42a) "at your residence for personal entertainment" ($p = .002$). ANOVA show that F = (8.348) and that there is a strong linear relationship between student gender and those who used a PC "at [home] for personal entertainment." The model summary (Table 4.42b) showed that the response "at [home] for personal entertainment" accounted for 18.4% of the variance.

Table 4.42a
Coefficients for Gender in Computer Fluency II

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.158	.289		4.002	.000
Gender	.484	.167	.184	2.889	.004

a. Dependent Variable: Use at home for entertain

Table 4.42b
Model Summary for Gender in Computer Fluency II

R	R Square	Adjusted R Square	Std. Error of the Estimate
.184(a)	.034	.030	1.227

a. Predictors: (Constant), Gender. b. Dependent Variable: Use at home for entertain

There is also a statistically significant relationship between students' gender (Table 4.43a) and responses that they are "better than good at math" (p = .018). ANOVA show that F = (5.631) is strong. The model summary (Table 4.43b) showed that "better than good at math" accounted for 15.2% of the variance.

Table 4.43a
Coefficients for Gender in Computer Fluency II

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.587	0.253		14.154	0.000
Math skills	-0.347	0..146	-0.152	-2.373	0.018[a]

a. Dependent variable: Math skills

Table 4.43b
Model Summary for Gender in Computer Fluency II

R	R Square	Adjusted R Square	Std. Error of the Estimate
.152(a)	.023	.019	1.063

a. Predictors: (Constant), Gender. b. Dependent Variable: Math skills

Multiple Regression Analysis of Computer Fluency III

Significant indicators (Table 4.44) of Computer Fluency III are Age (p = .021) Occupational Group (p = .004), Gender (p = .001), and Personal Circumstance (p = .032).

Table 4.44
Linear Regressions for Computer Fluency III

Model		Sum of Squares	df	Mean Square	F	Sig.
Age group of respondent	Regression	25.131	17	1.478	1.887	0.021
	Residual	151.982	194	0.783		
	Total	177.113	211			
Ethnic/Racial background	Regression	13.497	17	0.794	1.202	0.266
	Residual	127.536	193	0.661		
	Total	141.033	210			
Household Income	Regression	30.741	17	1.808	1.572	0.076
	Residual	208.254	181	1.151		
	Total	238.995	198			
Educational level of respondent	Regression	3.116	17	0.183	1.211	0.259
	Residual	29.356	194	0.151		
	Total	32.472	211			
Occupational group	Regression	398.367	17	23.433	2.267	0.004
	Residual	2005.746	194	10.339		
	Total	2404.113	211			
Gender	Regression	8.811	17	0.518	2.684	0.001
	Residual	37.275	193	0.193		
	Total	46.085	210			
Mothers highest education level	Regression	13.523	17	0.795	0.995	0.466
	Residual	150.365	188	0.800		
	Total	163.888	205			
Fathers highest education level	Regression	18.037	17	1.061	1.277	0.211
	Residual	156.177	188	0.831		
	Total	174.214	205			
Personal circumstance	Regression	62.501	17	3.677	1.784	0.032
	Residual	397.651	193	2.060		
	Total	460.152	210			

Predictors: (Constant), Use internet browser, Use online library, research online, Use of email, Online discussion groups, Create web pages, Write a PC program , Word experience, Excel experience, Presentation experience, Database experience, Web browser experience, Confidence with word, Confidence with Excel, Confidence with PowerPoint, Confidence with Access, Confidence with web-browsing

Regression Analysis for Age in Computer Fluency III. The linear regression established that age for Computer Fluency III is significant, just as it was in Computer Fluency II. There is a statistically significant relationship (Table 4.45a) between the students' age and their responses stating they would use "Online discussion groups" (p = .029). The data from ANOVA show F is fairly strong (4.799), indicating that a liner relationship exists for students who use online discussion groups and their age.

Table 4.45a

Coefficients for Age in Computer Fluency III

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.614	.236		15.288	.000
Online discussion groups	.186	.085	.140	2.191	.029[a]

a. Dependent Variable: Online discussion groups

Table 4.45b

Model Summary for Age in Computer Fluency III

R	R Square	Adjusted R Square	Std. Error of the Estimate
.140(a)	.020	.016	1.199

a. Predictors: (Constant), Age group of respondent
b. Dependent Variable: Online discussion groups

The regression analysis for Age in Computer Fluency III also established that the students' "confidence level using Web browsers" (Table 4.46a) is statistically significant (p = .032). ANOVA show that F = (4.644), is fairly strong, and that there is a linear relationship between the student age and their level of "confidence with web browsers." The model summary (Table 4.46b) demonstrates that "confidence with web browsing" accounts for 13.8% of the variance in the model.

Table 4.46a

Coefficients for Age in Computer Fluency III

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	4.223	.273		15.445	.000
Age group of respondent	-.213	.099	-.138	-2.160	.032

a. Dependent Variable: Confidence with Web browsing.

Table 4.46b

Model summary for Age in Computer Fluency III

R	R Square	Adjusted R Square	Std. Error of the Estimate
.138(a)	.019	.015	1.398

a. Predictors: (Constant), Age group of respondent
b. Dependent Variable: Confidence with Web browsing

Regression Analysis for Occupational Group in Computer Fluency III. There is a statistically significant relationship between students' occupational group and that they would use computers (Table 4.47a) for "research online" (p = .002). ANOVA show that F = (9.879) and that there is a very strong linear relationship between occupational group and those who indicated they prefer using a PC for "research online." The model summary (Table 4.47b) showed that "research online" accounted for 20.1% of the variance.

Table 4.47a
Coefficients for Occupational Group in Computer Fluency III

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	1.989	.096		20.799	.000
Occupational group	.065	.021	.201	3.143	.002

a. Dependent Variable: Research online

Table 4.47b
Model summary for Occupational Group in Computer Fluency III

R	R Square	Adjusted R Square	Std. Error of the Estimate
.201(a)	.040	.036	1.079

a. Predictors: (Constant), Occupational group, b. Dependent Variable: Research online

There is also a statistically significant relationship (Table 4.48a) between students' occupational group and their "confidence with Word" (p = .033). ANOVA show that F = (4.589) and that there is a strong linear relationship between occupational group and those who indicated they were "confident with Word."

