CONCEPTUALIZATION, MEASUREMENT, AND PREDICTION OF COMPUTER TECHNOLOGY INTEGRATION IN ADULT BASIC SKILLS EDUCATION

by

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(Under the direction of Dr. Thomas Valentine)

ABSTRACT

The purpose of this study was to understand how *computer technology integration is* manifested in Adult Basic Skills Education (ABSE) classrooms. In order to accomplish this broad purpose, three research questions were posed. (1) How is *computer technology integration* best conceptualized and measured? (2) To what extent do perceived *relative advantage*, *compatibility*, and quality of *technology resources* separately explain the observed variance in *computer technology integration*? (3) To what extent do perceived *relative advantage*, *compatibility*, and quality of *technology resources* jointly explain the observed variance in *computer technology integration*?

The sample for this study included all full-time ABSE instructors working under the Georgia Department of Technical and Adult Education. The mean age was 50. Eighty-six percent were female; 80% were White; 14% were Black, 2% were Hispanic and 1% was Asian. All were using computer technology in their classrooms.

The first research question required qualitative analysis and used a Delphi approach to map the construct of *computer technology integration*. Ultimately, four characteristics emerged. These included: *seamlessness* – easy movement between computers and other instruction; *learner-appropriateness* – ability of learners to use computer technology; *learner-empowering* – proactive use of computer technology by learners, and *instructor-facilitated* – instructor management of learners' effective use of computers. The second and third research question required quantitative analysis and involved the examination of factors that predict *computer technology integration*. Predictor measures were based on the work of Everet Rogers' (1995) *Diffusion of Innovation*. Specifically, the study attempted to predict *computer technology integration* in ABSE based on teachers' perceptions of the *relative advantage* and *compatibility* of using computer technology for instruction in ABSE and the perceived quality of their *technology resources.*

Ultimately, a one variable model captured most of the observed variance with *compatibility* predicting 61% of the observed variance in *computer technology integration.* The construct of *compatibility* encompassed instructors' beliefs about pedagogy and how adults learn, and how well they believed computer technology aligned with those beliefs.

INDEX WORDS: computer technology integration, relative advantage, compatibility, training, technology resources, Delphi, Adult Basic Skills Education, Adult Basic Education, Adult Literacy

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DEDICATION

This dissertation is dedicated to my mother, who was a woman of remarkable faith and who was, without question, “the Wind Beneath My Wings.” I am grateful for her unwavering faith, her tireless prayers, her sacrifices, her courage, her fierce love that brought us through the worst of time, and her determination to give her children a sense of mission and purpose.

She was not degreed, but had an untuitive wisdom that fostered profound truth. She was not wealthy, but her heart was generous and her hand was open. She knew poverty, but was rich in love. She valued peace, but fiercely defended the name of her God and her belief in the God-given potential of every individual.

My mother would not have thought it important to argue the difference between research and theory, nor did she need empirical evidence to understand truth. Truth was to be found in the very character of God. She wouldn’t think of questioning His existence any more than I would think of questioning her love, and love was her legacy. Had it not been for this, I would have lacked the courage to dream, as well as the conviction to see the dream through.

Standing on that foundation, I give thanks to my Lord and Savior, Jesus the Christ, whose consistency of character makes trusting easy, and whose ways are beyond the reaches of empirical evidence. I thank Him that His faithfulness is new every morning. I acknowledge Him in all my work and look forward to the paths upon which He will direct me. Through my mother, I found the confidence to begin. Through Him, I found the strength to finish.

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CHAPTER 1
THE PROBLEM

Background

Over a ten-year period, I worked to facilitate the integration of computer technology in Adult Basic Skills Education (ABSE). While developing a curriculum for technology use, I conducted structured interviews to determine participants' needs and was troubled as educators repeatedly expressed frustration with the implementation of computer technology integration. Even educators who were technology advocates did not believe they were using existing technology to its fullest potential; had no long-term vision for the technology of the future; and were not always able to find a solid link between program goals, student objectives and the use of computer technology.

Through this experience, I began to question my longstanding position as a proponent of technology integration. In fact, I was unable to clearly define integration in operable terms. Yet, I asked myself, if computer technology integration could be measured, how would it align with what was actually practiced in ABSE classrooms, and what factors would account for observed differences. These questions, couched in a pragmatic approach to research, are at the heart of this study.

Computer technology is quickly becoming a major element in instructional programs for educational purposes in general, and adult literacy in particular (Askov, 1995; Cole, 1997; Eveland, 1992; Hannafin, Hannafin, Hooper, Rieber, & Kini, 1997; Hopey & Ginsburg, 1996). Despite this phenomenon, it is not unusual to walk into adult literacy classrooms and find computer systems and sophisticated software packages that are either underused or not used at all. The integration of computer technology in ABSE curriculum is an issue that needs to be examined because it appears that ABSE instructors have been slow to practice integration. Over the past ten years, I have made repeated visits to over 100 Adult Basic Skills Education programs, locally and nationally. I have consistently found that, although instructors exhibit willingness and even an enthusiasm in regard to the integration of computer technology for instruction, they sometimes experience difficulty with the process. One veteran instructor using a Cinderella analogy described the integration process as an attempt to shove an oversized foot into a tiny glass slipper. While computer technology is large in terms of cost, content, training and the need for technical support, the glass slipper of ABSE remains small in terms of budget, mission, training resources and quality technical support.

To meet program objectives, teachers intuitively or consciously determine which instructional methods are effective and, subsequently, which are used (Cole, 1997; Holloway, 1997; Oppenheimer, 2003; Rockman, 1992; Turner, 1995; Whitcomb, 1996). Logically, an examination of current levels of *computer technology integration*; perceptions regarding its *relative advantage* or potential to support or impede existing instructional methodologies; beliefs about its *compatibility* with what instructors know about teaching adult learners; and beliefs about the quality of technology resources are issues that support investigation. At this point, it is difficult to accurately determine what teachers believe about the *relative advantage*, *compatibility* and perceived quality of *technology resources*. It is equally unclear as to whether their current levels of technology use constitute integration. An examination of these factors as predictors of technology integration will hopefully yield a model of integration that does not supplant, but rather supports and advances the broad purposes and mandates of traditional ABSE instruction.

At the onset of the study, I thought of *computer technology integration* as computer use for the purpose of instruction. However, it involves much more than an understanding of how to use hardware and software. It involves the instructors' ability to use computer technology in a manner that promotes the overall objectives and outcomes of ABSE programs and participants. Studies indicate that the computer can be a powerful tool in the hands of a well-trained teacher (Bailey & Rentz, 1989; Eveland, 1992; Haas, 1996; Hopey & Ginsburg, 1996; Turner, 1995). It follows logically that an examination of factors impacting computer technology use stands to benefit the field of education in general and ABSE in particular.

The Practice of Adult Basic Skills Education

It would be unrealistic, however, to begin that examination without supplying a general description of ABSE in terms of its instructors, its students, and its facilities. On a national level, there are unique challenges and constraints that persistently plague ABSE but are rarely encountered in other educational disciplines. These include: part-time employment, volunteer teachers, high teacher-turnover, isolation of students and teachers from peers, limited opportunities for staff development, inadequate classroom facilities, a shortage of resources, and inconsistent student attendance. Many instructors are part-time employees, working without benefits and teaching in isolation, often in the evenings when adult students are less likely to be working. Technical mentoring and support are difficult to impossible in some of these situations. In addition, there is a national absence of certification standards for ABSE professionals and a similar dearth of research related to the specialized area of ABSE (Wang, Hawk & Tenopir, 1999).

ABSE facilities can range from church basements to workplace meeting rooms, to trailers, to sophisticated technical school classrooms. Some facilities are not necessarily ideal for computer integration both in terms of space and scheduling issues. Often classes are conducted in borrowed community buildings that serve a diverse range of community interests. One classroom that I visited was located in a local poolroom. Another was housed in a small, rural, neighborhood restaurant. Use of these rooms often requires that the facility remain unencumbered by the educational trappings of visiting literacy classes. At times, these facilities have a limited number of electrical outlets for computer labs and a lack of security that jeopardizes the placement of computer labs. In one trailer that I visited, the instructor had been given ten new computers. Her husband had built special tables to house the equipment. However, each piece of hardware was plugged into a series of extension cords connected to the only power outlet in the building. Students were warned to be careful of the wires taped across doorways, and a number of venders refused to install software because proper electrical standards for system support were lacking. In contrast, less than fifteen miles from this facility, ABSE participants enjoyed a highly sophisticated technical environment with ample technical expertise and support staff.

ABSE facilities also experience discrepancies in the availability and quality of training in the use of computer technology for instruction. Where staff development is limited and difficult to administer, vendors are sometimes the only training resource. There are also differences in technology hardware and software across ABSE environments, and despite the most sincere efforts to promote technology integration, staff development of a technical nature can be limited at best. In one statewide needs assessment, 76% of respondents reported receiving technology training. However, less then 20% of their technology training was hands-on. Most training (80%) involved lecture format in which presenters demonstrated the use of technology for instruction (Black, 1998).

The variety of locations of ABSE facilities and the subsequent challenges to professional development also add to the uniqueness of the ABSE student. Participants enter ABSE programs on various academic levels, which may range from non-readers to those who were academically capable, but for one reason or another, simply did not obtain a high school diploma. This broad range of abilities and student objectives foster ABSE classrooms that operate much like a one-room schoolhouse. The multiple-level component is often addressed with a tutorial, one-on-one framework of instruction and curriculum materials specifically designed to meet individual needs. Participants attend classes as their personal schedules allow, creating what is known as open-enrollment. There is little consistency in the time students arrive for instruction or in the accumulated hours they devote to their objectives (Stein, 1997).

While instructors, participants and facilities make ABSE different from other educational formats, those factors alone cannot fully explain the difficulty in adopting computer technology for the purpose of instruction. In fact, some would argue that computer integration would serve to resolve some of these issues and for that reason, computer technology's role in ABSE is important. It is important to instructors and participants because it addresses the issue of multilevel classes through individualized instruction that provides immediate feedback. Software design often begins with a diagnostic evaluation of student level and prescribes instructional remediation, even outlining the process by which specific skills are acquired. Software programs can address the most basic educational levels and use both audio and visual cues to assist even the non-reader in working independently. Computer integration could also assist teachers in working effectively with open entry students who are unable to attend regular instruction because of their work schedules. Since computers provide a medium that promotes connectivity in otherwise isolated environments, it could help to eliminate the isolation experienced by teachers and students attending classes in remote locations in the evening hours.

For better or worse, technology has become a major focus in education. This is evidenced by the fact that funding for technology integration in education has been increasing at a rapid pace. In the U.S. alone in 1998, thirty million dollars was allotted to K-12 schools for the implementation of technology programs (Cwiklik, 1997). Comparable figures for the support of technology in ABSE are not available, however, it has long been recognized that, historically, funding for ABSE has been negatively disproportionate. However, regardless of the funding, technology as an instructional tool will be ineffective without the most critical link, the instructor. If ABSE programs experience difficulty, reluctance or perhaps even resistance to the overall concept and actual implementation of technology-based curriculum, there must be reasons. Those reasons need to be identified in order that ABSE programs and program participants realize the benefits derived from an adequate understanding and mastery of this technical phenomenon that permeates the society in which they live.

Statement of the Problem

While there are those who believe that computers are the gateway to empowerment, there are also those who are skeptical, at best, and those who are downright alarmed by the unquestioned acceptance of this electronic phenomenon. In conducting staff development classes, I have discovered that the spectrum of perceptions is broad, encompassing everything from reverence, to indifference, to scorn. The beliefs of educators exist somewhere along that continuum and what teachers believe about the value of an innovation is critical to the success or failure of its adoption. Rogers (1995) states that the significance of any new technology is evaluated on the basis of “subjective evaluations of near-peers that have adopted the innovation.” Cole (1997) describes the technology enthusiast as the most effective transmitter of technology training.

Yet we presently know very little about what ABSE teachers believe concerning the value of computer integration in ABSE. Research on teachers' beliefs and perceptions is notably scarce in the existing knowledge base. An extensive search of the literature produced less than 700 publications. The pros and cons of using technology in education environments were discussed in only fifteen, and those findings were based on the results of student satisfaction and gain, rather then on the perceptions of the individual instructors using the technology. Similarly, only a few were related to faculty perceptions of the *relative advantage* and *compatibility* of using computer technology. Fewer addressed teachers' perceptions of computer integration in Adult Basic Skills Education.

Overall, there was little information that provided insight into the apparent lack of computer integration into ABSE, in spite of the perceived advantages for doing so. Except from the standpoint of academicians and administrators, little is known about teachers' perceptions of the perceived *compatibility* of computer integration with what they believe about teaching adult learners, and little is known about what teachers perceive as the *relative advantage* of using computer technology for instruction in ABSE curriculum. We would benefit from an understanding of how teachers perceive technology integration because teachers are critical informants as to what enhances or inhibits the diffusion of technology in ABSE classrooms. An understanding of teachers' perceptions is critical to the design and development of future programs. It is critical to the goals of a student body that is largely disenfranchised by limited academic skills and certification.

Whether the rationale is reasonable or unreasonable, the evidence is all around us: society has placed a significant value on computer technology. Educators as well as students have to function and participate within that society.

To date, I have found few empirical studies specifically addressing ABSE teachers' perceptions of the *relative advantage*, *compatibility* and *technology resources* related to the use of computers.

Purpose of the Study and Research Questions

The purpose of this study was to understand how *computer technology integration* is manifested in Adult Basic Skills Education (ABSE) classrooms. In order to accomplish this broad purpose, three research questions were posed.

1. How is computer technology integration best conceptualized and measured?
2. To what extent do perceived *relative advantage*, *compatibility*, and quality of *technology resources* separately explain the observed variance in *computer technology integration*?
3. To what extent do perceived *relative advantage*, *compatibilit*y, and quality of *technology resources* jointly explain the observed variance in *computer technology integration*?

Significance

Because technology plays such a prominent role in society, there is an obvious need to address its role in educational institutions that prepare adults to function effectively within that society. With that objective in mind, program planners in educational institutions in general, and adult literacy programs in particular have deemed technology a desirable component of innovative instructional programs. Despite this increasing pressure to integrate technology into educational programs, ABSE providers have been slow to adopt it. Such resistance may be evident in ABSE formats because planners have not taken into account what teachers perceive as the *relative advantage* of technology integration, what they perceive as *compatible* with their instructional philosophies, and how they perceive the quality of their *technology resources*. That even the strongest proponents of technology realize its limitations is reflected by a prominent professor of sociology (Oppenheimer, 2003, pp. xiv): "One could also say that in the realm of education, technology is like a vine – it's gorgeous at first bloom, but quickly overgrows, gradually altering and choking its environment." He suggests that computer technology is not always consistent with learning theory.

Since it is typically instructors who assume the responsibility for implementation of instructional innovations, they have the potential to largely inform the research on this critical issue. Holloway (1997) notes that computer technology is not compatible with the aspect of social interaction that is inherent in most pedagogy. Cole (1997) points out that teachers are still using the same instructional techniques that have been used for centuries. She notes that despite the number of computers in American classrooms, little has changed in the overall pedagogical format.

The information from this study will assist program planners, technology designers and staff development providers to better serve ABSE instructors in integrating computer technology into their curriculum. This information is critical to the design and development of technology integration that maximizes what instructors perceive as consistent with program outcomes, student goals and teaching methodologies, and minimizes what they perceive as inconsistent.

CHAPTER 2
LITERATURE REVIEW

The purpose of this chapter is to review the literature on research related to *computer technology integration* in Adult Basic Skills Education (ABSE). This review will examine three areas: the effectiveness of technology use in ABSE, the adoption of computer technology in ABSE environments, and theoretical models of diffusion of innovations as they relate to *computer technology integration*.

In the first section, I will provide an overview of empirical studies on the use of technology in Adult Basic Skills classrooms. I will explore the strengths and weaknesses of the cited research, and offer conclusions as to what this body of literature reveals about *computer technology integration* in ABSE.

In the second section I will summarize the literature on the adoption of computer technology in ABSE environments. Since this study examines the notion of technology integration as an instructional tool, I will draw a connection between the research and how it relates to teachers' perceptions regarding *relative advantage*, *compatibility* and quality of *technology resources*. Studies on the quality of *technology resources* as a predictor of computer technology integration will explore issues of access, cost, and technical support for computer technology in ABSE. Literature related to *compatibility* will focus on teachers' attitudes regarding the potential of technology to support their pedagogical preferences, and reflect their understanding of adult learning theory and theory related to knowledge construction. The reviews related to *relative advantage* will examine research on program objectives and outcomes specific to ABSE and the potential for technology to supplement ABSE curriculum and advance learner and program goals.

In the third section, I will examine theoretical models for diffusion of technical innovations with particular emphasis on the work of Everett Rogers (1995) and Stephen Davies (1979). I will also provide a rationale for the model that will guide this study, as derived from the theoretical and empirical work reviewed.

Overview of Empirical Research

In this study, the term, *computer technology*, refers to the use of computers and auxiliary equipment such as CD-ROMs, printers, stand-alone and networked software applications, the Internet and the World Wide Web. This research review on technical innovations includes experimental and semi-experimental designs, qualitative designs and descriptive statistics. I will examine the strengths and weaknesses of these empirical studies using seven criteria: purpose, sample, data collection, data analysis, findings, recommendations and significance of the studies. I will offer conclusions as to what this body of literature reveals about computer technology use in ABSE.