Table 4.48a
Coefficients for Occupational Group in Computer Fluency III

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	4.642	.059		78.853	.000
Occupational group	-.027	.013	-.137	-2.142	.033

a. Dependent Variable: Confident with Word

A review of the histogram showed the data were skewed right, and the model summary (Table 4.48b) showed that "confidence with Word" accounted for 13.7% of the variance.

Table 4.48b
Model summary for Occupational group in Computer Fluency III

R	R Square	Adjusted R Square	Std. Error of the Estimate
.137(a)	.019	.015	.669

a. Predictors: (Constant), Occupational group b. Dependent Variable: Confident with Word

Regression Analysis for Gender in Computer Fluency III. There is a statistically significant relationship between students' gender (Table 4.49a) and their "use of an Internet browser" (p = .008).

Table 4.49a
Coefficients Gender in Computer Fluency III

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.869	.102		8.549	.000
Gender	.156	.059	.170	2.663	.008

a. Dependent Variable: Use internet browser

ANOVA show that F = (7.092) and that there is a very strong linear relationship between students' gender and those who indicated they are comfortable "using of an Internet browser." The model summary (Table 4.49b) showed that "use of an Internet browser" accounted for 17.0% of the variance.

Table 4.49b
Coefficients Gender in Computer Fluency III

R	R Square	Adjusted R Square	Std. Error of the Estimate
.170(a)	.029	.025	.428

a. Predictors: (Constant), Gender
b. Dependent Variable: Use internet browser

Regression Analysis for Personal Circumstance in Computer Fluency III. The only statistically significant relationship between students' personal circumstance (Table 4.50a)

and the predictor variables was their comfort using a "Web browser" when using a PC (p = .005). ANOVA show that F = (8.169) is very strong, and that a linear relationship exists between students' personal circumstance and those who indicated they are comfortable using a "web browser." The model summary (Table 4.50b) showed that "web browser" accounted for 18.2% of the variance.

Table 4.50a
Coefficients for Personal Circumstance in Computer Fluency III

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	4.733	.386		12.258	.000
Personal circumstance	-.172	.060	-.182	-2.858	.005

a. Dependent Variable: Confidence with Web browsing

Table 4.50b
Coefficients for Personal Circumstance in Computer Fluency III

R	R Square	Adjusted R Square	Std. Error of the Estimate
.182(a)	.033	.029	1.388

a. Predictors: (Constant), Personal circumstance
b. Dependent Variable: Confidence with Web browsing

Summary of Regression Analysis for Overall Computer Fluency

After completing a regression analysis for all the variables and factors in Computer Fluency I [demonstrated intellectual capabilities], three independent variables were identified as having significance; Age (p = .028), Occupational group (p = .026), and Gender (p = .010). Age and Occupational Group are both significantly related to the students who reported they would seek out a "User manual" (p = .054, p = .006). Gender is a significant predictor of a student reporting that they would "Google the inquiry" (p = .004).

The regression analysis for the variables and factors in Computer Fluency II [grounded conceptual knowledge] indicated that both Age (p = .012), and Gender (p = .008) are significantly related to student responses. Age is significantly related to students that use

a PC "at [their] residence for personal entertainment" (p = .002), and Gender is significantly related to students rating themselves "better than good at math" (p = .018).

The regression analysis further indicated that significant predictors for Computer Fluency III [demonstrated technical skill-sets] are Age (p = .021), Occupational Group (p = .004), Gender (p = .001), and Personal Circumstance (p = .032). Age is significantly related to students reporting they would use "Online discussion groups" (p = .029), and "confidence level using Web browsers" (p = .032). The self-reported ability of students who are "confident with Word" (p = .033) was significant related to Occupational group. Gender is significantly related to students who reported using "an internet browser" (p = .008), and Personal Circumstance is significantly predicted by students who reported using a "Web browser" when using a PC (p = .005).

Overall Summary of Results for Computer Fluency

This section reviewed the statistical analysis of the primary research question: are there significant differences in computer fluency among adult students than can be attributed to the demographic variables of age, ethnicity, SES, gender, and educational background? The combination of inferential statistics, significance tests, and regression analysis for all three computer fluency areas indicates that gender is consistently identified as a predictive variable for adult students in all areas of computer fluency as defined by NRC (1999). This phenomenon is discussed further in Chapter 5: Conclusions and Recommendations.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

Summary of the Study

The field of information technology can be exciting and highly dynamic. The opportunities to integrate IT into our curriculums at institutions of higher learning may be viewed by many of the professoriate as just as exciting. The problem identification in Chapter 1 detailed the phenomenon of exponential growth in e-learning out of developments in the IT sector, and its confluence with rapidly expanding participation in higher education by adult students.

The literature review (detailed in chap. 2) demonstrated that there is a wealth of research concerning how adult students learn (Bandura, 1977; Knowles, 1980; Schlossberg, 1984; Vygotsky, 1978), and to a lesser extent how adult students learn using IT (Irvine, 1999; Levenburg & Major, 1998; Martyn & Hura, 2004), and in particular, how adult students learn using on-line technologies (Cahoon, 1995; Furr, 2003). Cahoon and Fidishun (2000) provided clarity for understanding how these differences in learning become even more important, as the field of online and hybrid learning becomes more involved.

This quantitative cross-sectional study built upon that theme, and the design for this study is methodologically laid out in chapter 3. In the same way that the IT sector is evolving, the study sought to identify if adult students' computer fluency, defined by the three NRC (1999) skills sets: "intellectual capabilities, conceptual knowledge and appropriate technical skill sets" (pp. 2-3) are influenced by demographic variables. The primary research question specifically asked, "Are there significant differences in computer fluency among adult students that can be attributed to the demographic variables of age, ethnicity, SES, gender, educational background, and personal circumstance?"