Research Using Experimental or Quasi-Experimental Design

Rachal's Study: 1993. The following review of literature by Rachal (1993) synthesizes twelve studies published between 1984 and I992 that used an experimental or quasi-experimental design. Each involved the field testing of computer assisted instruction in ABSE, and each included pre and post testing of subjects who ranged in reading ability from non-readers to GED levels. Findings were grouped into three categories: no significant difference, mixed results, and statistical difference. Each review is listed separately because each used different software. Therefore, each represents a study that is unique to that software, but in an aggregate sense has significance in regard to the overall body of research and its implications for practice.

Studies Finding No Significant Difference. In the first no significant difference study, (Wangberg, 1985) used Language Experience Approach software over 22 instructional hours and pre-post tested with the Degrees of Reading Power Test. While the comparison group showed no gain, the treatment group gained one grade equivalent, which was not significantly different.

In the second study, Nurss (1989) used IBM Principles of Adult Literacy Software (PALS) over 8 months and 100 hours of instruction with non-readers. Groups were pre and post tested with the Test of Adult Basic Education (TABE). The treatment group improved .71 grade levels while the comparison group gained .34 grade levels, showing no significant difference.

The third study (Machen-Noll, 1986) used Steck-Vaughn GED 100 software over 120 hours of instruction. Both the treatment group and the comparison group were assessed regarding their interest in using computers. Though overall posttest results showed no significant difference, there were favorable, significant differences in the posttests of students who indicated an interest in computers on the pretreatment questionnaire.

The fourth study (Reid, l985) used PLATO software to teach math skills over 8 weeks for 3 hours per week. The computer-assisted-instruction (CAI) group gained 1.9 grade equivalents over the 1.1 gain of the traditional group and the 1.2 gain of the tutorial group. These were not significantly different.

The fifth and sixth studies (Gresham, 1986) used Curriculum Corporation software with GED students over 4 months and 40 hours respectively. Both pre and post tested with the Test of Adult Basic Education (TABE). Both studies administered an attitude inventory and both showed positive, affective gains in the CAI groups' attitude toward computers after treatment. Academic gains were greater for the CAI groups in both studies but were not significantly different.

Studies with Mixed Results. The mixed results grouping contained four studies. In the first study, Askov and Brown (1990) used basic skills software over 100 instructional hours to improve the reading level of 58 truck drivers taking an exam to procure their commercial driver's license (CDL). The group was pre and post tested using the Quick Assessment Test, the Commercial Driver's License Exam, and a Criterion Referenced Test. The posttest of the treatment group on the first two measures showed gains, however, there were no significant gains reported on the Criterion Referenced Test.

The second mixed results study (Askov, 1986) involved 27 inmates who were pre and post tested with the Slosson Oral Reading Test, the Baltimore County design and the Bader Reading and Language Inventory. In the post test, the group using CAI in the form of author developed software showed significant gains on the Slosson and no significant difference on the Baltimore County design and the Bader Reading and Language Inventory.

The third mixed results study (Macmurdo, I988) examined the use of Project Star software and traditional Laubach print materials with ABE students. Results of post testing indicated a gain for the CAI group of 1.2 grade levels per 50 hours of instruction. The study did not report whether these gains were statistically significant over the control groups gain of .7 grade equivalents.

The fourth of the mixed results studies (IOICA, 1990) involved 149 ABSE students who were pre and post tested with the Adult Basic Learning Exam (ABLE) after 30 hours of instruction over 18 months. The study did not indicate the type of software used or whether the CAI groups gain of 2.6 grade levels was statistically significant over the Laubach group's gain of 1.84 grade equivalents.

Studies Finding Significant Differences. Only two studies showed significant differences in the pre and post testing results of participants. The first study, (Park, 1990) treated adults needing basic skills. A variety of software was used over approximately 30 instructional hours. Subjects were pre and post tested with the Gates-MacGinitie Reading Test. The CAI group made no gains. Both groups were also given a pre and post attitude assessment toward computers, which indicated no attitude change toward computer use at the end of treatment. Overall, non-CAI groups were found to have higher academic gains.

The second study in which statistical significance was found (Tobin, l986) investigated the use of CAI for the development of vocabulary skills over a 50 minute instructional period, the shortest treatment time of any of the twelve studies. Four groups were divided by age (younger and older) and treatment (author developed vocabulary lists). Achievement for the treatment group was significantly better than for the comparison group, regardless of age.

Rachal's 1995 Meta-Analysis. In a later meta-analysis of twenty-one quasi-experimental studies, Rachal (1995) again examined the effectiveness of CAI in adult education. Similar to his previous study (1993), the results yielded no significant difference between the treatment group and the comparison group. However, this second meta-analysis did yield findings on secondary benefits resulting from the use of computer aided instruction. These included: improved learning time; student enjoyment of computer instruction, especially in terms of privacy and feedback; improved confidence levels; and reduced attrition levels.

Research Combining Qualitative and Quantitative Design

Large-scale implementation projects are those carried out at a district, state or provincial level. They are typically designed to create systemic change and thus have visionary perspective, viewing computers as change agents in an educational system (Reinking, 1998, p. 344). One such project benefited from a study designed to include both qualitative and quantitative components. Research combining qualitative and quantitative methodology extends the examination of factors relevant to technology integration to include a macro level examination of the vast interactions among the technology interface, the people who use it, and the cultural context of the adult basic education classroom. As

Reinking suggests, these relationships are “mutually influential rather than unidimensional” (Reinking 1998, p. 357) and as such stand to inform theory, research and practice regarding technology integration. While the following study lacks ethnographic intensity, it does include a qualitative component not present in the previously mentioned studies.

CALGARY – 1997. A 1997 report (Howard Research and Instructional Systems Inc., 1997) on a technology initiative in Calgary involved quantitative and qualitative study on the short term and long term effectiveness of CAI software in improving the reading achievements of 167 adult students enrolled in basic literacy, pre-GED and English as a Second Language classes. The evaluation utilized a quasi-experimental, non-randomized, pretest-posttest control group design using Autoskill Reading Program and/or PLATO software. Reading levels were assessed using the Bader Inventory, Yopp-Singer Test, and Woodcock-Johnson standardized reading inventory. In addition to the pre and posttests, additional data were collected six months after the program ended. Qualitative data was gathered using interview and observation methods. No significant difference was reported in educational gains between the treatment group and the comparison group. The qualitative study indicated positive affective results both in the form of student enjoyment of computer instruction and increased motivation to achieve academic pursuits.

Research Using Descriptive Statistics

Descriptive Statistics provide the field of Adult Basic Skills Education with a helpful understanding of issues that drive the integration of technological innovations: access, equipment, software, use, and effectiveness. The following section will describe the results of seven surveys in regard to adult literacy and issues of access, use, and perceptions.

Research Conducted by the National Council on Adult Literacy (NCAL). In 1996, the National Council on Adult Literacy (Hopey, Harvey-Morgan &

Rethemeyer, 1996) conducted a study of adult literacy programs surveying six states: Pennsylvania, New York, Delaware, North Carolina, Illinois, and California. Five hundred and fifteen programs returned surveys for a response rate of 31.54%. Programs were representative of the target audience and served from 6 to 100,000 students per year with the majority listing an average budget between $500,000 to $100,000 annually. Most had part-time or volunteer staff and an average of 1.9 full time teachers per program. A majority (79%) used technology but in limited ways. Regarding the use of technology, 82% listed administrative purposes, 67% listed instructional purposes, 31% listed assessment and 26% listed networking. Most (80%) used computers for drill and practice and a small percentage (14%) used multimedia packages. In regard to access, only 3% of the programs provided 10 or more hours per week, while 51% offered between two and five hours. Hardware capabilities were a bit limited, with 47% using Apple II machines and 42% using low-end IBM PC computers. Peripherals included CD-ROM (26%), modems (22%), scanners (12%), digital sound tools (12%), and video laser disks (11%); however, these were found only in programs with higher budgets and organizational resources

A positive correlation was found between the use of technology and annual budgets and the use of technology in programs linked to larger organizations housing additional technological resources. These findings are consistently comparable to those found in five other surveys covering different geographical areas. These include: Askov and Means' survey (1993), which examined fifty-one states including the District of Columbia, as well as Puerto Rico and Guam; Freer and Alexander's (1996) survey of Florida and Ohio; Pennsylvania's survey (Burrows, 1995), Georgia's survey (Black, 1998) and Sabatini and Ginsburg's survey (1997) of Mid Western Adult Literacy Programs in Michigan, Illinois, Minnesota, North Dakota, South Dakota, Wisconsin, Indiana and Iowa.

Research Conducted by the National Institute for Literacy (NIFL). A survey sponsored by the National Institute for Literacy (Rosen, 1996) is uniquely focused on the use of the Internet in ABSE classrooms. However, the survey was delivered via the Internet, and respondents included researchers, developers, graduate students, and consultants, a population outside the target population of ABSE practitioners. The results of the study were therefore not generalizable to the ABSE population.

Other than Rosen's study, there is general consistency in the findings across survey results on a national scope. This consistency provides information that is vital to program decisions on technology integration in ABSE classrooms. Most reported positive perceptions of the use of technology in ABSE and a desire to integrate on a more complex level.

The review of survey research identified three major deterrents to the use of technology in ABSE with lack of funding expressed as the major hindrance. This problem of funding deficits was reflected in concerns regarding issues of hardware, software, and technical support. The second highest problem was a lack of training, especially staff development that included hands-on methodologies. The third obstacle was time. Teachers and administrators needed time to master new technologies before attempting to teach with them.

Strengths and Weaknesses of the Reviewed Studies

Research using Experimental and Quasi-experimental Design. The experimental and quasi-experimental studies examined the effectiveness of computer-assisted instruction over traditional instructional modalities. Such investigations could provide important insights regarding technology integration. However, technology proponents conducted some of these studies. Technology advocates or corporations with a stake in establishing the success of their products conducted several studies. Indeed, some of the researchers were also instrumental in developing the software that was used by the treatment groups.

This leads me to question the possibility of research bias. The studies might have assumed that technology is generally valuable and that problems related to technology integration are temporary and surmountable.

Attempts to follow effective research design were also problematic. Sample selections were sometimes limited by program constraints including technical access, quality of technical equipment, and training of personnel. Attrition and irregular attendance were consistently noted as problematic factors in data collection and analysis. Pre and post testing instruments were not consistent across studies, which made the overall findings of the meta-analysis difficult to generalize.

The consistent recommendation across studies encouraged continued use of CAI. This recommendation persisted despite the overwhelming evidence across programs that there was no significant difference or, at the best, mixed results regarding the effectiveness of CAI over traditional methods of instruction.

Research Using Descriptive Statistics. The findings of survey research, though more consistent across studies, were limited in similar ways. Researchers, as technology advocates, may have influenced research design and results by nature of their positions as advocates. On the surface, the samples used in survey research seemed inclusive of the broad audience of Adult Basic Skills Education practitioners and students. Yet, the possibility exists that those responding to the surveys were potentially more comfortable with technology than those who did not respond.

In addition, several of the surveys were sent to program administrators. In terms of data collection and analysis, this opens up the possibility that respondents were administrators whose answers might differ significantly from those of instructors and students. Those who responded to the Internet survey were obviously using the Internet. Therefore the data is misleading in determining the scope and effectiveness of the Internet as an educational tool.

Along that same logic, the ability of the respondents to accurately answer queries on program hardware and software is questionable. In one personal experience (Black, 1998), respondents were unable to answer questions about equipment and software with accuracy. This error went undiscovered until survey developers went out to ABSE programs with staff development materials that used Microsoft Office. At that point, they discovered that respondents had unknowingly marked the wrong preference as their software of choice. Most had Microsoft Works and had to upgrade to a professional version of the software in order to participate in the staff development activities.

Conclusions

Perhaps the limitations inherent in experimental and quasi-experimental design are indicative of a need for a different type of research design. Research in its purest sense involves the task of creating knowledge. Merriam & Simpson (1995, p. 5) describe it as "… a systematic, purposeful, and disciplined process of discovering reality structured from human experience." In regard to research and literacy, however, Reinking (l998, p. 338) states, "There is relatively little systematic research focusing on well defined problems related to literacy and technology." That is the difficulty in presenting an overview of the empirical research in literacy and technology. Kamil and Lane (1998) reviewed four leading reading research journals and found less than 1% of articles referencing this topic. The pervasive use of technology in literacy environments and the relevant dearth of articles in reading and literacy journals are indicative of challenges in this area. Reinking (1998) suggests the appearance of new technology occurs at such a rapid pace that researching its effectiveness in educational settings is like "hitting a moving target" and research in this area becomes a matter of reacting rather than a systematic, intensive process of discovery.

Possibly the design of these studies can be made to reflect a perspective that includes the human factors that impact the use of technology and its effectiveness. Intensive case studies that examine the interaction of teachers, students and technology in the context of the classroom could significantly inform the field. The work of the Calgary project approaches this with the inclusion of a qualitative component. Nonetheless, it lacks the intensive ethnographic element that would indicate how a technology-rich educational environment would enhance or inhibit educational gains.

Ultimately, whether the research was experimental, quasi-experimental, intensive case study, or survey, problems with sampling, data collection and analysis, and flawed research design could render the results more suggestive than predictive. Despite these limitations, the studies are helpful in informing theory, research, and practice.

Research on the Adoption of Computer Technology in ABSE

In a society that seems to embrace computer technology, resistance to its integration in adult basic education has been documented in research (Vacc, 1984; Evans-Andris, 1995; Russell, 1996). Resistance is a behavior. Behavior is an outcome of attitude (Massoud 1991). Studies consistently indicate the importance of teacher demeanor and attitude in the delivery of computer assisted learning (Moore, 1993; Russell, 1996: Massoud, 1991; Keeler, 1996). Unfortunately, studies examining ABSE teachers' attitudes regarding *computer technology integration* are few. There are, however, studies that offer limited but significant insight into teachers' beliefs concerning the adoption and diffusion of computer technology in ABSE.

This section of the literature review examined three areas of research: quality of *technology resources, relative advantage* and *compatibity* as they impact the adoption of computer technology. First, studies that directly or indirectly addressed teachers' perceptions and attitudes about the quality of *technology resources* in their educational settings were investigated. Second, studies reflecting teachers' perspectives on the *relative advantage* of using computer technology in ABSE were reviewed. Third, studies examining the *compatibility* of computer technology in regard to adult learning, pedagogical perspectives, and theory on knowledge construction were reviewed. More specifically, this review focused on recent studies that advance an understanding of these three factors as predictors of *computer technology integration* in ABSE.

Research on the Quality of *Technology Resources* in ABSE

Studies consistently confirm a limited range of computer technology available to ABSE providers and participants. According to a report by the Office of Technology Assessment (1993), adult literacy providers are hampered in their access to educational technology by limited funding. According to the same report, programs typically average approximately $500 per fiscal year for technology integration. Technology designed specifically for ABSE students is limited because ABSE audiences represent only about .4% of the educational software market. Financial constraints are consistently listed as a major hindrance to technology integration. The second largest constraint is a lack of training, specifically hands-on experiences. The third barrier is a lack of time for ABSE professionals to learn and implement technologies that emerge at a pace that exceeds the capacities of a largely part-time or volunteer component of the educational spectrum.

In Sabatini and Ginsburg's (1997) survey, instructors listed perceived barriers to technology integration: lack of resources, lack of time to practice on the technology, and lack of information about the use of technology. Other perceived barriers included difficulty in choosing software and hardware and difficulty in understanding the use of technology as it relates to ABSE. Instructors also perceived that training was a resource that was particularly lacking. They expressed a significant need for hands-on training and opportunities to observe other programs using computer technology. Hopey, Harvey-Morgan, and Rethemeyer (1996) found that only 8% of technology training in ABSE involved hands-on formats, while 91% used lecture or seminar.

Research on *Relative Advantage* and *Computer Technology Integration* in ABSE

An examination of instructors' perceptions regarding the *relative advantage* of using computers in ABSE is an issue that supports investigation. Though the cited studies did not specifically mention *relative advantage*, they did investigate the advantages and disadvantages of computer technology use. One logical advantage to using any educational innovation rests in its potential to promote the attainment of learner and program objectives and outcomes. In this sense, it seems only logical to examine the perceptions of ABSE instructors regarding the potential for *computer technology integration* to accomplish these outcomes and objectives. Accordingly, a review of research on program objectives and outcomes as they relate to computer technology is critical to this study.

There is a considerable body of research on standards and participation factors in ABSE, which link to technology integration. Participation studies point out that adults attend classes for a variety of reasons, three of which have particular implications for computer integration: job advancement, personal advancement, and family related issues such as helping children in school (Beder, 1990; Beder & Valentine, 1990; Brookfield, 1987; Stein, 1997). Without at least a basic understanding of technology, it is difficult for ABSE participants to achieve job placement or job security (Aronowitz & DiFazio, 1994). Technology has pushed the educational requirements for job applicants to at least the twelfth grade level and employers express concern that they will soon be hard pressed to find applicants with the appropriate knowledge base by the year 2000 (Gordon, 1997).

The National Institute for Literacy developed standards research that confirms the significance of technology in impacting the lives of adult students in their role as parents, citizens and workers (Stein, 1997; Askov, 1995). Stein

(1997) developed customer-driven standards, which measure the effectiveness of ABSE programs. She points out that in a comparison with seven industrialized countries, U.S. workers had the lowest literacy levels. Using a role map of workers, Stein focuses on the ability of adults to adapt to changes in technology within the workplace, a standard that addresses their self-identified goal of establishing a "Bridge to the Future."

> We know that the world has changed enormously in the past forty years. The revolutions in technology and telecommunications mean that we are flooded with information, pressed to make decisions based on that information, hurtling through changes in how we work and live at a speed that was unimaginable when we were children. We know, too, that our education system – for both children and adults – has not kept pace with these changes (p.2)

Stein's study involved fifteen hundred ABSE students in one-hundred-and-forty-nine programs in thirty-four states, including Puerto Rico. In this study, ABSE students identified four competencies they hoped to gain by attending basic skills programs. These included access, voice, action and continued learning opportunities

> … to have access to information and orient themselves in the world;
>
> to give voice to their ideas and opinions and to have the confidence that their voice will be heard and taken into account; to solve problems and make decisions on their own, acting independently as a parent citizen and worker, for the good of their families, their communities, and their nation; to be able to keep on learning in order to keep up with a rapidly changing world." (p.4)

Stein also asserts that workers have to use technology to keep pace with a changing economy.

Research on workplace illiteracy also has implications for the importance of computer technology in ABSE. A study on developing skills standards for workplace literacy (Askov, 1995) identifies technology training as a necessary, ongoing component of ABSE programs since workers need to understand how to use computer systems or new machinery. Technology, as a basic skill, is consistently recognized in research studies that investigate ABSE and its relationship to the workplace (Stein, 1997; American College Testing, 1994; U.S. Department of Labor, 1991; Manly, 1994; Sar Levitan Center for Social Policy, 1997). The National Alliance of Business (1997) identifies 37 skills and competencies necessary for entry-level jobs and breaks those into five domains: ability to use resources, interpersonal skills, information, systems and technology. They also note that the secretaries must master word processing, workers have to understand statistical control and robotics and be able to read and respond on the basis of information found on graphs, charts and manuals. Computer technology addresses many of these skills.

In 1991, The Secretary's Commission on Achieving Necessary Skills (SCANS) published their final report identifying the skills necessary to succeed in the workplace (US Department of Labor, 1991). Under the U.S. Department of Labor, the Commission specified a three-part foundation that included basic skills, thinking skills, and personal qualities. The basic skills comprised the ability to read, to write, to perform arithmetic and mathematical operations, to listen and to speak. The thinking skills included creative thinking, decision making, problem solving, seeing things in the mind's eye, knowing how to learn and reasoning. Personal qualities encompassed responsibility, self-esteem, sociability, self-management, integrity and honesty.

These basic competencies have shaped adult literacy education curriculum nationally and comprise the skills identified as program and personal goals by ABSE instructors and students. Since these are the skills most often addressed in ABSE programs, it is important to know whether ABSE instructors perceive that *computer technology integration* will be an appropriate tool in achieving these goals. However, I could find little research to uncover these perceptions other than the studies reviewed by Rachal (1993; 1995). Those reviews did not measure ABSE teachers' perceptions directly, but they did lead to the conclusion that a significant number of instructors continue to have a positive attitude toward the use of technology and that this might be due to teachers' perceptions regarding the benefits of technology. These benefits include faster learning rates, immediate feedback, reduced attrition, increased student self-confidence, and increased privacy (Rachal, 1995). An Australian study (McCarthy, 1994) contributed seven additional perceived benefits to this list. These include scoring and record-keeping, focused tutorial assistance, and graphics animation, as well as organization, display and volume of materials.

On the other hand, *relative advantage* is negatively impacted when instructors are required to invest considerable time to adapt computer-generated materials that do not effectively reflect ABSE curriculum and relevant program and learner goals (Stites, 2003; Ginsburg, 1998, Wagner, 2001). Recently Wang, Hank and Tenopir (1999) studied users' interactions with resources on the World Wide Web and found that the cognitive needs of users were not consistently considered in the design of web sites. This disadvantage can result in the use of computer technology that does not match the academic and technological skills of the learners. This eventually affects learner attitudes, which ultimately affect learning itself.

The impact of learner attitudes and perceptions on learning was the focus of a recent study by Daley, Watkins, Williams, Courtenay, Davis and Dymock (2001). Findings indicated that instructors needed to focus on structuring technology-enhanced learning environments that generated positive attitudes among learners. Stites (2004) reports that instructors sometimes expend considerable effort constructing learning experiences that incorporate the use of computers to enhance traditional learning content. In that regard, Imel (1998) and Askov (2003) assert that the burden of responsibility for the effective use of technology rests with the instructor, both in terms of course structure and student motivation. With this burden looming, research needs to examine the gaps that inhibit *computer technology integration*.

Despite findings that educational gains are evident through the use of technology in ABSE classes (Maclay & Askov, 1987; Papagiannias 1987; Maclay & Askov, 1988), access does not assure use, and use, when present, is largely drill and practice rather than integration into existing curriculum. This finding is particularly disturbing since technology is most effective if used as a supplement to regular instruction, rather than as a replacement for traditional teaching methodologies (Moore 1993; Garza & Gibbs, 1994; VanProoyen 1994). Despite this finding, *computer technology integration*, as a supplement to traditional instruction, is a vague concept.

Turner (l993) suggests that the absence of research examining the effectiveness of computer-assisted instruction largely contributes to teachers' resistance to adopting it. Landauer (1995) refers to this phenomenon as the "productivity paradox" or the inability of research to determine a statistically significant connection between the use of computer technology and learning gains (Rogers, l995; U.S. Congress, 1993; Turner l993; Keeler, 1996). Teachers also experience this disconnect between the promise of technology and the reality of assessment in ABSE classes. Test results consistently show no significant difference between the gains of students taught with computers and the gains of students taught using traditional methodologies.

Research on *Compatibility* and *Computer Technology Integration* in ABSE

Though the following studies did not specifically research the aspect of compatibility as it relates to the adoption of computer technology, they did touched on its importance from three perspectives: teachers' perceptions and attitudes about computer technology; pedagogy and computer technology; and theory on adult learning and knowledge construction as it applies to computer technology.

The importance of instructors' perceptions about computer technology is reflected in several studies. Shohet (2001) suggests that what is sometimes perceived as instructor resistance to the adoption of technology may actually be evidence of their discomfort in using it. To address this discomfort, she recommends the implementation of long-term staff development. Askov, Johnson, Petty and Young (2003, p. 65-66) support that perception: "Teachers must feel comfortable with the technology if they are going to help their students become comfortable with it." McKenzie (2003, p.1) echoes this need for instructors to be trained in pedagogical techniques that address the use of computer technology in the classroom: "Sadly, much of the 'digital revolution' urged on schools has proceeded without noting the research describing how teachers learn challenging new strategies." Vannatta and Fordham's research (2004) indicated the importance of teachers' dispositions as significant predictors of computer technology use in K-12 classrooms. The study identified three combinations of characteristics as critical to the adoption of technology. These included: the amount of technology training they engaged in; the amount of time they spent using technology beyond the contractual work week; and their openness to change.

Accepting computer technology as an instructional modality involves more than the notion of teachers' ability to use it as a tool. It involves the ability of computer technology as an instructional tool to reflect what instructors value with regard to pedagogy. The potential for computer technology to reflect what instructors value provides a counter-perspective to the perception factor because it places the adoption focus on the technology rather than on the instructor.

Burge and Roberts (1993) stress that the adoption of technology is largely dependent on its ability to align with the values and pedagogical perspective of instructors. Stites (2004) and McKinzie (2003) recommend an emphasis on content and pedagogy in the use of technology, rather than a focus on hardware and software. Bone and Kingsley (2004) conducted a Delphi study, which found that one of the most persistent concerns of instructors regarding the use of technology was whether or not the content of computer technology software aligned with existing educational materials and goals. Hopey, Harvey-Morgan, and Rethemeyer (1996) identified a belief that software currently used in ABSE is “condescending and inappropriate”, predominately drill and practice, and not reflective of adult interests. These factors are evidenced particularly in the absence of learning content that is embedded in life skills, and life skills are critical in the development of ABSE learner goals and in the delivery of ABSE curriculum.

Turner (l993) suggests there may be several factors that contribute to instructor resistance to *computer technology integration*, among them, the inability of software applications to adapt to the “highly humanistic and process-oriented” nature of adult literacy education. The potential for computer technology to embrace theory on adult learning is also essential its adoption by instructors. Rather than providing instruction that centers only on the attainment of skills, Selwynn (2003) discusses the need for learning with technology to be critical and emancipatory in purpose. Similar studies stress the need for learning with technology to be active, transformational and consistent with adult learning theory as expressed in the work of Knowles (1980), Merriam and Cafferella (1999), Brookfield (1987), Mezirow (1991) and others. Ginsburg (1999) notes that computer technology should be used to supplement and extend existing learning and provide a value-added component to the overall educational experience. Stites (2003) enumerates four characteristics as essential to the learning experience: active engagement of learners, participation in groups, frequent interaction and feedback and connection to real-world content. Cowles (1998) suggests that student interests should be at the core of learning with computer technology and that the learner should be an active participant in the learning process. Adoption rests on the potential for computer technology to facilitate the attainment of these philosophical preferences. McKinzie (2003) coined the term ”toolishness” to emphasize the “foolishness” of focusing on hardware and software rather than on learning.

In addition to theory on how adults learn, studies suggest that the use of computer technology should align with theory on how knowledge is constructed. Teachers’ acceptance of learning theories covers a broad spectrum of beliefs from a traditional banking perspective (Freire, 1972) to constructivist perspective (Cunningham 1993). Somewhere along this broad spectrum, the viewpoint of the instructor is anchored. While computer technology lends itself well to some of these instructional values, it significantly inhibits others. Spiro, Feltovich, Jacobson and Colson (1999) note that technology should facilitate knowledge that is constructivists in nature. Imel (1998, p.3) defines constructivism as: “… learning theory, in which individuals actively construct meaning by interacting with their environment and incorporating new information into their existing knowledge … “ Imel asserts, however, that computer technology does not promote constructivism and identifies that misconception as one of the myths of learning technologies in adult education. Wagner and Kozma (2003) stress that learning with technology should support social interactions which are essential to knowledge construction. A similar study by Askov, Johnson, Petty and Young (2003, p. 67) also notes the importance of knowledge construction as a social interaction: “In education it is widely accepted that an important aspect of one’s knowledge is socially constructed.”

Regardless of whether instructors see education as the transfer of knowledge from teacher to learner or whether they believe meaning is constructed through the experiences of the learner, Ginsburg (1998) suggests that integration ultimately falls into one of four categories: technology as curriculum; technology as a delivery mechanism; technology as a complement to instruction; and technology as an instructional tool. Instructors' beliefs about how knowledge is constructed may be reflected in which of these categories best exemplifies their use of computer technology for instruction

In summary, recent studies would seem to advance an understanding of the three central factors of this study as predictors of *computer technology integration* in Adult Basic Skills Education. These include instructors' perceptions and attitudes toward the use of computers as an instructional tool. These specific perceptions include beliefs about *relative advantage*, *compatibility* and the quality of *technology resources* as essential characteristics to the adoption of computer technology in ABSE.

However, the complexity of learning new technologies is also a deterrent to integration. This was examined in an action research project examining how adults learn new technologies; Russel (1996) formulated a six-stage model of technology implementation. The initial stages were characterized by heightened attitudes of anxiety, frustration, nervousness and bewilderment. Learning was reported to be a rather time-consuming, intrusive, intimidating process, requiring intensive systems of support. She also found these negative attitudes diminished as the innovation process progressed to the final stage of creative application. This stage was referenced in a recent survey of the Office of Technology Assessment (1993, p. 3): "But creative uses of technology are the exception rather than the rule in most adult literacy programs today, the dream rather than the reality."

Models of Integration

The purpose of this study is to examine instructors' use of technology in ABSE and the factors that impact use. I will attempt to conduct this study through the theoretical lens of diffusion research. The theoretical model of diffusion that specifically guides this study is based on the work of Everett Rogers (1995). I will review relevant research drawing on this framework and will compare other innovation models that were reviewed for this study. Finally, I will present a theoretical framework to guide the study, providing a rationale for what I intend to use and what I do not intend to use form the theoretical and empirical work reviewed.

Davies' Diffusion Model. Research examining theoretical models on technology innovation and diffusion is extensive in regard to domain and scope. In choosing a guiding framework, I studied the literature of Davies (1979) and Rogers (1995). Davies presents a model based on corporate innovations across multiple firms. His theory (1979, p. 1) proposes three interlocking phases of the diffusion process. The first, invention, is the stage in which the innovation is conceived, through scientific knowledge or principles, by the innovative organizations. Little is known about the innovation in this phase. The second stage, innovation, is evidenced when the organization or innovator introduces the innovation for the purpose of adoption. The third stage, imitation or diffusion, occurs when the idea is perceived to be an advantage over existing technology within the innovative firm and is eventually adopted by the other firms.

According to Gomulka (1990), this theory refutes two assumptions. The first is that the rate of diffusion is consistent across organizations. The second is conjecture that throughout the adoption process the technology undergoes substantial improvement that renders it more valuable to the adopter. The model operates on eight propositions (Davies, 1979, p. 60-67): (1) potential adopters become aware of an innovation, (2) information on the innovation becomes more substantial over time, (3) an information search initiated by potential adopters improves the accuracy of information, (4) information on more sophisticated, expensive innovations require a more substantial information search over a greater time period, (5) the magnitude of information will differ among potential adopters, (6) firms use a rate of return yardstick to decide on adoption, (7) rate of return guidelines become less important over time, and (8) benchmarks for rate of return differ broadly across firms. While Davies' model applies predominantly to corporate organizations making "inner-firm" decisions" (Davies, l979, p. 67) and focuses specifically on technology, Rogers offers a model that has application on corporate or non-corporate levels and goes beyond a focus on technology.

Rogers' Diffusion Model. Everett Rogers' characteristics of diffusion take into account, not only the technological aspect of the change process, but also the human factor critical to successful implementation of technology. (Bandura, 1977; Chin & Benne, 1985; Benne, 1985; Morris & Dillon 1996). The model focuses on the interests and concerns of the potential user or adopter. This focus provides an ethical anchor for a diffusion process that has the potential to be grounded in egalitarian rather than autocratic process. It is this aspect of Rogers' model that makes it especially significant to the study of factors impacting levels-of-use of technology by ABSE instructors.

The first characteristic, *relative advantage*, considers the adopter's perception of the innovation as being more effective than current practices or methodologies. The second characteristic, *compatibility*, reflects the user's perception of the innovation as complementary to current educational norms and practices within the adopter's organizational frame of reference. *Complexity*, the third component, denotes the adopters' perception regarding the level of sophistication required to implement the innovation. The fourth characteristic, *trialability*, involves the opportunity to practice using the innovation to master or become familiar with the technology. The final characteristic, *observability*, encompasses the ability of the adopter to ascertain how others are implementing the innovation and to observe its effectiveness in accomplishing the long and short-term goals of the organization.

Both Rogers and Davies' models are generalizable, however, I chose Rogers work as a guide for model selection because of its broader application to education. I examined other diffusion studies similar to Rogers' for the purpose of creating a model to guide the study. Most focused on three aspects of innovation: the stages of the change process, the role of the change agent in facilitating that process, and the organizational factors that influence diffusion. Considering the comprehensive extent of the literature and the limited scope of this paper, three criteria guided model selection: (1) the model's relevance to educational change specific to technology; (2) the model's focus on the perceptions of the adopter as critical to successful implementation and diffusion; and (3) the model's explicit or implicit relevance to Rogers' (1995) five characteristics of diffusion. While these characteristics may not have been the major emphasis of the following models, they are characteristics that are either explicitly or implicitly embedded into the design of the models.

Social Interaction Model (SIM). The Social Interaction Model (Hall & Hord, l987) proposes a five-stage process of innovation. In the awareness phase, users recognize there is a problem and agree that change is desirable. In the second stage of increased interest, more information is gathered to assist users in the decision making process. In the evaluation stage, the decision to accept or reject an innovation is reached. If the innovation is accepted, a trial phase begins where users apply the innovation. Finally, the adoption process takes place, and innovation is implemented. Rather than relying on external change agents, this model depends on internal social networks of change agents and adopters to provide information flow. Support from change agents decreases after stage two and completely dissipates at the point of full implementation.

The SIM encompasses Rogers' innovation characteristics. During the evaluation stage, adopters have opportunity to determine the *relative advantage*, *complexity*, and *compatibility* of the innovation. Diffusion is dependent on learning that originates from internal social networks, as adopters observe and communicate with peers (*observability*). Adopters also practice using the innovation prior to implementation and full adoption (*trialability*). The SIM embodies a focus on the adopter by reason of the change agent's position as a member of an internal social network.

Related Research. Kozma (1979) examined social networks and diffusion. He divided adoption factors into two major categories: formal and informal networks and intrinsic and extrinsic rewards. Internal networks included social interaction among members of a system while external networks considered available resources, human, material, and financial in nature, within the organizational structure. Intrinsic motivation involved personal satisfaction while extrinsic motivation comprised support from managerial components. The study revealed formal networks were predictive of positive levels of innovation implementation. Informal networks had very low levels of predictability. This finding was inconsistent with that of the SIM and other studies (Hall & Hord, 1987; Rogers & Shoemaker, 1971). Extrinsic rewards predicted implementation of technical innovations, while intrinsic rewards predicted use of non-technical innovation. Kozma explains one possibility for this finding is that external rewards are related to promotion and salary raises because they are measurable, while non-technical innovations such as teaching methodologies are difficult to assess. Social Interaction research suggests that these networks and organizational supports are critical to the diffusion process (Kozma, 1979).