The results from this study [detailed in chap.4] are illuminating, educational, and replicable. The data and findings from this study can be beneficial for future program development and continuing research in the field of adult and continuing higher education.

This chapter summarizes the main findings in each of the areas of computer fluency noted above and illuminates significant learning points and contributions of the outcomes of the study to the field of continuing higher education. The conclusions and limitations are followed by recommendations for educational practice and for future research.

Research Question and Findings

This study had one research question: Are there significant differences in computer fluency among adult students that can be attributed to the demographic variables of age, ethnicity, SES, gender, educational background, and personal circumstance?

Findings from the Demographic Data

- The literature identified that many adults have a low level of technical literacy and discussed the paradox of increased personal computer ownership set against slow strides in personal computer fluency (Pearson & Young, 2002). I hypothesized that this dynamic is complicated by the interaction effects of demographic variables: age, gender, ethnicity, SES, and educational background. Data from the demographic questions on the instrument identified that nearly half of the survey respondents had declared annual household income levels well in excess [$75,001 or higher] of the host-site state median income levels. Considering that the overwhelming majority of adults reported they are engaged in full time employment and that geographically there are more dual income families in this region of the country than in any other region, it is understandable why the figure is high. This finding suggests that access to PCs is not necessarily correlated with personal computer fluency. The data support

this conclusion; furthermore adult students who identified in older age brackets did not demonstrate computer ownership or fluency at significantly higher levels compared to adult students identifying in younger age groups.

- Based on Schlossberg's transition theory (1984), one hypothesis asked if personal circumstance was connected to personal computer fluency. Even though the motivators that bring adult students into higher education are likely predictors of success (Merriam & Caffarella, 1991), the data do not indicate that personal circumstance is correlated with computer fluency.

Limitations from Demographic Data

- Participation and support for the research was strong; in fact the response rate (54.62%) exceeded the instrumentation projections outlined in the methodology section of Chapter 3 considerably. Reflecting upon the use of a tailored design methodology advocated for by Dillman (2000), I have concluded that the instrumentation response rate could have been improved. This was due primarily to errors in the timing and delivery of follow-up mailings, exacerbated by the excessive time gap that existed between initial email survey and the eventual follow-up paper copy mailings.
- The data indicated student population distributions based on race/ethnicity to be marginally below the host-site state-wide levels for people of color. With 93.44% of all respondents identifying as White, non-Hispanic, there was a much lower number of all under-represented ethnic and racial groups. Primarily because of this, I chose to collapse the data for respondents of color rather than look at results for each under-represented population. It is possible to make summary statements of generalizability

about participating students in the study; however, it is not practical or meaningful to do that by ethnic or racial grouping.

Findings from Computer Fluency I

- The data that emerged informed me that a male adult student taking classes in the hybrid format is less likely than a female to ask for help with a PC glitch or to seek out assistance from a Help Desk. This finding validates what we already know about the male condition; that males are less likely to seek out assistance (Möller-Leimkuhler, 2003). This knowledge is potentially beneficial for the recruitment, training, and development of adult students working with new learning management systems (LMS) or the more recent introductions to campuses: learning portals, and even on-line orientations. It will furthermore better position instructional faculty to be able to plan for and provide gender specific remediated training. Furthermore, this knowledge may enable administrators and staff, especially those in continuing higher education institutions to proactively work towards supporting male students, through advising, counseling, and mentoring dialogues especially when using gently intrusive questioning techniques (Miller & Murray, 2000) to build student competency in this area.
- The majority of adult students stated they were very comfortable with learning new applications on a PC. This has a potential benefit to the institution, especially in light of changes in LMS; introduction of new portal software for institutional websites; and integration of social networking into the curriculum. It would appear that the majority of the adult student body is open to change and willing to adopt new technologies. A point of significance here is that 40% of homemakers stated they were not comfortable learning new PC applications. In light of the increasing

ownership of personal computers (U.S. Department of Commerce, 2001), which underscores Pearson and Young's (2002) research on the "unacknowledged paradox" outlined earlier in the literature review, the phenomenon that many homemakers do not feel comfortable is worthy of consideration for further study. Could it be that the technology gap that Toffler identified (1980, 1991) is upon us? Responses from adult students to this question varied from: too busy with children; unemployed and therefore unable to afford internet access; unmotivated; not perceived as important; and lacking broad based educational background to appreciate the importance of utilizing technology for personal enrichment.

- Many of the intellectual skills identified in Computer Fluency I are already evolved at the personal level and serve the adult students well. In the area of fault finding, adult students appear to understand the protocols and processes necessary to remedy small issues, or at least they appear to know where to go to get an answer. This point again builds upon Toffler's (1980) prophetic predictions that the illiterate of the future will be those who "cannot learn, unlearn, and relearn" (p.367). Atwell (2001) acknowledged there are "information haves" and "information have-nots" (p.253). This study re-affirmed the point that access to a PC even among older adult students does not mean that educational computing is occurring, nor does it necessarily lead to a student's personal computer fluency.

Findings from Computer Fluency II

- We know that adult students returning to degree completion programs are historically math-phobic (Tobias, 1994). This point was re-affirmed by the study with nearly two-fifths of the students rating their skills as open to improvement [could be better]. The

adult students attending hybrid classes at the host site mirror the nationwide trend of adult students in this regard.

- Responses to the question on personal writing skills demonstrated that the majority of adult students view themselves as well developed in this fluency area. It can be concluded from the data that the further adult students progress through the educational process toward degree completion the more likely they are to develop and demonstrate improved writing skills. This finding has profound positive implications for most programs that espouse writing across the curriculum, for this study indicates that students participating in hybrid and web-supported courses are more likely to self-rate themselves as competent in the area as they move through the program.
- An overwhelming majority of students rate their research skills as "at least good." This is also a positive finding, and one reflecting that adults have confidence in their personal fluency skills using a search engine on a PC for personal research. This builds upon Cahoon's (1995) research on informal and vicarious learning in the workplace. We also know that the majority of this population reports using an Internet browser daily (Computer Fluency III). These findings indicate that although adult students have high self-efficacy in this area, their interpretation of a sound research tool (Google™, Yahoo!, Ask, Wikipedia) may be very different from the perception of full-time faculty in institutions of higher. I consider this phenomenon worthy of further inquiry.
- The study contributed to what we know about ownership of PCs, building on the earlier predictions of Morrisette (1999) about household penetration rate. The study identified that the greater household income, the more likely that the household will be able to afford a PC, and therefore the more likely that a PC will be brought into the

classroom to support individual learning. This finding aligns with the emergent trend of increased PC ownership [75.8% have a laptop] and almost universal usage by traditional age students (Salaway & Borreson, 2007) on campus. We can see a trend that traditional age and adult students will use a PC to support their education differently, which validates Frey and Alman's (2003) earlier observation that before adult students can address the issue of learning, they must master the technology.

Findings from Computer Fluency III

- The majority of students responded that they were very confident in their ability to use either word processing or spreadsheets to complete assignments. The data also indicated that the confidence and efficacy levels of adult students attending hybrid programs are inversely correlated with their age; i.e., the younger adult students are more confident than the older adult students. This point dovetails with the knowledge gleaned assessing Computer Fluency II; that writing skills are self-reported as being stronger, the older a student is. The study findings indicated that based on self-reporting, age is a predictor of evolved appropriate skill-sets, and that younger adult students will self-report higher levels of efficacy using word processing and spreadsheets. This finding reflects the upswing in cell-phone ownership reported in the recent ECAR study of undergraduate students (Salaway & Borreson, 2007), which indicates a positive causal link between ownership and Computer Fluency III, one that was not readily identifiable using the results from the U.S. Census Data (2001).
- Only a very small group of adult students identified as using the hybrid learning modality exclusively for degree completion, and this group has a more evolved level of technical fluency. This underscores an earlier finding from a program assessment

(Armstrong, 2006) that the hybrid program using WebCT does not stand alone for adult learners but is an important flexible option to support other curriculum and programming options.

- Adult students report not using an online library with the same regularity as they do Internet research, and many went to the institutional Website only 1-2 times a month, or not at all. This finding is alarming because most students who responded to this survey are not located in the close geographic area of the host-site, but are located in the geographic region of the host-site satellite campuses. This point implies that the adult students are not physically using the host-site library to undertake research, which builds upon Atwell's (2001) observation that from one perspective very little educational computing may be occurring. Although this group of students may be developing skills in word processing and spreadsheets brought about by increased PC ownership, access and utilization of electronic library resources is not similarly increasing to match this increase in ownership.
- The data reflect a high level of computer fluency among adult students who use email for communication; this point had an element of predictability. The youngest age group who are high volume users of social networking sites reported using email less often than the older groups of students, 25-34 and 35-44 year olds. The data from this research indicate that there is no one preferred modality that all adult students use. Adults employed in professional occupational groups are the most likely group to check emails on a regular basis, and this is probably because they are in environments where connected organizationally networked PCs enable and facilitate this.
- The data show that a very small group of students subscribe to or use internet discussion groups. This is surprising when we consider that part of the pedagogy

incorporated into the WebCT platform is the discovery of new knowledge through both synchronous and asynchronous learning; in particular, instructor moderated online discussion groups. Students do not appear to be practicing the craft outside of the virtual classroom, which limits their capacity to become more fluent in the area.

Limitations of the study

Delimitations

Participation in this study did not include traditional age student populations. A second delimitation is that this study did not address regular 15/16-week semester-based programming; it did look at accelerated and evening degree programs. The scope of this study did not include adult students in regular (15/16-week semester) classes, instead focusing on 10-week accelerated evening and weekend courses. This limits the generalizability of the results.

Limitations

The scope of the study, focused only on adult students in accelerated degree programs, limited the ability to generalize the findings to other campuses or programs for traditional-age students. The study research question examined the digital divide, in particular access among adult students identifying with different demographic traits. The study emphasized hybrid and accelerated learning, which did not include totally on-line learning platforms, so any predictive value is limited to face-to-face (F2F) and hybrid learning.

Were a future replication of the study to occur, the timing of survey distribution especially between pre-notification, initial mailing, and individualized follow-up will be critical for a highly successful response rate. Successive missives must be distributed in a timely manner to raise and maintain awareness of the study to likely participants. This study

allowed too long a period between the electronic instrumentation and the paper copy follow up. The consequence was a low response to the follow-up mailing. Improved spacing of data collection attempts for a future study could potentially avoid this limitation, and thereby produce a higher participant response rate.

All data were self-reported, and not verified though other means. They were also reported at a single point in time to give the cross-sectional response that the methodology outlined. To enable observation of changes in computer fluency over the time students are in the program a longitudinal study would be desirable.

Low numbers of people of color precluded drawing definitive conclusions or statements of generalizability related to differences among various student populations based on race and ethnicity.

The results for many of the regressions showed low R^2 values, a phenomenon occasionally seen when multiple linear regressions are run, and does not mean because R^2 values are similar that the populations are similar, it may merely be indicative of poorly measured variables.

For this study $\alpha = .05$, and testing twenty hypotheses the probability that none of them are significant is $0.95^{20} = 0.36$. This gives a 0.64 probability (1-0.36) of finding one significant result amongst those multiple regressions. Expert opinion cautions against lending "too much importance to a lone significant result" (Bland, 2004, p.1) as it may occur by chance alone. This phenomenon has been recognized and using the Bonferroni correction when handling data in SPSS is appropriate and allows for this.

Recommendations for Educational Practice

Recommendation #1

Optimize the strategy of gently intrusive questioning when advising adult undergraduate students. Continued staff development and training with academic advisors in the area of intrusive questioning technique should be implemented at the host-site. Benefits might include increased student interactions and avoidance of course withdrawals and course drops in hybrid and online learning environments. By probing and questioning, advisors, faculty, and administrators can help adult students to continue to optimize their learning. Enhanced institutional intervention in the form of advising and counseling support can help students to recognize their own reluctance and resistance to seek out assistance, and therefore can be turned into a learning opportunity, as the model will help them "learn how to learn" (Fink, 2003, p.75) on the continuing path to academic success.