In studies that targeted the importance of early adopters, Rogers (l995) stressed the importance of informal social networks as critical to the dissemination process. Early adopters' roles in networks allowed for information to be shared with the larger body of adopters in a manner that was consistent with the organizational frameworks in which innovations took place. Similarly, Havelock (1971) emphasized the importance of knowledge dissemination within a SIM through the use of linkage agents. These agents bridge the gap between the adopter, as a knowledge user, and the resource, or knowledge producer. The linking agent acts as a consultant, assisting the adopter in diagnostic and problem-solving procedures related to the innovation.

Rand Model. This model evolved from a study (Berman, 1973) involving eighteen states and 293 individual innovations. The purpose of the research was to identify patterns of successful implementation. The strength of this model is its comprehensive nature, which had the advantage of examining a body of existing innovations to find commonalties contributing to the success or failure of the change process.

A three-stage model was developed based on Berman's research. In the initiation phase, support for change is gathered. In the implementation phase, both the school and the innovation mutate in a process known as mutual adoption. The mutation factor is unique to this model and involves the adaptation of the innovation plan, materials, and training methodologies to address the needs of the local institution. The model places emphasis on organizational support as critical to the innovation process and imperative for sustained change. The final stage, institutionalization, involves the process whereby the innovation is fully implemented into the system.

Findings (Berman, Greenwood, McLaughlin & Pincus, 1975) indicated that of the 293 innovations, programs providing staff development tended to be more successful in the innovation process than those that did not. While it is implied, effective training could conceivably contribute to minimizing the complexity involved in implementing the innovation. A second finding indicated that programs adapting materials to fit local needs were consistently successful. This reflects Rogers' standards, particularly compatibility, or the ability of the innovation to conform to the norms of the existing organizational infrastructures and practices. Successful implementation was dependent on support from the organization in which the innovation was introduced. Organizational management was critical to sustained use of innovations. This finding is consistent with research regarding barriers to implementation (Broad & Newstrom, 1992; Cormier & Hagman, 1987). Without organizational support, implementation is difficult, if not impossible, to sustain.

Concerns-Based Adoption Model (CBAM). The Concerns Based Adoption Model (Hall & Hord, 1987) is perhaps the most demonstrative of the five characteristics of diffusion because it focuses on the concerns of adopters. Once concerns are assessed, the change agent is able to provide necessary adjustments to the innovation process. Attention to adopters' perceptions of the innovation process appears to be diagnostic, prescriptive, and continuous. Through incident intervention, the change agent works to remedy concerns of adopters. The non-sequential infrastructure of the model provides monitoring of the innovation process using continuous adopter feedback. This feedback conceivably alerts change agents to issues regarding the *relative advantage* and *compatibility* of the innovation, the *complexity* involved in implementation, the need for additional levels of usage (*trialability*) and the possibility of having adopters observe the use of the innovation with peers (*observability*).

The model's "stages of concern" categorize adopters' question types as progressively moving through three areas as the adopter gains confidence in the innovation process. These concerns of self, task, and impact, aligns consistently with Rogers' characteristics of innovation. Concerns about "self" align with *complexity* by resolving issues of personal ability and potential conflicts with existing structures. Do I have the resources? Will I be able to understand the innovation? Is there a personal benefit to using this innovation? *Trialability* is also evident in self-concerns. Will I be able to practice the technology before I use it with students? Will students know more than I know? “Task” aligns with *compatibility* and is evidenced in questions concerning use, organization and scheduling of the innovation, as well as inquiries about the time demands of the implementation process. Concerns related to the “impact” of the innovation deal with *relative advantage*. How will innovations impact students? Will outcomes compare with or surpass outcomes of current instruction? Will modifications or replacements of the innovation be necessary? Are there better alternatives to the innovation?

This model also renders a measure of “levels-of -use” which provides behavioral indicators for implementation on eight levels: non-use, orientation, preparation, mechanical use, routine, refinement, integration, and renewal. In practical terms, an adopter on a minimal level of implementation could potentially benefit from a subsequent intervention involving the observation of the use of the innovation by peers whose levels of usage are higher, indicating they may be using the innovation in observable, positive instructional applications.

Related Research. The Concerns Based Adoption Model stresses necessary changes within individual adopters, which are critical to implementation. Loucks-Horsley (1996) contends this model has significant implications for teacher training and adoption. Her research suggests that CBAM has the potential to inform content, guide process, and provide time guidelines for sustaining innovations. This is evident in its focus on users’ levels of concern and use, factors that are particularly applicable to staff development.

This model also has implications for instruction. Wells and Anderson (1997) conducted a study of student use of the Internet at West Virginia

University to determine attitudes toward adoption of innovation. The CBAM stages of concern instrument developed by Hall, George, and Rutherford (1978) was used as the research tool. The first four areas of concern: awareness, information, personal concerns, and management issues, were collapsed into a category called internal concerns. The last three stages: consequence, collaboration, and refocusing, were collapsed into an external concerns category. This research found that internal concerns decreased over the process of adoption while external concerns increased. Implications for course design suggested a need for slowly pacing introductory concepts, scheduling moderate numbers of activities, highly structuring the presentation of new ideas, assessing skill mastery prior to moving into new activities, increasing access, and providing practice time to master the innovation.

Rogers' Model Verses Other Models

Coombs (1987) spoke of the myriad of classifications of innovation but contended there were commonalties that transcended disciplines. In an effort to develop the model that would guide this study, I examined those differences and commonalties to determine which had specific relevance to Rogers' five characteristics. In each model, innovation was perceived as a single factor of analysis involving change within a traditional system. In this study, innovation comprises multiple units of analysis or "technology clusters" (Rogers, l995). This refers to the use of computers and auxiliary equipment such as CD-ROMs, printers, stand-alone and networked software applications, the Internet and World Wide Web. Multiple component innovations, while not obvious in the reviewed models, are consistent with Rogers' framework and the reality of ABSE.

Past diffusion research has generally investigated each innovation as if it were independent from other innovations. This is a dubious assumption, in that an adopter's experience with one innovation obviously influences that individual's perception of the next innovation to diffuse through the individual's system. In reality, a set of innovations diffusing at about the same time in a system is interdependent. It is much simpler for diffusion scholars to investigate the spread of each innovation as an independent event, but this is a distortion of reality (p. 15).

Regarding information flow, the reviewed models consistently stress its importance. The SIM's emphasis on internal social networks, and related research on intrinsic and extrinsic rewards compliments Rogers description of knowledge related to information flow. This includes two types of knowledge: knowledge about an innovation's capacity to achieve desired outcomes and knowledge about evaluation, or an innovation's potential to have advantages and disadvantages. In this model, information about evaluation will be evidenced though instructors' perceptions of the advantages and disadvantages of the use of technology in ABSE. Information on desired outcomes will be evidenced in an analysis of the relationship between these perceptions and Rogers' characteristics of diffusion.

While the reviewed models sometimes mention these characteristics, there appears to be no direct application to the adoption process. The CBAM's levels of concern are closely associated with these attributes but are only inferred. Similarly, the CBAM and Rand models' emphasis on organizational support, incident intervention and adopter feedback infers Rogers' characteristics. Davies (1979) presents a three-phase model of innovation that begins with an innovation stage fostered by an outside firm. In the introduction phase, the *relative advantage* of the product is made clear to the consumer. At that point, imitation or diffusion takes place. While *relative advantage* is rather clear in terms of product, its application to educational innovations is rather nebulous. As the research on technology use in ABSE suggests (Gresham, 1986; Kamil & Lane, 1998; Keeler, 1996; Nurss, 1989; Rachal, 1993; Rachal, 1995), there is little assurance of technology's ability to produce educational gains, and there are significant problems in collecting data over time that will quantify other possible advantages. The isolated nature of adult basic education, the part-time, volunteer status of instructors, the tutorial component of instructional delivery, and the open-entry enrollment of ABSE students stand to impact compatibility in innovation. Limited funding and the location of ABSE classes in borrowed facilities may inhibit training and negatively affect *complexity*, *trialability*, and *observability*. Rogers' theory, as applied to ABSE professionals, presents an opportunity to add to the body of diffusion research by examining innovation within a unique educational infrastructure from the perspective of the adopter. Finally, Rogers' theory provides a vehicle by which the human component of diffusion can be examined. While process and change agents are critical to diffusion, so is an understanding of the adopters' perceptions. Since these five characteristics embody the human side of diffusion, they will best serve to guide my study.

Rationale for Using Rogers' Model as the Theoretical Framework

The Davies model assumes that the adopter chooses an innovation that will prove profitable enough in the long run to be financially feasible to the adopting organization. This model focuses on firms and the differences in their ability to process information, their attitudes toward risk, and their broad organizational goals. These goals account for different rates of adoption across organizations according to their size. The second assumption of the Davies model contends that innovations are modified over time and produce variations that are eventually more profitable. Innovations are divided into two groups: A, which is simple and inexpensive and B, which is complex and costly. The latter experiences slower adoption but more sustained implementation. The number of adopters increases in the earlier stages of the diffusion process and then drops off. While this model was effective for profit-based organizations, I did not include it because it did not meet the criteria established for model selection.

Similarly, I did not choose change agent models unless the change agent relied heavily on the perceptions of adopters. Such models would preclude a democratic process, which involves the inclusion of the perceptions of the adopter regarding the implementation of the innovation. These diffusion models may establish conformity in the adopters' use of an innovation, however it is not likely that these models will elicit the commitment of the adopter without which change can not be sustained (Chin & Benne, 1985: Bandura, 1982).

The Concerns Based Adoption Model's use of the three stages of concern align well with Rogers' diffusion theory, thus it is viewed as relevant to this study. The implications for this model's contribution to diffusion of innovation appear to be significant. It would also be interesting to examine whether Kozma's collapsed categories (1979) lend themselves to Roger's characteristics and whether Kozma's findings regarding internal and external concerns of adopters apply ABSE and diffusion of innovations.

The Rand Model adds the component of mutual adoption, whereby the success of the innovation is dependent on the ability of the organization as well as the individual adopters' ability to change. This involves adjusting the innovation to meet the needs of the user, and the ability of the user to adapt to the requirements of the technological innovation. This factor is embedded in Rogers' characteristics of diffusion and may contribute important information to research on the change process in ABSE classrooms.

Finally, the Social Interaction Model has been included because it relies on the user to provide information flow. The difference between this and other models is found in the declining importance of the change agent over time. Current research seems to indicate the need for the change agent to remain active throughout the diffusion process. It may be significant to examine the effects of the change agent in a declining role during the diffusion process.

In summation, components of the Concerns Based Adoption Model, the Rand Model and the Social Interaction Model lend themselves to inclusion in this research. Specifically, the components of stages of concern, levels of use, mutual adoption, internal and external concerns and the related categories of internal and external networks have relevance to the characteristics developed in Rogers' model. These components stand to enhance Rogers' model by contributing to an analysis of instructors' perceptions and advancing an understanding of the human component of the diffusion process.

CHAPTER 3

RESEARCH QUESTION 1: METHODOLOGY AND FINDINGS

Conceptualization and Measurement of Computer Technology Integration

The purpose of this chapter is to discuss the methodology and findings related to Research Question 1, which examined the conceptualization and measurement of *computer technology integration* in Adult Basic Skills Education (ABSE). Research Question 1 involved one question: How can *computer technology integration* in Adult Basic Skills Education best be conceived and measured? This measurement called for the subsequent identification of classroom practices as indicators of those characteristics. This was the most challenging aspect of the research in the sense that it presented a major sidestep to the original study. That sidestep spanned over two years and involved a process that was largely qualitative.

Overview

At the onset of this study, I felt there were various levels of *computer technology integration* in (ABSE), with some instructors using computers effectively and others not using computers effectively at all. Effective use was more about quality than quantity. Initially I tried to quantify the concept and made several wrong steps along the way.

Ultimately however, a more precise conceptualization was proposed. *Computer technology integration* was best defined by examining classroom practices that would serve as indicators of computer technology use in ABSE. This involved the implementation of a Delphi study to identify those characteristics and indicators which were established by national experts in the field of technology and ABSE. The findings of the Delphi study are presented below and the final instrument is included in Appendix A.

Conceptualizing *Computer Technology Integration*

Research Question 1 of the study required the identification of the characteristics and indicators of *computer technology integration*. For years, I had advocated technology integration, sometimes without a clear understanding of what it meant. Developing the construct presented considerable challenges in that it first had to be conceptualized and then defined.

To gain clarity, I drew on a familiar analogy, the use of textbooks in ABSE classrooms. Instructors, who based their entire instructional methodology on the use of textbooks, engaged more in textbook dependency than in quality textbook integration. Similarly, the concept of *computer technology integration* was not reflected in the sheer quantity of technology use. The conjecture of the study was that *computer technology integration* was evidenced in a thoughtful blend of instructional modalities and thoughtful planning around student objectives and program outcomes.

It was a difficult construct to measure, however, in that it presupposed the existence of essential characteristics of quality computer technology use. I was willing to posit that indeed those characteristics existed, but capturing that notion became extremely problematical. In my first instrument, presented in my prospectus defense, I attempted to measure *computer technology integration* as the theoretical percentage of time representing optimal use of computers in the classroom. Optimal use involved the percentage of use that was conducive to producing effective results. This definition proved unsatisfactory to both the committee and me for two reasons. First, because it depended on the accurate recall of instructors, it was an unreliable measure. Second, it was more a measure of quantity than quality of computer use.

Developing a Measurement Framework

Modified Delphi Study. Ultimately, a modified Delphi study was chosen as an appropriate method by which to both conceptualize and operationalize the construct. This method allowed for the building of a theory of *computer technology integration* based on the consensus of expert opinion. The study employed a multi-stage, Delphi approach, which was first proposed by Helmer and Rescher (1956) as an alternative to scientific models of prediction. The approach allowed for the exploration and explication of evasive concepts through the systematic sharing, evaluation, and re-evaluation of ideas among experts. The core notion of the Delphi approach to knowledge creation is that the tacit knowledge of well-informed individuals can be combined to produce knowledge that is of equal or greater quality and utility than more “objective” scientific methods. By placing high value on complex human judgment and reflection, the Delphi method represents an epistemological break from more positivistic approaches to knowledge creation. Specifically, the study sought to collect, condense, and explicate expert opinion about computer integration through a series of interviews and questionnaires. The research was guided by a single research question: What classroom practices exemplify the quality use of computer technology in adult literacy classrooms? To accomplish this, I implemented a seven-stage data collection and analysis process that employed a qualitative approach. Table 1 depicts this process and the resultant outcomes.

Concept clarification. In the first stage of the Delphi process, I clarified the target concept and described it in written form. I set boundaries on what was and was not relevant. Practices had to reflect the realistic environment of adult literacy classrooms, which often involve open enrollment, irregular attendance, and a broad spectrum of instructional methods, including small group instruction

Table 1. Stages of the Delphi Study

Stage	Activity	Product
Stage 1	• Clarified Research Question	
Stage 2	• Selected Expert Panel	• Expert Panel (see Appendix B)
Stage 3	• Mailed Letter of Intent • Conducted Semi-structured Telephone Interviews w/Experts • Analyzed Transcripts using Constant Comparative Method • Wrote 2 page Concept Paper	• Letter of Intent (see Appendix C) • Tape transcription of Interviews • Determine the Characteristics of *Computer Technology Integration* • Delphi Letter #2-Measurement Framework (see Appendix D)
Stage 4	• Emailed theoretical framework • Conducted follow-up telephone interview to critique theoretical framework • Analyzed taped interviews	• Modification of Characteristics and Indicators based on the Opinion of the Experts • Development of Potential Survey Items
Stage 5	• Collected ratings of classroom practices (35 potential items rated on Likert scale) • Development of Means Chart Analysis of items to identify those rated high by 8 of 11 experts	• Delphi Letter #3-E-mail correspondence - Potential Survey Items (see Appendix E) • Means Chart (see Appendix F)
Stage 6	• Conducted validity sort • Retained items rated highly by 7 out of 10 reviewers • Refined items based on reviewers' input	• Validity Sort (see Appendix G) • Validity Frequency/Means Chart (see Appendix H) • Refined Measurement Framework (see Appendix I)
Stage 7	• Developed instrument on *Computer Technology Integration*	• Final Instrument (see Appendix A)

as well as one-on-one tutorials. Practices also had to apply to a wide range of instructional methodologies ranging from stand alone, software-based content to project-based learning.

Expert Panel. In Stage 2, twelve national experts were selected to serve as a panel of experts (see Appendix B). These experts, who work at research universities and government institutes across the United States and North America, were selected based on their proven expertise and leadership in the area of technology and adult literacy. Eleven of the twelve agreed to participate in the study. Of these eleven, everyone participated in all stages of the project.

Letter of intent. In the third stage of the process, a letter of intent (see Appendix C) was written and sent to the 11 experts inviting them to be a part of an expert panel to help me refine the construct of *computer technology integration* in its most ideal form and validate the measurement. I really believed this approach would allow me to get the best wisdom from the field and then put it to work. The experts were interviewed about examples of excellent computer integration and classroom practices in computer use in ABSE. Interviews were taped and transcribed and then analyzed to determine the essential characteristics and indicators of *computer technology integration* as defined by the experts. Once those were determined, I wrote a two-page concept paper in which I spelled out what computer integration was and was not as defined by the expert panel.