Recommendation #2

Utilize existing library personnel and resources to promote available research tools. Close collaboration with host site library staff to share student responses in the areas of research can begin a discussion around promotion of existing library resources and how to continue to promote access to them and their value to adult students. This could also be a stepping off point to demonstrate other valid and credible resources to support educational research for students.

Recommendation #3

Ongoing development of computer fluency and research skills in course work. The skills building that library support staff can do to develop research skills for adult students can also be developed by faculty members. Careful curriculum and syllabus design will allow

faculty to integrate technology and online research into the classroom experience as well as outside of it for homework, individual and group assignments.

Recommendations for Future Research

Recommendation #1

Select a host site with a larger enrollment of under-represented student populations. It would be highly desirable to replicate this study in an institutional environment that has greater proportions of under-represented student populations, in particular students of color, in distance learning programs. In this way it is highly likely the study would produce results allowing generalizability across racial and ethnic groups.

Recommendation #2

Extended research into adult student retention. As indicated by the results, males are less likely to ask for help than females, when confronted with a PC dilemma. It would be beneficial to extend this line of inquiry further to identify if there are significant differences in course drop-out rates for hybrid and web-supported courses by gender. The program demographic of 2/3 female, 1/3 male (Collins, 2008) at the host site is a trend that is reflected both locally and nationally. This under-represented group of males may be at risk without institutional support or interventions designed to prevent males dropping out of hybrid and web-supported programs because they have computer fluency challenges, due to their reluctance to ask for assistance. The results of further inquiry into this phenomenon can help solidify the direction of institutional support initiatives.

Recommendation #3

Conduct more research to determine who responded as "homemakers" and why they do not feel comfortable using new PC applications. The sample was small [$n = 5$]; however, it would be valuable to understand why a subset of adult students perceived by many as

having the freedom and personal time to enhance their individual skills appear not to want to do so. Is the fear of "stepping into the void" (Bash, 2003) and learning new computer skills similar to the reluctance of many who are terrified to return to higher education? This small sub-set who potentially have the ability to function as self-directed learners in a safe learning environment with technology [at home] could have implications for adult student non-credit programming. Findings from this study could indicate a continued need for introductory computer courses targeted towards homemakers, or possibly learning tutorials with phone/internet support. I see value in conducting a qualitative study to explore these issues.

Recommendation #4

Identify adult student research habits and practices. As college and university libraries continue to redefine their value to students, it may be valuable to know how and where adult students go to do research in support of degree completion coursework. Further inquiry in this area, possibly by survey, may enable campus libraries to better develop their services for non-traditional students, and enable faculty to better develop course material of relevance, applicability, and interest for study. Knowing where and how adult students conduct research could enable the areas of student development and academic support to provide stronger institutional support initiatives.

Recommendation #5

Identify if faculty perceptions of adult students' research capabilities correlate with the student's self-assessment. Knowing if the student's self-esteem and self-rating of personal research skills is accurate can help continue to improve curriculum. If faculty in particular are aware of individual and group sized generalizable trends then introduction of technology in the classroom can potentially be adjusted to work for all needs. This area for further

inquiry might be investigated through either focus group meetings with adjunct faculty or large group discussion. A qualitative approach is likely to yield a broad range of responses about the capabilities of undergraduate adult students.

Recommendation #6

Assess the needs of adult learners for large group communications. It would appear that educators, administrators, and faculty who themselves are in the older age groups may need to be creative in finding ways to connect with the younger group of adult students who do not always check emails daily, but prefer social networking (facebook, myspace, text messaging, instant messenger). This might be an area worthy of further study through focus groups, survey, or a series of conversations to identify the preferred medium to use to connect with adults attending higher education programs.

Conclusions of the study

This idea for this study arose out of a program assessment conducted by the researcher in 2005. The hypothesis that the computer fluency of adult students attending hybrid and F2F classes is shaped by demographic variables was found to be a challenging one to prove. This prompts the question: if demographic variables do not participate in shaping computer fluency among adult students, what would?

There are two points arising from the study that help to situate the findings among the body of literature. Firstly; the finding of male student reluctance to ask for assistance with PC glitches builds upon Martyn and Hura's (2004) earlier observations that although there are few documented gender differences in learning, "males show more favorable attitudes toward computers" (p. 26). A second point that helps situate this study in the literature builds upon Knowles (1998) discussion of adult use of technology actually need[ing] to help students become self-directed. The finding in this study, that many students experienced higher than

median income levels suggests that access to higher education and in particular using technology for degree completion is still a function of income for many adult students.

Feedback from instrumentation identified ways to improve participation by adult students for future studies replicating the study methodology. The study also found that the personal circumstance of the study participants was not correlated with their personal computer fluency. Results indicated that gender is correlated with the likelihood of seeking out assistance with IT problems, and that irrespective of gender or age, adult students are open to change and comfortable learning new applications. The survey participants reinforced the premise of lifetime learning, knowing how to obtain answers to complex questions, although this level of computer fluency was not proven to be correlated with age.

Math skills, often quoted challenges to successful degree completion for adult students, were identified as areas needing improvement, while writing was generally self-rated by all participants as well developed. Study data helped to identify that adult students believe they are good researchers, although the range of online resources they tap into to conduct research is limited. Furthermore, even if the study participants own a PC they needed to master technology in order for it to be supportive of degree completion. Findings also identified that younger adult participants are very comfortable using PCs for college assignments and that as the reporting age group increased comfort level decreased. Respondents also reported back as being highly proficient using emails for personal communication, although this group do not identify as using institutional libraries for research. In conclusion, I believe the findings from this study have potential for both educational practice and future educational research.