Summary of preliminary findings. In stage 4, an e-mail summary of preliminary findings, in the form of a measurement framework (see Appendix D) was shared with the experts. They were then asked to provide criticism, suggest improvements and elaborations in a follow-up telephone interview. All eleven experts provided substantive suggestions at this point. The interviews were taped, and then analyzed to modify the characteristics and indicators to reflect the criticisms of the expert panel. Based on the results, a list of 35 potential survey items was developed (see Appendix E).

Rating characteristics and practices. In stage 5, I asked the experts to rate these 35 classroom practices based on their importance to *computer technology integration*. Frequency and means were charted and items were ranked by means (see Appendix F). Behaviors considered highly desirable by at least eight of the eleven experts were retained as essential to our theoretical formulation. Through this process, it became apparent that there were really four distinct aspects of *computer technology integration*.

Construct Validity. In stage 6, I created validity sort kits (see Appendix G) containing the following:

- Directions
- Five labeled envelopes, one for each of the four categories of *computer technology integration* and one for any item which could not be classified
- Thirty six strips of paper on which items were listed

Subsequently, ten individuals familiar with survey development gathered in a conference room and independently sorted each item by characteristic. After the sort was completed, the group discussed their choices and gave suggestions on possible revisions to the wording of several characteristic and indicators. Frequency charts were then created (see Appendix H). Each item consistently identified under one characteristic of *computer technology integration* by 7 out of 10 individuals was retained as essential for measurement development and for the development of the final instrument (see Appendix I). Ultimately, in stage 7, final items were randomized and placed in the survey under Section 1: How computer technology is used in your classroom. (see Appendix A).

Findings in Relation to Research Question #1

Research question #1 employed the Delphi approach to map the construct, *computer technology integration*, as it applied to adult literacy classrooms. The resultant theoretical framework is depicted as Table 2. As can be seen from an examination of that table, emergent themes ultimately took the form of classroom characteristics and classroom practices. Conceptually, a classroom that embodies these characteristics and practices is a classroom in which *computer technology integration* is evidenced.

The first characteristic calls for a classroom in which computer use is *seamless*. Computer use is not an unusual event, and it is not something that learners engages in “every Tuesday and Thursday morning.” Instead, computer technology is a taken-for-granted element of everyday instruction. There is an easy flow from computer to book to paper to discussion, and both learners and teacher benefit form using the best modality – alone or in combination – for accomplishing the learning task at hand.

The second characteristic calls for a classroom in which computer use is *appropriate for learners*. Learners in adult literacy classes have special characteristics. They are more likely to have learning disabilities than other adults. They are more apt to be members of socially oppressed groups. They are more likely to have come from poor families and poor schools and thus have had limited access to computer technology. Also, by definition they have lower reading, writing, and math skills than other adults. The selection of both hardware and software must be made in light of these realities. However, as more than one of our experts reminded us, a good teacher does not trap learners in their histories. In the best classrooms, learners’ technology expertise increases as their academic skills do, and the definition of “appropriate technology” is fluid.

Table 2. Four Characteristics of *Computer Technology Integration* in ALE

CHARACTERISTIC #1: COMPUTER USE IS SEAMLESS Definition: There is easy movement between computer-based instruction and other forms of instruction. Practices: • Learners access computers as easily as they access more traditional learning tools, such as paper and books. • Computer use is routinely augmented by class discussion • Computers are used in combination with other learning formats, such as lectures and books. • Computers are used to enhance other learning activities.
CHARACTERISTIC #2: COMPUTER USE IS APPROPRIATE FOR LEARNERS Definition: Learners are able to use the computer technology in the classroom. Practices: • The level of computer-accessed content matches learners' literacy skills. • Accommodations are made for learners with different languages, cultures, and socioeconomic backgrounds. • Accommodations are made for learners with special learning needs. • The levels of technology match learners' technology skills.
CHARACTERISTICS #3: COMPUTER USE IS INSTRUCTOR-FACILITATED. Definition: Instructors facilitate learners' effective use in computer technology in the classroom. Practices: • Instructors actively assist learners in using computers to achieve individual learning goals • Instructors provide feedback to students on their computer-based learning.
CHARACTERISTIC #4: COMPUTER USE IS LEARNER-EMPOWERING Definition: Learners are proactive in using computer technology for learning. Practices: • Computer use enhances learners' ability to work independently. • Computer use enhances learners' ability to work collaboratively. • Learners choose from a range of learning materials available through computer use.

The third characteristic calls for a classroom in which computer use is *instructor-facilitated*. The use of computers changes but does not diminish a teacher's instructional responsibility. In the best classrooms, teachers are actively engaged in planning and monitoring computer use. Although there are many instructional choices that can and should be made by the learners themselves, it is the teacher's job to ensure that the technology is up and running—and appropriate for the learning task at hand. Moreover, as with any learning modality, the teacher needs to provide the kind of guidance and feedback that will allow students to achieve their learning goals.

The fourth characteristic calls for a classroom in which computer use is *learner-empowering*. The use of computers enhances students' opportunities to work independently as well as in groups. Students are able to make decisions about when and how to use computers and are able to use computers to choose from a broad range of materials that might not be available to them in programs with limited resources and funding. They are also able to use computers to engage in real-life problem-solving scenarios that are relevant to their personal and professional lives and their roles as citizens, family members and workers.

Computer Technology Integration as a Single or Multiple Measure

One decision that was critical to the overall study was whether or not *computer technology integration* consisted of one measure that included four aspects, or whether it actually consisted of four distinct scales. This was a critical decision because it significantly impacted the data analysis process. It determined whether or not there would in fact be one dependent variable or multiple dependent variables. In order to resolve this question, I took three actions.

First, I treated each aspect as a sub-scales and conducted reliability analyses on each aspect and the full measure of *computer technology integration* to see if the measure itself had enough internal consistency (coefficient alpha) to stand alone. Table 3 depicts the alphas for each of the four aspects. Internal consistencies were encouraging in the sense that the total integration scale had a very high reliability (.95). Moreover, each of the aspects demonstrated internal consistency in its own right with coefficient alphas as follows: *seamlessness* = .85; *appropriateness* = .80; *instructor-supported* = .92; and *learner-empowering* = .88.

Table 3. Distribution and Reliability of Aspects of *Computer Technology Integration*

Variable	Number of Items	Scale		Mean Item Mean	Alpha
		M	SD		
<u>Dependent Variable</u>					
Seamlessness	4	19.21	4.49	4.80	.85
Appropriateness	7	30.94	6.98	4.42	.80
Instructor-Supported	9	43.99	8.63	4.89	.92
Learner Empowering	11	46.83	10.34	4.26	.88
Integration (Total)	31	142.71	26.80	4.60	.95

While the reliabilities for each sub-scale in Table 3 indicated that I could examine each aspect independently, the reliability for total integration was even higher and justified treating all four aspects collectively. Therefore, neither analysis served to resolve the initial question as to whether or not the outcome variable should be treated as one measure or as multiple measures.

A second analysis was, therefore, necessary. I ran intercorrelations among the four aspects, treating them as sub-scale to find out if high intercorrelations would indicate that it actually would not be useful to treat the aspects as separate variables. The intercorrelations between aspects were, for the most part, moderate to high, ranging from .81 to .64. Intercorrelations in descending order were as follows: .81 for *appropriateness* and *instructor supported*; .81 for *learner empowering* and *instructor supported*; .76 for *seamlessness* and *instructor supported*; .72 for *seamlessness* and *learner empowering*; .68 for *appropriateness* and *learner empowering*; .64 for *seamlessness* and *appropriateness*. These substantial intercorrelations, depicted in Table 4, suggested that a single measure might be best.

Table 4. Intercorrelations of Four Aspects of *Computer Technology Integration*

	r	p	r^2
Seamlessness and *Appropriateness*	.64	.01	.41
Seamlessness and *Learner Empowering*	.72	.01	.52
Seamlessness and *Instructor Supported*	.76	.01	.58
Appropriateness and *Learner Empowering*	.68	.01	.46
Appropriateness and *Instructor Supported*	.81	.01	.66
Learner Empowering and *Instructor Supported*	.81	.01	.66

As a third step, I conducted a factor analysis of the four aspects to determine the deep structure of the integration variable and whether or not it was multidimensional. Results of the exploratory factor analysis confirmed the decision to use a single dependent variable. The exploratory factor analysis produced a single variable containing 79% of the observed variance and none of the remaining components demonstrated an eigenvalue in excess of 1. Therefore, for the purposes of the present analysis, I treated the outcome variable, *computer technology integration*, as a single dimension.

CHAPTER 4

RESEARCH QUESTIONS 2 & 3: METHODOLOGY AND FINDINGS

Predictors of *Computer Technology Integration*

The purpose of this chapter is to discuss the methodology and findings related to Research Questions 2 and 3, which examined the predictors of *computer technology integration* in Adult Basic Skills Education (ABSE). These questions necessitated a quantitative method in which Adult Basic Skills Educators in Georgia submitted a self-completion survey on their use of and beliefs about *computer technology integration* in ABSE. The study examined three independent variables as predictors of *computer technology integration*: (1) instructors' perceptions of the *relative advantage* of using computer technology as a teaching tool, (2) instructors' perceptions of the degree to which computer technology is *compatible* with their personal teaching style and their understanding of how adults learn and (3) instructors' perceptions of the quality of their *technology resources*.

In order to accomplish these purposes, two research questions were proposed:

Research Question #2

> To what extent do perceived *relative advantage, compatibility* and quality of *technology resources* separately explain the observed variance in *computer technology integration*?

Research Question #3

> To what extent do perceived *relative advantage, compatibility* and quality of *technology resources* jointly explain the observed variance in *computer technology integration*?

The chapter is divided into nine major sections: theoretical framework, instrumentation, sample, data collection, data preparation, description of respondents, data analysis, limitations and findings. The first section explains the theoretical framework for the study. Next, the instrumentation is provided, including a description of the major constructs and the instruments developed to measure those constructs. Specifically, this section focuses on construct definitions, survey items, validity, and reliability. The third section explains the proposed sample, who they are, and why they were believed to be the appropriate sample for the study. In the fourth section, the data collection procedure is examined. The strengths and weaknesses of the data collection method are also considered. In the fifth section, data preparation is explained, followed by a description of the survey respondents in section six. The final three sections deal with data analysis, limitations and findings.

Theoretical Framework

Though *computer technology integration*, in and of itself, may not be considered an innovation, its adoption into adult literacy environments is constantly evolving. A study of the literature and practices in the field yielded many possible predictors. However, because survey length is directly linked to response rate, the instrument design had to be short enough to be manageable. This required choosing a small number of predictor variables that were well measured, rather than many variables poorly measured. The work of Everett Rogers (1995) on diffusion of innovations became the theoretical framework upon which this study is based. Of Rogers' five characteristics of adoption, two were of particular interest to this study, *relative advantage* and *compatibility*.

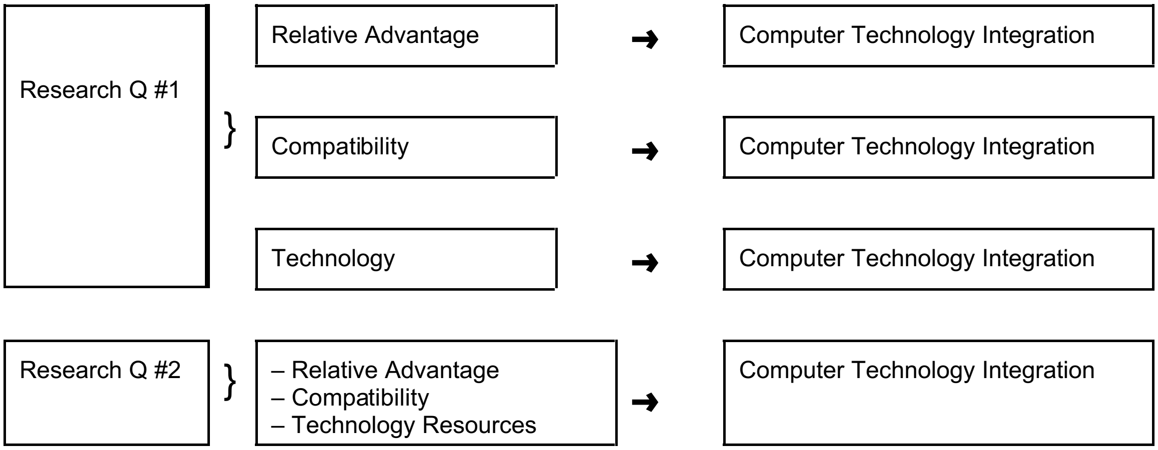
Since instructors are critical to the adoption of the innovation, so are their perceptions regarding the usefulness of computer technology in terms of pedagogical philosophies and the attainment of program and participant goals. According to Rogers, "*Relative advantage* is the degree to which an innovation is perceived as being better than the idea it supersedes." (1995, p. 212) This construct was used to examine whether or not instructors perceived the use of computers as an advantage over more traditional instructional methods. Subsequently, the power of these beliefs to impact the quality of computer use in their classrooms was examined.

The second predictor variable dealt with instructors' beliefs about the teaching process as it applies to adult learners. This notion was captured in the construct of *compatibility*. As Rogers defines it, "*Compatibility* is the degree to which the innovation is perceived as consistent with the existing values, past experiences and needs of potential adopters." (1995, p. 224) The construct was used to explore whether or not instructors would engage in quality computer use if they believed that the use of computer technology was compatible with their values, experiences and needs.

The third predictor variable, *technology resources*, explored instructors' beliefs about the quality of the resources available to them. This variable was included simply because of the resource variation in ABSE programs across the state. Specifically, *technology resources* relates to the perceived quality of computer hardware, computer software and technical support. Obviously, if instructors do not have the technology and related support, integration is difficult, if not impossible, to achieve.

Predictor variables were studied from two perspectives, their potential to separately explain the outcome variable and their potential to jointly explain the outcome variable. Figure 1, depicts the relationships that were explored. .

Figure 1: Relationships Examined

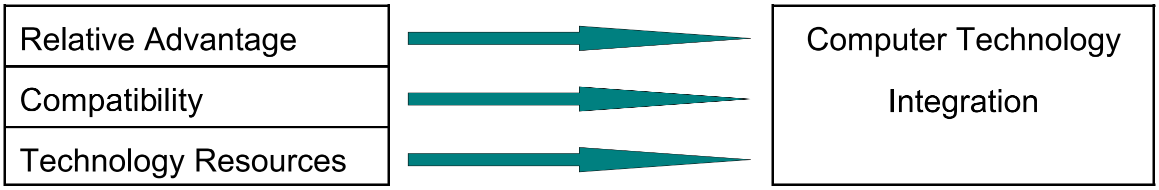


Rogers' model of diffusion of innovations has proven very robust over the years, especially in predicting the adoption of technology innovations. As stated in the literature review, the model includes five characteristics: *relative advantage*, *compatibility, trialability, observability* and *complexity*. Each of these characteristics has the potential to contribute to the framework depicted in Figure 2 below. While recognizing their importance, I had to make several critical decisions as to which would be examined in this study.

Adequate response rate and reliable measurement are essential elements of survey design that have to be given serious consideration in the selection of the survey variables. The likelihood of designing a survey that would measure all five of Roger's predictor variables in a single survey, in a single point in time was not a realistic proposal. The consequences of doing so could result in an instrument that would be well over 100 items in length. A survey of that length could result in a weak response rate. Consequently, I was faced with the task of choosing the most important variables among Rogers' five characteristics.

Although it was accurate to acknowledge that all of these characteristics could be important predictors, ultimately only two became a part of the study: *relative advantage* and *compatibility*. There is a substantial body of research on adults as learners and on the process of knowledge construction. In my work with

Figure 2: Measurement Framework



for two reasons. It places the focus on technology rather than sound pedagogy. ABSE instructors over many years, I had ample opportunities to hear their perceptions about the ”fit” of computer technology in the adult learning environment. These pedagogical anchors, though widely diverse among ABSE instructors, seemed to account for their use of computer technology. For this reason, I believed *compatibility* would be a strong predictor of integration.

Similarly, instructors’ responsibility to address program and learner outcomes was a common focus of their networking on the *relative advantage* of the use of computer technology. It was understandable that content delivered through computer technology was critical to its adoption. The more teachers perceived that technology lent itself to these goals and objectives, the more likely it seemed that they would adopt it.

A third non-theoretical predictor, *technology resources*, was originally embedded in instructors’ *background* characteristics. I later added it as a predictor based on the same rationale for choosing *relative advantage* and *compatibility*. I believed it would be a significant predictor of adoption.

In all, the framework included the exploration of three predictor variables: *relative advantage, compatibility*, and *technology resources*. Figure 2 depicts this framework.

Instrumentation Overview

For the purpose of this study, computer technology was defined as computers and auxiliary equipment such as CD-ROMs, printers, scanners, stand-alone and networked software applications, the Internet and the World Wide Web. The integration of computers related to instructional integration, which included teachers' integration of computers for the purpose of teaching or the development of materials to be integrated in the teaching paradigm.

Research Question #2 and #3 involved the development of measures for *relative advantage*, *compatibility* and *technology resources*. Table 5 summarizes the quantitative stages of instrument development.

Table 5. Quantitative Instrument Development Process

1. Development of a Measure for *Relative Advantage*
2. Development of a Measure for *Compatibility*
3. Development of a Measure for *Technology Resources*

Development of a Measure for Relative Advantage. As mentioned in the review of existing literature, survey research directly examining Rogers' characteristics of diffusion as factors impacting the use of computer technology in ABSE focused on two major components, process and change agents. Consequently, the majority of studies focused on diffusion as a process and on the role of the change agent in the process. In addition, most studies pertained to K-12 practices that did no reflect the turbulent nature of ABSE. Therefore they were not expected to contribute directly to the study.

According to Rogers, *relative advantage* is: "...The degree to which an innovation is perceived as better than the ideas it supersedes." (1995, p. 212). For the purpose of this study, *relative advantage* is the degree to which instructors perceive computer technology as better than traditional methods of instruction. It implies the ability of the innovation to enhance what instructors currently do to achieve instructional outcomes.

Constructing a *relative advantage* scale presented a challenge from two perspectives. I had to conceptualize the notion of relative, and I had to decide what advantage was to be measured. The validity of this construct was obtained using the outcomes listed by the National Institute for Literacy in *Equipped For the Future* (Stein, 1997). Ultimately, I constructed ten outcome items to measure instructors' perception of *relative advantage* as it related to student and program objectives.

Once valid items were obtained, a dual measure was established to examine instructors' perceptions of the advantage of using computers over traditional instructional methods. After more reflection, however, I came to the conclusion that I really wasn't comparing computer instruction with non-computerized instruction. I was never envisioning a cyber classroom without instructors.

Ultimately, I decided on a method where respondents would decide the extent to which the addition of computer technology to traditional classroom instruction improved (*relative advantage*) student achievement of desired educational outcomes. A six point Likert scale, ranging from *strongly disagree* to *strongly agree*, was used to measure perceptions of *relative advantage* of instructional use of computers. Table 6 depicts the measure and corresponding outcomes established by the National Institute for Literacy.

Development of a Measure for Compatibility. According to Rogers, "Compatibility is the degree to which an innovation is perceived as consistent with the existing values, past experiences, and needs of potential adopters. An idea that is more compatible is less uncertain to the potential adopter and fits more closely with the individual's life situation. Such *compatibility* helps the individual give meaning to the new idea so that it is regarded as familiar. An

Table 6. Measure of Relative Advantage

	Measure	Corresponding EFF Outcome
Item 1	When learners use computers, they have better access to information.	• Greater Access to information
Item 2	When learners use computers, they can make more informed personal choices.	• More information for orientation
Item 3	When learners use computers, they have better opportunities to keep up with the world as it changes.	• More opportunities to keep up with world changes
Item 4	When learners use computers, they have more opportunities to voice their opinions.	• More opportunity to express ideas and opinions
Item 5	When learners use computers, there is a better chance that their voice will be heard.	• More opportunity that ideas will be heard
Item 6	When learners use computers, their ideas can better influence important decisions.	• More opportunity for ideas to be taken into account
Item 7	When learners use computers, they have better opportunities to engage in problem-solving.	• More opportunity to engage in problem-solving
Item 8	When learners use computers, they have better opportunities for independent decision-making.	• More opportunity of independent decision making
Item 9	When learners use computers, they have better opportunities to engage in independent action.	• More opportunity to engage in independent action
Item 10	When learners use computers, they have better opportunities to learn how to learn.	• More opportunity to learn how to learn

(National Institute for Literacy in *Equipped For the Future*, 1997, Stein) innovation can be compatible or incompatible (1) with sociocultural values and beliefs, (2) with previously introduced ideas, or (3) with client needs for the innovation." (1995, p. 224)

For the purpose of this study, compatibility refers to the degree to which computers are perceived as consistent with instructors' values and philosophies regarding the way in which adults learn. *Compatibility* implies ability of the innovation to support the philosophical ideals and values of the instructor. The term, *compatibility* requires a measure to determine the philosophies and values that shape personal teaching styles based on how adults learn and the degree to which respondents perceive computer instruction to be compatible with those philosophies and values.

Initially, I identified what instructors valued in teaching methodologies. To determine the measure of *compatibility*, I examined the philosophical perspective of respondents in regard to their personal teaching style as it related to their beliefs about how adults learn. Norm groups, consisting of five ABSE instructors were queried on their values and philosophical orientation in regard to teaching styles and beliefs about how adults learn. The query continued until saturation was reached. Contrasting values were measured on a score between 1 and 4, with 1 indicating disagreement with the norm value and 4 indicating agreement with the norm value. *Compatibility* scores were to be obtained by comparing the respondent score and the norm score of four. If the respondent's score registered above or below the absolute value of the norm score, the measure would indicate how far from perfect *compatibility* the respondents were in their perceptions regarding the potential for computer technology to support their individual instructional style. However, there was slight overlap between the *relative advantage* construct and *compatibility* construct. As a result, I had to rethink the construct to develop a more precise measure. Using Rogers' definition of *compatibility*, I developed seven items shown in Table 7.

Table 7. Measure of Compatibility

Rogers' Definitions	Corresponding Item
The innovation is perceived as consistent with the existing values of the potential adopters (p. 224)	Item 1: Teaching with computers is compatible with my instructional approach.
The innovation is perceived as consistent with past experience of potential adopters (p. 224)	Item 2: Teaching with computers is compatible with the way I have always taught.
The innovation is perceived as consistent with needs of potential adopters (p. 224)	Item 3: Teaching with computers is compatible with my beliefs about how adults learn.
The innovation is perceived as consistent with sociocultural values and beliefs of potential adopters (p. 224)	Item 4: Teaching with computers is compatible my socio-cultural values.
The innovation fits closely with the life situation of potential adopters (p. 224)	Item 5: Teaching with computers fits into the way I prepare for class.
The name of the innovation often affects its perceived compatibility (p. 236)	Item 6: Teaching with computers is something I enjoy.
Such compatibility helps the individual give meaning to the new idea (innovation) so that it is regarded as familiar (p. 236)	Item 7: Teaching with computers is a necessity in my classroom.

Rogers, 1995

Development of a Measure for Technology Resources. The third variable, *technology resources,* was originally embedded in background characteristics.

However, because it included three measures: Quality of Hardware, Quality of Software, and Quality of Technology Support, it was removed from background characteristics and created as a separate measure called quality of *technology resources*. While the measure was limited in scope, I believed it would provide an accurate picture of the variable as a potential predictor.

Sample

I made two major decisions concerning the make-up of my study sample. The first consideration involved a choice between a national or statewide sample. A national sample had certain advantages. Notably it would enable me to collect information from states in which ABSE instructors may do things differently from instructors in Georgia. However, the national sample would not permit for any meaningful generalizations, since there was no master list of teachers. In reality, I was interested in all adult education practitioners, whether they were instructing in the United States or in other countries. However, I had to find a sample that would allow me to get a respectable response rate. Ultimately I decided on the state sample because of these reasons:

- Georgia has a very tightly organized adult literacy system. Several years ago, then Governor Zell Miller put into place one full-time teacher in each of Georgia's 159 counties. This number has remained relatively constant over the years, though a few larger counties have hired additional full-time instructors.
- The state of Georgia provided a list of the total population of full-time public teachers in the state. No comparable list existed for the national program.
- The Georgia sample provided a representation of all types of major programs common to the broad spectrum of ABSE environments. These included but were not limited to English as a Second Language,

Workplace Literacy, Corrections, ABSE, Pre-GED/GED, and Family Literacy.

- A state is an important unit of analysis. Georgia embodies rural, urban and suburban populations that are reasonably representative of many other southern states where literacy has been a longstanding problem.
- A positive relationship with the sample population provided a reasonable assurance that the response rate would be meaningful.

This last expectation was based on my relationship to the sample population. I had worked as an ABSE instructor in Georgia, as a staff development instructor, as a curriculum developer for the diffusion of technical innovations, and as a researcher under the direction of the University of Georgia (UGA) and Georgia Institute of Technology (GT). Both universities are highly regarded among ABSE practitioners and research communities locally and nationally. My professional responsibilities necessitated close collaboration with the sample population and resulted in the establishment of a positive relationship with them. Professional collaborations have also equipped me with significant knowledge of Georgia's ABSE programs, their staff, size, funding and resources. Finally, a focus on publicly funded programs would reduce sample error by allowing the administration of survey materials to the total population of full-time instructors working under the Georgia Department of Technical and Adult Education (GDTAE).

Georgia is divided into thirty-seven Service Delivery Areas (SDAs) each managed by a director serving counties designated by the Georgia Department of Technical and Adult Education, Office of Adult Literacy (OAL). Each county has at least one full time instructor who reports to the director and both are accountable to the GDTAE . One hundred and sixty-five (165) full-time ABSE teachers from 37 Service Delivery Areas and 157 counties in the state of Georgia were surveyed.

No directors participated because the study examined instructional use of computer technology. Directors, who do not typically teach, could only offer their perceptions about how instructors may be using computer technology. However, instructors were queried on issues that sometimes related to administrative domains. They were asked for their perceptions on the quality of hardware and software they were using and the quality of the technology support they were receiving, as these could be important predictor variables. They were also queried on how much of their time was devoted to administrative tasks.

While the above considerations were positive aspects of choosing a publicly funded, statewide sample, it also posed one small risk. My professional work with Georgia ABSE professionals was funded under a grant from the Georgia Department of Technical and Adult Education, the major funding source for the sample population and their respective institutions. Initially, there were concerns that this affiliation might produce response bias in favor of computer technology, which was the priority of the funding agent. However, because of the large degree of teacher-turnover, it was estimated that I presently had familiarity with roughly 45% to 50% of the current list of instructors. That reduction served to minimize the risk. Ultimately, the advantage of having a level of familiarity with some instructors would contribute to an improved response rate and that result outweighed any minimal risk of bias in responses.

Data Collection

Data collection took place in three stages. In the first mailed correspondence to instructors (see Appendix J), I defined the purpose of the study, the voluntary nature of participation, and the timeframe for data collection. Participants were encouraged to return their data within a two-week period. Those choosing not to participate were asked to write "NO" on the survey and return it in a self-addressed envelope. Participants marking the survey in this way did not receive additional requests for surveys. Those who did not return a blank survey or a completed survey received a postcard (see Appendix K) two weeks after the initial due date. The postcard requested that participants mail their surveys in the stamped, self-addressed envelope within two weeks. After the two-week period, non-respondents received a final full mailing. Table 8 depicts this procedure.

Table 8. Three Stages of Data Collection

	Stage	Content	
1	First Mailing	•	This consisted of the survey, the cover letter, the human subjects information form and a self-addressed, stamped envelope
2	Second Mailing	•	This consisted of a reminder postcard
3	Third Mailing	•	This consisted of a full mailing, including a reminder letter, the survey, the human subjects information form and a self-addressed, stamped envelope

As required by the Human Subjects Department of the University of Georgia, a Research Information Sheet (see Appendix L) was included with each survey to inform participants of the purpose of the study, the voluntary nature of participation, the minimal risk, the confidentiality of the data handling, and the intended uses of the research findings.

Of the 165 instructors surveyed, 117 mailed in responses for a raw return rate of 71%. Of those, five were returned with notes from the instructors stating that they had no computers in the classroom. Two respondents had completed all items except those related to computer use in the classroom. Of those two, one instructor had attached a note requesting two computers. One survey was blank with no attached note. In all, eight surveys were not usable and 109 were considered usable.

The fact that a number of the surveys contained missing item responses presented a challenge for a study that uses multiple regression or factor analysis. Specifically, both of those procedures use listwise deletion, whereby if a person is missing only one of the survey item responses, that individual drops out of the analysis. Rather than have a shifting *n* throughout the analysis, whereby one sample is described and analysis is calculated on another sample, a decision was made to reduce the sample from the response rate of 109 to a stable sample of 85. All procedures are based on that number which represented 52% if the total population of full time instructors.

Data Preparation

Initially, a codebook was developed to serve as a frame of reference for data entry. Each questionnaire was examined for possible inconsistencies and for inaccurate data entry. After inaccurately completed surveys were eliminated, raw data from correctly completed surveys was entered into the statistical software, SPSS 11.0.1, to collect summary information for all responses. Frequencies, means and standard deviations were calculated on the variable of central interest, *computer technology integration*, as well as on the predictor variables, *relative advantage, compatibility* and *technology resources*. Frequency, means and standard deviations were also calculated for the additional variables, background characteristics and *technology* resources.

Recoding Variables: Creation of scales. Several variables were recoded into scales. The recoded variables included *computer technology integration*, *compatibility, relative advantage*, and *technology* resources. In the section called additional analysis, the *Race* variable was recoded. This decision was made based on the fact that two categories of the variable, white and black, accounted for 94% of the respondents, while Asian and Hispanic accounted for only 3%.

Distribution and Reliability of Key Variables. Coefficient Alpha was calculated for the three predictor variables. Alphas ran from a high of .94 to a low of .81. Specifically, Coefficient Alphas ran in descending order as follows: .92 for *compatibility*; .94 for *relative advantage*; and .81 for *technology* resources. All key predictor variables exhibited significant internal consistencies. These are depicted in Table 9.

Table 9. Distribution and Reliability of Key Measures

Variable	Number of Items	Scale M	Scale SD	Mean Item Mean	Alpha
Independent Variables					
Compatibility	5	23.03	5.78	4.61	.92
Relative Advantage	12	51.57	12.70	4.30	.94
Technology Resources	5	11.87	14.27	4.76	.81

Description of Respondents

Table 10 describes the composition of the survey respondents. The average age of respondents was approximately fifty. Females represented 86% of the population, while 14% were males. Eighty percent of respondents were Caucasian, 14% were Black, two were Hispanic and one was Asian.

In terms of degree, most (59%) reported earning a Bachelor, and 34% reported earning a Masters. Four had Specialist Degrees and two had Doctorate Degrees. Seventy-two percent of the respondents represented rural Georgia, making this a highly rural study. This reflects the geographic parameters of the state, but not necessarily the population parameters. However, 18% of respondents were from urban locations, and 8% were teaching in suburban locations.

Table 10. Personal Characteristics of Study Respondents (n = 85)

Variable	Values	
AGE	Mean 49.9,	SD 9.85
GENDER		
Female	n = 73,	86%
Male	n = 12,	14%
RACE		
White	n = 68,	80%
Black	n = 12,	14%
Hispanic	n = 2,	2%
Asian	n = 1,	1%
DEGREE		
Bachelor	n = 50,	59%
Masters	n = 29,	34%
Specialist	n = 4,	5%
Doctorate	n = 2,	4%
LOCATION		
Rural	n = 61,	72%
Urban	n = 15,	18%
Suburban	n = 7,	8%

Table 11 depicts the work descriptors for respondents who were asked to report the percentage of time they performed specific tasks related to their ABSE position. Responsibilities in descending order included teaching (mean = 61.32), administration (mean = 22.56) and Program Planning (mean = 13.95). The average number of years teaching adult literacy was 8.8, and the average years teaching with computers was 7.7.

Respondents were asked to identify the subjects they taught by checking *yes* or *no* next to the name of the subject. The subjects taught in descending order included ESL (mean = 1.58); math (mean = 1.08, reading (mean = 1.06); and writing (mean = 1.06). Many instructors reported teaching other subjects (mean=1.98).

The category of adult literacy included three levels. Those levels and related means were as follows:

- Pre Literacy (mean = 1.16)
- ABSE Grades 2-8 (mean = 1.05)
- ABSE Grades 9-12 (mean = 1.07)

The category of English as a Second Language encompassed three levels. Those levels and related means were as follows:

- ESL Pre-Literacy (mean = 1.61)
- ESL Grades 2-8 (mean = 1.64)
- ESL Grades 9-12 (mean = 1.66)

Given a (yes) or (no) choice, respondents were also asked to report whether or not they had received training to use computer technology for instruction. The mean was 1.22.

Data Analysis

A variety of statistical procedures was used to analyze the data. Survey results were entered into the statistical software package SPSS 11.0.1. Statistical procedures were specific to each of the research questions.

Initially, a codebook was developed to serve as a frame of reference for data entry. Each questionnaire was examined for possible inconsistencies and for inaccurate data entry. After defective surveys were eliminated, raw data from accurately completed surveys was entered into the statistical software to collect

Table 11. Work Descriptors of Study Respondents (n = 85)

Variable	Values	
% WORK TIME	Mean 49.9,	SD 9.85
RESPONSIBILITIES		
Teaching	Mean 61.32,	SD 19.03
Program Planning	Mean 13.85,	SD 9.27
Administration	Mean 22.56,	SD 14.39
Other	Mean 9.57,	SD 6.78
YEARS TEACHING		
In Adult Basic Skills Education	Mean 8.79,	SD 6.45
With computers	Mean 7.86,	SD 4.74
SUBJECTS TAUGHT		
Reading	n = 80,	94%
Writing	n = 80,	94%
Math	n = 78,	92%
ESL	n = 36,	42%
LEVELS TAUGHT		
Pre Literacy	n = 71,	84%
ABE Grades 2-8	n = 81,	95%
ABE Grades 9-12	n = 79,	93%
ESL Pre-Literacy	n = 33,	39%
ESL Grades 2-8	n = 31,	37%
ESL Grades 9-12	n = 29,	34%
HAD TRAINING ON COMPUTER USE IN THE CLASSROOM	n = 63,	74%

summary information for all responses. Frequencies, means, and standard deviations were calculated on *background* and *training* variables as well as on the variables of central interest, *relative advantage*, *compatibility* and *technology resources*.

Research question #2 examined the impact of the predictor variables, *relative advantage, compatibility* and *technology resources* on the outcome variable, *computer technology integration*. It examined how the predictor variables separately predict the outcome variable. Simple regression analysis was used to determine whether or not the predictor variables explained observed variations in the outcome variable.