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APPENDICES

APPENDIX A: NRC FITness Report, 1999 (framework)

Being Fluent
with
Information Technology

Committee on Information Technology Literacy
Computer Science and Telecommunications Board
Commission on Physical Sciences, Mathematics, and Applications
National Research Council
NATIONAL ACADEMY PRESS
Washington, D.C.

Preface

In response to a request from the National Science Foundation, the Computer Science and Telecommunications Board (CSTB) of the National Research Council initiated a study in August 1997 to address the subject of information technology literacy. The rationale for such a study was that the increasing importance and ubiquity of information technology in daily life make it essential to articulate what everyone needs to know and understand about information technology. Such an articulation would be an essential first step toward empowering all citizens to participate in the information age.

Information technology as a topic for literacy has multiple constituencies. For example, the library science community has developed a conceptual underpinning for skills that are important for finding, evaluating, and using information, all of which are important aspects of any definition of information technology literacy. Because they spend their professional lives as creators of information technology, computer scientists have their own perspectives, as do practitioners in disciplines that have traditionally relied on computational tools, such as science and engineering. Disciplines in the arts and humanities are just beginning to tap the potential of information technology and will become (indeed, some would argue are now) important stakeholders. More generally, the broad category "knowledge worker" encompasses many professions in the workplace, and virtually all knowledge workers make use in greater and lesser degrees (increasingly greater) of information technology. Traditionally "blue-collar" workers such as auto mechanics and heating/air-conditioning technicians must also cope with a proliferation of embedded computing devices. And as government begins to provide more services to the public using information technology, the citizenry itself becomes an interested constituent.

THE COMMITTEE'S APPROACH

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In addressing its charge, the committee chose a broad definition of information technology. Information technology was defined to include the more traditional components of information technology (such as general-purpose computational devices, associated peripherals, operating environments, applications software, and information), as well as embedded computing devices, communications, and the science underlying the technology.

As for the knowledge and understanding component of its charge, the committee decided to use the term "fluency." Professor Yasmin Kafai, who briefed the committee, noted that fluency connotes the ability to reformulate knowledge, to express oneself creatively and appropriately, and to produce and generate information (rather than simply to comprehend it). This report uses the term "fluency with information technology," or FITness, and it characterizes as fluent with information technology (FIT) those who use, understand, and know about information technology in the ways described in Chapter 2. Chapter 1 contrasts fluency with the more common term "literacy."

All of the committee believed in the social desirability of the broadest possible dissemination of a set of fundamental concepts, skills, and capabilities. Good arguments were made to and by the committee for defining "everyone" in terms of all junior high school graduates, all high school graduates, all non-college-bound individuals, all college-bound individuals, and all adult citizens (as lifelong learners). But in the end, rather than argue that FITness was required of everyone in some demographic category of the population, the committee instead chose to make its case for the education of individuals who want to be able to use information technology effectively. Furthermore, issues of committee expertise and budget imposed some practical constraints on the committee's work, and the committee decided that it was best qualified to focus, as a first step toward fuller implementation, on the group of learners with which it was most familiar—the four-year college or university graduate. This first step toward implementation is discussed in Chapter 4.

The intent of this report is to lay an intellectual framework for fluency with information technology that is useful for others in developing discipline-specific and/or grade-appropriate efforts to promote FITness. However, this report is not a FITness textbook, a curriculum for FITness, or even a description of standards for FITness.

METHODOLOGY

The committee sought input in three ways: through briefings on the topic from individuals who have worked in the field (Appendix C), from electronic input in response to a set of questions about FITness that the committee broadcast widely over the Internet, and from perspectives provided at an invitation-only workshop in Irvine, California, held to explore the subject, for which participants were sought from a broad range of backgrounds and interests (Appendix D). The committee, itself composed of individuals representing varied backgrounds and expertise (Appendix E), used this broad range of input in an integrative manner to inform its own deliberations on the appropriate scope and nature of FITness.

ACKNOWLEDGMENTS

The committee appreciates the sponsorship of the Cross-Disciplinary Activities of the Directorate for Computer and Information Science and Engineering of the National Science Foundation for this project, and especially the support of John Cherniavsky.

The committee benefited from input from a broad range of sources. A list of workshop participants is contained in Appendix D; a list of briefers is provided in Appendix C. Douglas Brown of Bellevue Community College and Mary Lindquist of Columbus State University provided useful comments on Chapter 2. Comments of reviewers (listed immediately following this preface) helped the committee to tighten its presentation and to determine the appropriate emphasis on the various topics contained in the report.

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APPENDIX B: Adult student computer fluency instrument

Adult Student Computer Fluency Survey Survey #_____

Dear Division of Adult Learning student,

My name is Graeme Armstrong, and I have been employed at Simpson College since 1999, firstly in the Division of Adult Learning, and more recently with the Student Support Services program.

I am currently conducting research as part of the requirements to complete a Ph.D. in Higher Education at Iowa State University. I would like you to participate in the enclosed survey questionnaire. Throughout the survey you may skip any questions that you do not feel comfortable answering.

The results from this survey will be used as a large part of my dissertation, and will eventually be made available to, and shared with, the Division of Adult Learning.

Please take a moment to read and complete the consent form on the bottom half of this page.

I would like to thank you for taking time out of a busy day to complete this questionnaire. I really appreciate your support, and I look forward to being able to share the survey results with you once all the data has been analyzed.

Graeme Armstrong
September, 2007.

****
Confidentiality and Informed Consent:

The information you provide will be kept confidential. Your name will be replaced with codes and the data will be stored on a password-protected computer or in a locked cabinet with access limited to the investigator.