Research question #3 examined the impact of the predictor variables, *relative advantage, compatibility* and *technology* resources on the outcome variable, *computer technology integration*. It examined how the predictor variables jointly predicted the outcome variable. Multiple regression analyses were used to determine the extent to which the predictor variables jointly explained observed variations in the outcome variable.

Additional Predictor Variable

One additional variable was examined to determine its potential as a predictor variable. This was the *background* variable. Bivariate analysis was conducted on this measure.

Limitations

There are two limitations relevant to this study. First, although the sample represents the population of the full time teachers in the Georgia’s publicly funded programs, the findings are not necessarily generalizable to other ABSE programs. For instance, in Georgia, there are many teachers working in the private sector. Also teachers in other states may have dramatically different technology configurations. Therefore, any generalization beyond the described sample may not be reliable.

Second, although *compatibility* demonstrated its strong statistical predictive power in this study, a careful examination of two measures, *relative advantage* and *compatibility*, indicates that there may be some conceptual overlap, which could have resulted in a spuriously high correlation coefficient. Both limitations have implications for further research.

Findings Related to Research Question #2: Bivariate Relationships

Research question #2 required the determination of bivariate relationships between the predictor variables and the outcome variable, *computer technology integration*. Simple correlation analyses were used to calculate the relationship between the outcome variable, *computer technology integration* and each of the three predictor variables: *relative advantage, compatibility* and *technology resources*. Coefficients of determination were obtained by squaring the correlation coefficients to determine the proportion of variance in the outcome variable explained by each of the three predictor variables separately.

Of the three predictor variables, three were significantly related to *computer technology integration* as shown in Table 12. The correlation coefficients ranged from a low of .39 to a high of .78. The strongest explanatory variable was *compatibility*, which explained 61% of the observed variance in *computer technology integration*. The other statistically significant correlates, in the order of descending explanatory power were: *relative advantage*, explaining 37% and *technology resources*, explaining 15%. These scores indicate strong, positive associations between the predictor variables and the outcome variable, *computer technology integration*.

Findings Related to Research Question #3: Multivariate Relationships

Research question #3 examined how the predictor variables jointly explain the observed variance. This required R2 identification of the best model for

Table 12. Correlations of Predictor Variables with*Computer Technology Integration* (n = 85)

Predictor Variable	r	p<	r^2
Advantage	.61	.01	.37
Compatibility	.78	.01	.61
Technology Resources	.39	.01	.15

computer technology integration and involved two steps. The first step was to determine the degree of inter-correlation among the predictor variables using pairwise correlation analysis.

Two of the predictor variables, as measured in this study, were highly intercorrelated. Table 13 depicts these relationships. *Compatibility* and *relative advantage* shared the greatest degree of intercorrelation at 42%, while 18% of the inter-correlation was shared between *compatibility* and *technology* resources. The lowest inter-correlation, 5%, was shared between *relative advantage* and *technology resources*.

Table 13. Intercorrelations of Predictor Variables Using Pairwise Correlations

	r	p	r^2
Compatibility and *Relative Advantage*	.65	.01	.42
Compatibility and *Technology Resources*	.43	.01	.18
Relative Advantage and *Technology Resources*	.22	.01	.05

These levels of multicollinearity had possible implications in regard to the formulation of a prediction model for *computer technology integration*. Because of the high correlation between *relative advantage* and *compatibility*, it seemed unlikely that both variables would be represented in the explanatory model. However, it did seem that *technology resources*, which evidenced lower intercorrelations, might make it into the model. However, an additional analysis had to be run to determine whether those assumptions were valid.

Thus, a second step in examining Research question #3 was initiated. In this stage, a determination was made on how the predictor variables combined for maximum explanatory power. An ordinary least squares (OLS) regression analysis yielded three possible models. Each model was examined for two criteria. The predictor variable had to be statistically significant, and the model itself had to be statistically significant.

Once these criteria were established, the proportion of variance explained by each model was examined. Ultimately, the best explanatory model for predicting the outcome variable, *computer technology integration*, was the model with the highest R2 that also met the established criteria - statistical significance.

Three Variable predictor Model for *Computer Technology Integration*

Table 14 presents the three variable model in which the predictor variable, *compatibility*, explained 61% of the observed variance in the outcome variable, *computer technology integration*. *Relative advantage* added 17% to the observed variance in the outcome variable and *technology resources* added 16 % to the observed variance.

Table 14. Three Variable Predictor Model

Predictor Variable	Standardized Parameter Estimate	p
Compatibility	.61	<.001
Relative Advantage	.17	.088
Technology Resources	.16	.033

Note: Model Statistics: R^2 = .65: df = 3: F = 45.76: p = < .000

In this model, the predictor variables, *compatibility* and *technology resources* were statistically significant at the .001 and .05 level respectively. *Relative advantage* failed to achieve significance at the .05 level.

The Three Variable Model was significant at the .001 level, explaining 65% of the observed variance in *computer technology integration*. However, this model did not indicate a significant improvement over the individual parameter estimates reported in Table 12. In addition, one of the three predictor variables, *relative advantage*, failed to achieve significance at the .05 level. These two factors led us to explore another alternative, the two variable predictor models.

Two Variable Model for *Computer Technology Integration*

Stepwise Regression was used to determine the best two variable model explaining *computer technology integration*. As presented in Table 15, the predictor variable, *compatibility*, had a Beta weight of .73 , and *technology resources* had a Beta weight of .15.

In this model, the predictor variables, *compatibility* and *technology resources* were statistically significant at the .001 and .05 level respectively. The Two Variable Model was also significant at the .001 level, explaining 64% of the observed variance in *computer technology integration*.

Table 15: Two Variable Predictor Model

Predictor Variable	Beta	p
Compatbility	.73	<.000
Technology Resources	,15	.049

Note: Model Statistics: R^2 = .64: df = 2: F = 65.42: p = < .000

In summary, as I try to understand the best predictor model of *computer technology integration*, I am left with these three basic facts:

- A single predictor model, *compatibility*, explains 61% of the observed variance.
- A two variable model, *compatibility* and *technology resources* explains 64% of the observed variance.

- A three variable model, *compatibility*, *relative advantage*, and *technology resources*, explains 65% of the observed variance.

Additional Analysis

As a final stage in the analysis, I looked at the relationship between respondents' 11 *background* variables and the study's outcome variable, *computer technology integration*.

1. Age
2. Years Teaching in ABSE
3. Years Teaching with Computers
4. Highest Degree
5. Gender
6. Training with Computers
7. Race
8. Location
9. % Work involving Teaching Tasks
10. % Work involving Administrative Tasks
11. % Work involving Program Planning

Ultimately, each variable was examined using two criteria. The variable had to have a logical relationship to the outcome variable, and its measurement had to be appropriate for bivariate analysis. Of the 11 variables examined only one had any predictor power at all, and that was *Training*. Results indicated higher levels of *computer technology integration* in classrooms where instructors had been trained in the use of computer technology for instructional purposes. The *Training* variable correlated significantly with the outcome variable at the .001 level with a mean of 1.22.

CHAPTER 5

DISCUSSION AND IMPLICATIONS

The purpose of this study was to understand how computer technology integration is manifested in Adult Basic Skills Education (ABSE) classrooms. In order to accomplish this broad purpose, three research questions were posed.

1. How is *computer technology integration* best conceptualized and measured?
2. To what extent do perceived *relative advantage, compatibility*, and quality of *technology resources* separately explain the observed variance in *computer technology integration*?
3. To what extent do perceived *relative advantage, compatibility*, and quality of *technology resources* jointly explain the observed variance in *computer technology integration*?

Specifically, the study examined three predictor variables, instructors' perceptions of the *relative advantage* of using computer technology; their perceptions as to whether or not computer technology was *compatible* with their personal teaching style and their understanding of how adults learn; and their perceptions about the quality of their *technology resources*. One additional background variable was also examined for prediction power. This chapter will present a summary and discussion of the findings and present the possible implications for research, practice and policy. A table of the findings and related literature is included as Appendix M.

Summary and Discussion of Findings

Summary and Discussion of Findings on Computer Technology Integration. The first findings related to the very nature of *computer technology integration*. Using a Delphi approach to map the construct, I identified emergent themes that ultimately took the form of classroom characteristics and practices. Conceptually, a classroom in which these characteristics and practices were evidenced was a classroom in which *Computer Technology Integration* was evidenced. In all, four major characteristics surfaced. These included:

- *Seamlessness* – Easy movement between computers and other instruction
- *Learner-Appropriate* – Ability of learners to use the computer technology
- *Learner-Empowering* – Proactive use of computer technology by learners
- *Instructor-Facilitated* – Instructor management of learners' effective use of computers

Each of these aspects of *computer technology integration* was further defined in terms of 13 specific practices in ABSE classroom. Four practices were related to *seamlessness*; four were indicative of *learner-appropriateness*; two reflected *instructor-facilitated* and three related to *learner-empowering*. These practices are listed in Table 11 of Chapter 3.

In the process of developing this measure, I made two discoveries that held significant implications related to data analysis and subsequent findings. First, I found that the reliabilities for each aspect of the outcome variable were significantly high. Each of the aspects demonstrated internal consistency in its own right with coefficient alphas as follows: *seamlessness* = .85; *appropriateness* = .80; *Instructor-Facilitated* = .92; and *learner-empowering* = .88. These reliabilities indicated that I could examine each aspect of *computer technology integration* independently.

However, the second finding was that the coefficient alpha for total integration was even higher at .95. This seemed to indicate *computer technology integration* consisted of one measure that included four aspects. These conflicting findings required that I conduct additional analysis that would lead to a decision as to whether or not the outcome variable in this study should be treated as one measure or as multiple measures.

In this effort, I examined the four aspects and found that they indeed had significant intercorrelations ranging from.81 to .64. These intercorrelations are depicted in Table 7 of Chapter 3. On the surface, these high levels suggested that a single measure of *computer technology integration* might be most appropriate. However, further analysis was necessary and, as a third step, I conducted a factor analysis of the four aspects to determine whether or not the measure was multidimensional. Results produced a single variable containing 79% of the observed variance and none of the remaining components demonstrated an eigenvalue in excess of 1. This confirmed the decision to use a single dependent variable called *computer technology integration* which consisted of four components: *seamlessness, appropriateness, learner-empowering*, and *instructor-facilitated.*

Seamlessness refers to the easy movement between computer-based instruction and other forms of instruction. It involves open access to computer technology and promotes its use as a supplement to other instructional modalities. This aspect of integration is reflected in recent studies that suggest that the use of technology should be based on sound pedagogy and integrated into existing instruction for the purpose of enhancing content and the learning experience (Stites, 2003; Phillips and Kelly 2000; Ginsburg, 1999; Wagner 2001; Imel, 2001). These same studies emphasize that the focus of instruction should be on program goals and objectives rather than on the technology itself. McKenzie (2003), who studied the process of teachers adopting technology, uses the term “toolishness” to infer the “foolishness” of using technology for technology’s sake alone.

The characteristic of *appropriateness* holds that computer content should match learners’ abilities, from a technical, academic and cultural perspective. It also contends that technology should address the needs of individuals with physical and learning disabilities. Stites (2003) identifies several barriers to technology integration. These barriers include the lack of on-line materials that meet the literacy levels of ABSE students and the lack of equitable, universal access. Imel (2001) notes that the design of technology itself has social, political, and cultural implications that impact the learning environment, creating a technology- driven pedagogy rather than a learner-driven one. Wagner (2003, p. 63) states that, “Projects within the digital divide must first and foremost be about learning, and about culturally appropriate content. “He stresses need for content to address issues relevant to improving the lives of participants.

The aspect of *learner-empowering* advocates that the learner is proactive in the use of technology for goal achievement. Proactive involvement involves the learner’s ability to work independently as well as collaboratively. It also indicates that the leaner should be able to choose from a wide range of learning materials available through computer technology. This aspect of *computer technology integration* is echoed in the work of researchers and practitioners who stress the need for proactive participation of the learner in technology-related activities (Imel, 1998; Cowels, 1997; Stites, 2003; Kozma & Wagner 2003). These studies also stress the importance of computer technology use that supports both independent and interdependent learning environments.

The notion of technology being *instructor-facilitated* recognizes the responsibility of instructors to guide the learner’s effective use of computer technology and to provide them with feedback regarding progress toward their learning goals. The role of the instructor is emphasized in a recent participatory research study that examined the connection between learning and technology (Daley, Watkins, Williams, Courtenay, Davis and Dynmock, 2001). This study found that variations in learning with technology were largely attributed to the learner's attitudes and perceptions of the technology itself. Findings suggest that instructors need to structure technology-enhanced learning environments with careful attention to the development of learning tasks that foster positive attitudes among learners. Similarly, Imel (1998) emphasizes that the use of technology requires a learning environment that assures the attainment of instructional and learner goals and that the impetus for the effective use of technology rests primarily on the instructor. Stites (2003) records the need for frequent interaction and feedback between teachers and learners, and McKenzie (2003) suggests that it is essential for teachers to manage the myriad of leaning activities inherent in technology-enriched environments.

Summary and Discussion of Findings on Bivariate Relationships with Computer Technology Integration. Bivariate relationships among the three predictor variables were examined in this phase of the research. Simple correlation analyses were used to calculate the relationship between the outcome variable, *computer technology integration* and each of the three predictor variables: *relative advantage, compatibility* and *technology resources*. Of the three predictor variables, three were significantly related to *computer technology integration* as shown in Table 12 of Chapter 4. The correlation coefficients ranged from a low of .39 to a high of .78.

By far, the most significant finding in this study was that we had a sizeable predictor, *compatibility*, which explained 61% of the total observed variance in the outcome variable, *computer technology integration*. The other statistically significant correlates, in the order of descending explanatory power were: *relative advantage*, explaining 37% and *technology resources*, explaining 15%. These scores indicated strong, positive associations between all predictor variables and the outcome variable, *computer technology integration*.

However the significantly high correlation between *compatibility* and the outcome variable caused me to reexamine each theoretical measure to establish whether or not each was independent from the other. This examination produced mixed results. On the surface level, each variable was indeed distinct. The first construct, *compatibility*, dealt entirely with instructors' pedagogical preferences and classroom behaviors. The second, *relative advantage*, focused only on instructors' perceptions of whether or not computer technology facilitated the attainment of program objectives and outcomes as they specifically related to ABSE.

There was no apparent construct overlap. However, the argument exists that because both measures related to instructional practices, some level of correlation could be expected. Furthermore, because the instructors have the power to control much of what goes on in the classroom, I could posit that these variables might be causal.

Summary and Discussion of Findings on Multivariate Relationships with computer technology integration. This phase of the study required the identification of the best model of *computer technology integration*. First, I examined intercorrelations between the predictor variables. Two were highly intercorrelated. *Compatibility* and *relative advantage* shared the greatest degree of intercorrelation at 42%, while 18% of the inter-correlation was shared between *compatibility* and *technology resources*. The lowest inter-correlation, 5%, was shared between *relative advantage* and *technology resources*. These are depicted in Chapter 4, Table 13.

Next, I tried to determine how the predictor variables combined for maximum explanatory power. An ordinary least squares (OLS) regression analysis yielded three possible models: a one variable model, a two variable model, and a three variable model. I examined each model for the greatest R2 and for statistical significance.

In summary, as I tried to understand the best predictor model of *computer technology integration*, I was left with these three basic facts as depicted in Table 16:

- A single predictor model, *compatibility*, explained 61% of the observed variance.
- A two variable model, *compatibility* and *technology resources* explained 64% of the observed variance.
- A three variable model, *compatibility, relative advantage,* and *technology resources*, explained 65% of the observed variance.

Table 16. Three Best Models

Model	Predictor	Proportion of Variance Explained
Best 1 Variable	• *Compatibility*	$r^2 = .61$
Best 2 Variable	• *Compatibility* • *Technology Resources*	$R^2 = .64$
Best 3 Variable	• *Technology Resources* • *Compatibility* • *Relative Advantage*	$R^2 = .65$

In reality, there was little to be gained, in moving beyond *compatibility* as the major predictor of *computer technology integration*. A three variable model did indeed add significant variance, but it was small, explaining 65% rather than 64% of observed variance in the outcome variable. By any standard of parsimony, it did not seem justifiable to use the three variable model to explain *computer technology integration* in ABSE.

Ultimately, using the research questions and sample related to this study, I seemed that where *compatibility* exists, *computer technology integration* also exists. At least, in this study, *compatibility* is a powerful predictor. Therefore, if this research is purely about prediction, the findings indicate that if a teacher's *compatibility* level is known, his or her ability to effectively integrate computer technology will also be known.

The aspect of *compatibility* is evident in Selwyn's (2003) study on information and communication technologies (ICTs) in adult education. He found that pedagogical viewpoints had significant impact on instructors' use of technology-based education. He noted that educators often perceive computer technology as a one-way transmission of knowledge rather than a transformative educational process. Adult educators who embrace education as a participatory, transformative activity may find computer technology less appealing than others who view education as the transfer of knowledge from the instructor to the learner.

Similarly, instructors' beliefs about the process of knowledge creation are also critical to the issue of compatibility (Imel, 2001; Askov, Johnson, Petty & Young, 2003; Dirkx and Taylor, 2001). Those who adopt a viewpoint of knowledge construction as skill acquisition may find the use of computer technology *compatible*. On the other hand, constructivists, who believe knowledge acquisition requires the manipulation of that knowledge in real-world situations and the validation of new knowledge thorough social negotiation (Cunningham, 1993) may find that the use of computer technology is hardly intuitive.