Your responses to this survey will be used in the formulation of my dissertation research. Your willingness to participate is voluntary, and you may withdraw from this study at any time without any negative consequences

1. I have read and understand the conditions and I consent/assent to voluntarily participate in this research study.
   □ Yes □No
2. I realize I am free to withdraw my consent and to withdraw from this study at any time without negative consequences (call 515-961-1231, to do this).
   □ Yes □ No
3. I consent to the use of my responses to the survey instrument for this research.
   □ Yes □ No
4. I fully understand that I may skip any question in the survey that I do not feel comfortable answering.
   □ Yes □ No
5. I understand that my survey responses are confidential.
   □ Yes □ No

Date:_____ Name: _____

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Q1. Please tell me which Division of Adult Learning classes you are attending:

a. Saturday *FAST*rack ☐
b. *FAST*rack – midweek only ☐
c. Saturday *FAST*rack and *FAST*rack ☐

Q2. Select the occupational group that best reflects your current full time or part time employment:

a. Management, Business and Financial Workers ☐
b. Science, Engineering and Computer Professionals ☐
c. Healthcare Practitioner Professionals ☐
d. Other professional Workers ☐
e. Technicians ☐
f. Sales Workers ☐
g. Administrative Support Workers ☐
h. Construction and Extractive Craft Workers ☐
i. Installation, Maintenance and Repair Craft Workers ☐
j. Production Operative Workers ☐
k. Transportation and Material Handling Workers ☐
l. Laborers and Helpers ☐
m. Protective Service Workers ☐
n. Service Workers, except Protective ☐
o. Homemaker ☐
p. Currently not employed ☐

Q3. Please describe which, if any of the following statements best describe your current personal circumstance?

a. I am recently divorced (inside the last 3 years) ☐
b. I am recently widowed (inside the last 3 years) ☐
c. I/we have recently added a child to our family ☐
d. I have recently changed employer (in the past year) ☐
e. I have recently re-entered the workforce (in the past year) ☐
f. I am recently married (in the past year) ☐
g. None of the above ☐

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Q4. How would you rate yourself on each of the following?

	Not good	Could be better	Good	Better than good	Very good
a. Mathematics	☐	☐	☐	☐	☐
b. Research skills	☐	☐	☐	☐	☐
c. Writing	☐	☐	☐	☐	☐

Q5. During the past year, how often did you use a computer?

	Daily	2-3 times a week	Once a week	1-2 times a month	Not at all
a. In a classroom on campus	☐	☐	☐	☐	☐
b. At your residence for coursework	☐	☐	☐	☐	☐
c. At your residence for personal projects	☐	☐	☐	☐	☐
d. At your residence for personal entertainment	☐	☐	☐	☐	☐
e. At or in an Internet Cafe	☐	☐	☐	☐	☐
f. At your local public library	☐	☐	☐	☐	☐

Q6. During the past year, how often did you use a computer?

	Daily	2-3 times a week	Once a week	1-2 times a month	Not at all
a. As a word processor (e.g., MS Word)	☐	☐	☐	☐	☐
b. As a spreadsheet (e.g., MS Excel or Quatro Pro)	☐	☐	☐	☐	☐
c. For its presentation software (e.g., MS PowerPoint)	☐	☐	☐	☐	☐
d. As a database (e.g., MS Access)	☐	☐	☐	☐	☐
e. For its proprietary software package (e.g., Quicken, TurboTax)	☐	☐	☐	☐	☐

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Q7. During the past year how often did you:

	Daily	2-3 times a week	Once a week	1-2 times a month	Once a year or never
a. Use an Internet browser	☐	☐	☐	☐	☐
b. Research topics using online library resources	☐	☐	☐	☐	☐
c. Research topics on the Internet	☐	☐	☐	☐	☐
d. Communicate using email	☐	☐	☐	☐	☐
e. Participate in online discussion groups	☐	☐	☐	☐	☐
f. Create pages on the Internet	☐	☐	☐	☐	☐
g. Write a computer program	☐	☐	☐	☐	☐

Q8. Rate your level of experience with the following computer software tools:

		No Preference	Beginner	Beginning Intermediate	Intermediate	Advanced Intermediate	Expert
a.	Word processing	☐	☐	☐	☐	☐	☐
b.	Spreadsheets	☐	☐	☐	☐	☐	☐
c.	Presentations	☐	☐	☐	☐	☐	☐
d.	Databases	☐	☐	☐	☐	☐	☐
e.	Web-browsers	☐	☐	☐	☐	☐	☐

Q9. How confident are you that you can use each of these types of software, if required to complete an assignment?

	Not at all	Somewhat	Moderately	Very	Extremely
a. Word Processing	☐	☐	☐	☐	☐
b. Spreadsheets	☐	☐	☐	☐	☐
c. Presentations	☐	☐	☐	☐	☐
d. Databases	☐	☐	☐	☐	☐
e. Web-browsers	☐	☐	☐	☐	☐

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Q10. You are using a computer application such as MS Access or MS Excel, and something goes wrong. Do you:

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
a. Ask someone for help	☐	☐	☐	☐	☐
b. Use the "online" help function	☐	☐	☐	☐	☐
c. "Click around" and try different options until you figure it out	☐	☐	☐	☐	☐
d. Look for a copy of the user manual	☐	☐	☐	☐	☐
e. "Google" the inquiry, as a plea for help	☐	☐	☐	☐	☐
f. Call your company/organization help desk (if you have one)	☐	☐	☐	☐	☐

Q11. Select the statement you most closely agree with:

a. I feel very comfortable about trying to learn a new application on the computer ☐
b. I am comfortable I can learn a new application on the computer ☐
c. I am fairly neutral about using computers to learn a new application ☐
d. I feel a little intimidated trying to learn a new application on the computer ☐
e. I find computers very difficult to understand and frustrating to work with ☐

Q12. A professor in one of your classes assigns a research project paper. **Describe the strategies or list steps** you would use to find information on your topic?

a. Use Google or some other search engine, and see what the first hits are then check out those sites. ☐
b. Access the college library Website, then use the search function in the library to locate texts, novels and other sources ☐
c. Check online to see if the subject has been written on before, download the paper and use sections of it in your submission ☐
d. Use peer reviewed journals online to find relevant hits and sources ☐

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Q13. If you unboxed all of the following new technology equipments: **select only one from the list of items** that are missing in order for you to make the system work?
Unboxed Computer Monitor, Printer, Hard Drive, Scanner. The items missing are:

a. Mouse, all cables, power supply ☐
b. Keyboard, all cables, power supply ☐
c. Scanner, digital camera, and shredder ☐
d. Mouse, keyboard, all cables, power supply ☐
e. Mouse, keyboard, scanner, shredder ☐
f. There is nothing missing ☐

Q14. You are working on an important paper that you have to turn in next class period. The paper is finished on a word processing software program, but the printer will not work. There is no one available who can give you immediate help. **Select one of the following that best describes how** you would attempt to fault find to get the printer to work:

a. From the pull down menus I would select settings, then Printers & Faxes and see if the print job was saved on the list ☐
b. First thing would be to check the printer tray to see if it was out of paper or jammed ☐
c. I would first check to see if the printer cable was connected properly to the PC, then hit the print button again ☐
d. I would select the print function again on my PC, to make sure I did "hit" the key correctly ☐

Q15. You are given the Web address for information you need for your next class, but when you try that Web address the site does not come up. There is no one who can help you. **Select one of the strategies from the list that best describes how** you would find the correct Web address on your own.

a. By using a search engine I might be able to find a current and accurate Web address ☐
b. It cannot be done, I would power down my personal computer ☐
c. I would go to the institution Web-site ☐
d. I wouldn't know what to do and would probably drop the class ☐

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***** DEMOGRAPHIC DATA *****

Q16. What is your gender?
- a. Male ☐
- b. Female ☐

Q17. What is your age?
- a. 16-24 years ☐
- b. 25-34 years ☐
- c. 35-44 years ☐
- d. 45-54 years ☐
- e. 55-64 years ☐
- f. 65 years or older ☐

Q18. Your ethnic background?
- a. White, non-Hispanic ☐
- b. Black, non-Hispanic ☐
- c. Hispanic ☐
- d. Asian/Pacific Islander ☐
- e. More than one racial/ethnic heritage ☐
- f. Other ☐

Q19. What is your highest level of educational achievement?
- a. Less than high school ☐
- b. High school diploma or its equivalent ☐
- c. Some college, including vocational /technical ☐
- d. Bachelors degree or higher ☐

Q20. What is your household income?
- a. $20,000 or less ☐
- b. $20,001-$35,000 ☐
- c. $35,001-$50,000 ☐
- d. $50,001-$75,000 ☐
- e. More than $75,000 ☐

Q21. What is your student classification?
- a. Freshman (1-29 credits) ☐
- b. Sophomore (29.01 – 61.00 credits) ☐
- c. Junior (61.01 – 95.00 credits) ☐
- d. Seniors (95.01 to graduation) ☐

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Q22. What is the highest level of educational attainment in your family?

	Mother	Father
a. Less than high school	☐	☐
b. High school diploma or its equivalent	☐	☐
c. Some college, including vocational /technical	☐	☐
d. Bachelors degree or higher	☐	☐

***** THANK-YOU FOR COMPLETING THE SURVEY QUESTIONS *****
YOUR COOPERATION IS REALLY APPRECIATED

PLEASE PLACE THIS COMPLETED SURVEY IN THE ENCLOSED PRE-PAID ENVELOPE AND RETURN IT TO ME AT THE FOLLOWING ADDRESS:

Attn: Graeme Armstrong
Director, Student Support Services
Simpson College, 701 North 'C" Street, Indianola, IA 50125.

"Selected items used with permission of University of Washington Office of Educational Research Assessment."

.

APPENDIX C: IRB Approval from Host Site

SIMPSON COLLEGE

Memorandum

Date: June 7th, 2007

To: Graeme Armstrong,, Principal Investigator

From: Don Evans, Chair Simpson College Institutional Review Board

Re: Research Proposal Assessing computer fluency among adult learners in accelerated degree programs at a midwestern liberal arts college.

Thank you for submitting your proposal to the Simpson College Institutional Review Board. Assessing computer fluency among adult learners in accelerated degree programs at a midwestern liberal arts college was judged to present minimal or no risks to participants, and I am pleased to inform you that your project has been approved as presented.

Best wishes for the success of your project.

Sincerely,

Don Evans

Donald Evans, Ph.D.
Chair, Simpson College Institutional Review Board

701 North C Street • Indianola, Iowa 50125 • 515.961.6251 • fax: 515.961.1498

APPENDIX D: IRB Approval from Iowa State University

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

DATE: September 7, 2007

TO: M. Graeme Armstrong
Student Support Services, Brenton Student Center, Simpson College,
701 North C St, Indianola, IA 50125

CC: Dr. Nancy Evans
N247D Lagomarcino

FROM: Jan Canny, IRB Administrator
Office of Research Assurances

IRB ID: 07-335 **Study Review Date:** 13 July 2007

The Institutional Review Board (IRB) Chair has reviewed the project, "Assessing computer fluency among under-represented adult learners in accelerated degree programs at a Midwestern liberal arts college" (IRB 10 07-335) and has declared the study exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b), Exempt Category (1,2). A description of this exemption category can be found in the list on the next page. Please note that you must submit all research involving human participants for review by the IRB. Only the IRB may make the determination of exemption, even if you conduct a study in the future that is exactly like this study.

The IRB determination of exemption means that this project does not need to meet the requirements from the Department of Health and Human Service (DHHS) regulations for the protection of human subjects, unless required by the IRB. We do, however, urge you to protect the rights of your participants in the same ways that you would if the project was required to follow the regulations. This includes providing relevant information about the research to the participants.

Because your project is exempt, you do not need to submit an application for continuing review. However, you must carry out the research as proposed in the IRB application, including obtaining and documenting (signed) informed consent if you have stated in your application that you will do so or if required by the IRB.

Any modification of this research should be submitted to the IRB on a Continuation and/or Modification form, prior to making any changes, to determine if the project still meets the Federal criteria for exemption. If it is determined that exemption is no longer warranted, then an IRB proposal will need to be submitted and approved before proceeding with data collection.