Perhaps Burge and Roberts (1993, p. 35) best captured this notion of *compatibility* in the following statement sited in Imel's (1998) work: "Technology use will reflect whatever values the educator holds--consciously or subconsciously--about her/his relationship with learners, and their use will invariably bring advantages and disadvantages" (Burge and Roberts 1993, p. 35).

Summary and Discussion of Findings on the Relationship of the Additional Variable and Computer Technology Integration. In addition to the variables of *relative advantage, compatibility*, and *technology resources*, one variable was explored to determine its potential as a predictor. The *background* variable, encompassed 11 factors, however, only one of these, *training*, yielded. Results indicated higher levels of *computer technology integration* in classrooms where instructors had been trained in the use of computer technology for instructional purposes. The *training* variable correlated significantly with the outcome variable at the .001 level.

Somewhat surprisingly, none of the other ten background characteristics predicted levels of *computer technology integration*. Only *training* yielded significance. Individuals who have been involved in professional development can feel some sense of satisfaction from the fact that instructors who have been trained in the use of computers for instruction have classrooms in which higher levels of *computer technology integration* are evidenced. Shohet (2001) also notes the need for staff development and stresses that the nature of such training should be long-term. McKenzie (2003) notes the importance of training that emphasizes how to blend curriculum objectives and technology rather than training that focus only on computer software. Additional studies express a definitive need for more research related to methods of effectively training educators in the use of technology for educational purposes (Stites, 2003; Leiberman, 1999; McKenzie, 2003).

While research supports the need for professional development as it relates to technology use, it is important to note that the training measurement in this study was somewhat limited. Only one question was asked, “Have you had training in using computers to teach at any level?” Further probing could tell us if there is causality between training and other variables. While we know that instructors who have training are more likely to use computers in an integrated manner, additional questioning might find this is true because instructors who value computer technology are those who seek training. In this study, however, no definitive direction could be identified.

Implications

The implications of this study for Adult Basic Skills Education relate to three areas: Practice, Policy and Research.

Implications for Practice. This study provides an evaluation tool by which *computer technology integration* can be measured using the standards of *seamlessness*, *appropriateness*, *learner-empowering* and *instructor-facilitate*d. Each of these four characteristics identified in the Delphi study can be evidenced in terms of the classroom practices listed in Table 11 of Chapter 3. Using this as a standard, a classroom can be evaluated to determine if computers are being used in an integrated manner. The characteristics provide a measure other then the amount of equipment in the classroom and the percentage of time computers are being used. Stites (2003) conducted a meta-analyses of K-12 research on new technologies and learning. He identified findings that apply to adult literacy and technology. Many of these findings correspond to the practices identified in this study.

Two of the aspects of *computer technology integration* specifically lend themselves to planning for and placing computers and related peripherals in ABSE classrooms. The aspect of *seamlessness* suggests that the placement of computers and related technology be such that students and teachers have as-needed access to technology. They should not have to wait to go to a lab setting or to use limited computer resources within the classroom. Also, the placement of equipment should be such that student can comfortably interact for curriculum objectives that are group orientated or project-based.

The aspect of appropriateness suggests that the software and computer programs purchased be appropriate to the background and experience of the learner. This would involve a clear assessment of learner needs and abilities by knowledgeable experts. It would also involve expertise for the purchase of assistive technologies that are appropriate for students with both physical and learning disabilities.

Perhaps the most significant finding that relates to planning is the need to work with instructors in an effort to understand what they believe about how adults learn and to align the use of computer technology with those beliefs. This means establishing an understanding of how technology will enhance their efforts to achieve program and student goals and objectives.

Similarly, two of the aspects of *computer technology integration* specifically lend themselves to the planning of staff development for instructors who will use the technology. The aspect of computer technology being *instructor-facilitated* requires training that focuses on guiding students in the use of technology that is expressly directed toward the achievement of learner and program objectives and outcomes. It also requires training in how provide timely feedback to student using computer technology.

The aspect of computer use being *learner-empowering* involves teacher training in how to encourage learners to be proactive in using computer technology for learning. This means equipping students to use the rich resources available through computer technology and involving them in both collaborative and independent learning modalities.

Finally, the significance of providing quality *technology resources* is critical to project planning. It stands to reason that teachers who have adequate support for computer technology will be more able to effectively use them. Numerous studies (Shohet 2001; Stites, 2003; Wagner 2003; Ginsburg, 1999; Selwyn's 2003; McKenzie 2003) stress the importance of a solid technological infrastructure and equally solid support for those infrastructures.

Implications for Policy. This model has implications for policy in ABSE. The current focus on evidence-based strategies for and evaluation of the achievement of ABSE goals and objectives stand to benefit from the application of this model. For example, the Workforce Investment Act (http://www.nifl.gov/nifl/policy/updates/02_07_19.html) requires that programs establish "... a targeted approach to serving youth; and improving performance accountability." This research can serve to set the framework in which such an approach is structured.

Proposed funding for National Leadership Activities to support research, (http://www.nifl.gov/nifl/policy/updates/02_07_19.html) demonstration, and evaluation projects administered by the Office of Vocational and Adult Education could benefit from this research also. It would be valuable to understand the relationships among the four aspects of *computer technology integration* and various methodological preferences. It would also be interesting to know if one aspect of *computer technology integration* can exist independently of the others or if they are mutually inclusive.

The National Institute for Literacy "… supports capacity building, communication, and policy analysis activities in support of the goal that all Americans will be literate and able to succeed at work, home, and in their communities." In this study, I used the outcomes identified by the National Institute for Literacy (Stein, 1997) to measure the construct of *relative advantage* (see Chapter 3, Table 3). The positive correlations between *relative advantage* and *computer technology integration* indicate the potential for computer technology to address the goals of the institute specifically, and literacy efforts in general.

Lastly, this study has strong implications for Community Technology Centers (CTCs) that receive funding to " …. provide opportunities for low-income children, youth, and adults to learn vital computer literacy skills in their communities." Creating learning activities that are appropriate for the varying interest and technology levels of the community, empowering citizens through technology and creating a seamless technology environment within the community setting are primary to the focus of the CTCs.

Implications for Research. This study has several implications for research. The first implication involves the use of the measure for *computer technology integration*. Since the attributes and their associated practices identified in this study were derived from a panel of experts, they have not been studied in depth in actual ABSE classrooms. It would be valuable to understand the relationships between the four aspects of *computer technology integration* and various methodological preferences. For example, how do the four aspects correlate with one-on-one tutorial type instruction as opposed to group instruction? How do they correlate with instruction that involves project-based learning as opposed to those using skills-based learning? Are they more prevalent in adult basic education classrooms, in GED classrooms, or in English as Second Language classrooms? What will these correlations imply?

In terms of inclusively, it would be interesting to know if one aspect of *computer technology integration* can exist independently of the others or if they are mutually inclusive. If they are present separately, which is more likely to be found, under what circumstances and why. If they are mutually inclusive, is one aspect present to a greater extent than others, in what environments, and with what outcome.

In terms of evidence-based research, are classrooms that exhibit these four aspects more effective in reaching participants' goals and program outcomes than more traditional classroom environments? In this study, I used the outcomes identified by the National Institute for Literacy (Stein, 1997) to measure the construct of *relative advantage* (see Chapter 3, Table 3). Future research could use those same measures to determine whether or not classrooms that integrate computer technology are more successful than others in achieving stated outcomes.

The second implication involves *compatibilit*y as a predictor of *computer technology integration*. Although *compatibility* demonstrated its strong statistical predictive power in this study, a careful examination of two measures, *relative advantage* and *compatibility*, indicates that there is some conceptual overlap, which could have resulted in a spuriously high correlation coefficient.

Specifically, both of the measures focused on teaching with technology. In future studies, additional analyses should be conducted to determine whether or not these two measures are independent or whether changes could be made to the instrumentation which would allow for independent measurement.

The third implication involves training. Since this study posed only one question regarding training, further research is needed to identify the relationship on a deeper level. A qualitative study might provide a more comprehensive examination that would determine how teachers are currently using computer technology in their classrooms and how that relates to their previous training experiences. The study might also seek to understand the extent to which instructors are self-taught and to what extent are they formerly trained. Correlations between *computer technology integration* and these types of training may yield information that would impact practice in ABSE.

The fourth implication involves the findings on the quality of *technology resources* available to instructors. Further research on which types of programs are more likely to provide quality *technology resources* could inform policy in terms of funding, legislation, and implementation. Are the best technology resources found in ABSE programs associated with technical or community colleges? Are they found most often in programs located in urban or suburban areas? Do programs with better levels of technology resources have more successful outcomes in relation to literacy and numeracy gains, employment, or inclusion in a largely technological society?

Improving Technology integration in Adult Basic Skills Classrooms

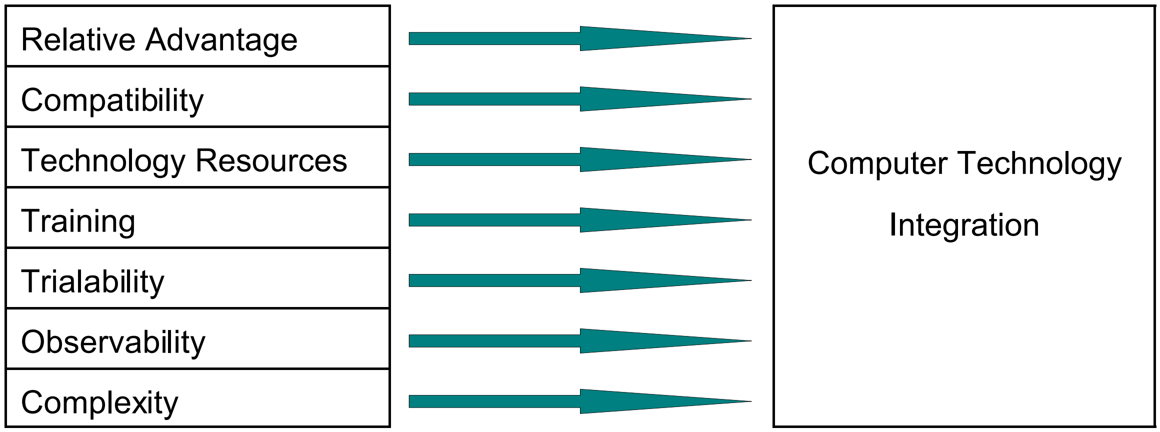
In this study, I have conceptualized *computer technology integration* and measured its predictors. Findings indicate that all three variables are indeed predictors. However, the implications of the study suggest that the resultant framework may be incomplete. There are two notable areas that could contribute to the creation of a fuller model. The first would be the insertion of the three omitted characteristics of Rogers' diffusion of innovation theory: *complexity, trialability* and *observability*. In the least, I have to wonder how *complexity*, which has been a longstanding predictor of adoption of technology, would have added to the current framework. The development of valid measures for these variables would greatly advance our understanding of the *computer technology integration*.

Training is another variable of interest. In the current study, training was a significant predictor. However, there was only one item measuring this predictor, and it was designed to assess a broad dimension of the *training* background of survey respondents. As a single item measure it dealt with computer training that was not specifically delineated enough to capture the richer aspects of training and its impact on participants . Therefore the measure was neither reliable, nor valid in the sense of measuring these deeper aspects of *training*. A more complete measure of *training* and its role would be important. Figure 3 depicts a more robust framework in which each of these predictor are included.

However, if our core finding is true, and *compatibility* is indeed the principal predictor, then an important question is raised: Can *compatibility* be changed through training? *Compatibility* is really a variable that involves the alignment of technology use with preferences and beliefs about practice. Seemingly, if you bring these into tighter alignment through training, one of two things would have to happen. The training could be designed to alter instructors'

Figure 3 depicts the more robust framework described above.

Figure 3: Fuller Model of Measurement Framework



beliefs about pedagogy. This outcome, however, may very well be undesirable for two reasons. It places the focus on technology rather than sound pedagogy. Second, it would be imposing values that might differ from those of the training participants, and this could have a negative effect on their levels of *compatibility*.

However, a more promising notion would be to embrace and respect instructors' beliefs about what constitutes good instruction and what they believe about adult learning. From that point of understanding, training could be used to explore ways in which both new and existing technologies can be used to advance instructors' beliefs.

Part of the resistance to technology evidenced in some educational environments could be attributed to the fact that instructors lack an awareness of their options in using technology. Training that centers on the instructor rather than on the technology, may facilitate instructor appreciation and adoption of technology. This holds great promise for increasing *compatibility*, because *compatibility* is about instructors – not training or technology. The more instructors learn about the capability, flexibility and adaptability of computer technology, the more they could realize that they can use it to advance many of their pedagogical preferences.

It is conceivable that levels of *compatibility* increase as instructors recognized that they can manipulate the technology to better reflect their core values, and that they can make the technology adapt to their instructional needs. That is a factor that might increase their *compatibility* level and have a direct impact on levels of *computer technology integration*. Whether they are constructivists or instructivists, they can learn to choose computer technology that “fits”; computer technology that enhances instruction; computer technology that is compatible with their own biases and belief systems.

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APPENDIX A

FINAL INSTRUMENT

APPENDIX A
FINAL INSTRUMENT
(Reduced Size Facsimile)

1 7 8 5

The University of Georgia
College of Education
School of Leadership and Lifelong Learning
Department of Adult Education

Dear Literacy Colleague,

In recent years, educators have been encouraged to integrate computer technology into instruction. However, despite the opinions of experts and policy makers, it is ultimately up to you, the instructor, who is in the best position to determine how to use computer technology in your classroom.

Although there have been numerous studies on technology integration in the K-12 system, few have examined it in adult literacy classrooms. Therefore, we are coming to you, the full-time adult literacy teachers of Georgia, to find out how you view the use of computers in the classroom. Data will be analyzed at The University of Georgia, and findings will help establish a realistic understanding of educators' beliefs and practices regarding computer use in ALE.

Three questions guide this study. Is computer use in the classroom compatible with what you believe about teaching adults? Is computer use effective in achieving the goals and objectives of your students and program? What does technology integration actually look like in terms of how educators use computers in real classrooms to teach real content to real adult learners?

We know that time is a valuable and scarce resource, especially for ALE instructors, so we have made every atempt to keep data collection to an absolute minimum in terms of time. It will take approximately 10 minutes to complete the enclosed survey. Your answers are completely confidential. Only the researchers will handle the surveys, and individual names will not be reported in the findings. An executive summary of the findings will be available for all participants upon request.

To assist us with this study, please do the following:
- Read the enclosed "RESEARCH INFORMATION SHEET."
- Complete the attached survey.
- Place the completed survey in the stamped, self-addressed envelope.
- Mail it back by January 14, 2002.

Your opinions are very important to us, and we hope you will agree to work with us on this study.

Sincerely,

Elizabeth Dillon-Marble (Formerly: Elizabeth Dillon Black)
Survey Coordinator
The University of Georgia

Thomas Valentine
Associate Professor
The University of Georgia

Research at The University of Georgia which involves human participants is overseen by the Institutional Review Board. Questions or problems regarding your rights as a participant should be addressed to Institutional Review Board; Office of V.P. for Research: The University of Georgia; 606A/Graduate Studies Research Center; Athens, Georgia 30602-7411; Telephone (706) 542-6514.

APPENDIX A
FINAL INSTRUMENT (Continued)

1785
The University of Georgia
College of Education
School of Leadership and Lifelong Learning
Department of Adult Education

TECHNOLOGY INTEGRATION STUDY

Research Information Sheet

We are conducting a study about computer technology integration in adult education classrooms to better understand what technology integration looks like in adult literacy environments. The study is being conducted by Elizabeth Dillon-Marble and Dr. Thomas Valentine form The University of Georgia, Department of Adult Education.

Your participation in this study is strictly voluntary. If you agree to participate, you will complete a questionnarie that should take no more than 15 minutes. We hope that you will choose to return a completed questionnaire; however, if you choose not to participate, let us know that you want no further correspondence regarding this study, by simply writing "NO" on the first page of the survey. Then place it inside the self-addressed envelope, and drop it in the mail

If you choose to participate, you will be one of many people in the state completing this questionnaire. We promise strict confidentiality in this study. Each questionnaire contains a code number on the back so we can send up to reminders to participants who have not returned the questionnaire. As soon as the research is complete, code numbers linking participants will be destroyed. Only the researchers will handle the surveys, and individual names will not be reported in the findings. The executive summary will be available to all participants upon request.

We do not foresee this study causing you any harm or discomfort. You are free to decline to participate at any time. If you have any questions about this research, now or in the future, feel free to contact Elizabeth Dillon-Marble at 404-894-9087 / lizdillonmarble@yahoo.com or Dr. Thomas Valentine at 706-542-2214. We can be reached by mail c/o The Department of Adult Education at 407 River's Crossing, The University of Georgia, Athens, GA 30602.

Please note: Completion and return of this questionnaire implies that you have read this information and consent to participate in the research.

Thank you for your help with this important research.

For questions or problems that may arise during this study, please call or write: Chris A. Joseph, Ph.D., Human Subjects Office, The University of Georgia, 606A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone No. (706) 542-6514; E-Mail Address: IRB@uga.edu.

APPENDIX A
FINAL INSTRUMENT (Continued)

Computer Technology Integration Questionnaire

People often talk about computer technology in adult literacy education (ALE). However, we have very little data to let us know what is really going on. This questionnaire asks about what is happening in your classroom. Please be completely frank. Your answers are strictly confidential and will provide a realistic understanding of how computers are actually used in adult literacy classrooms.

SECTION 1: HOW COMPUTER TECHNOLOGY IS USED IN YOUR CLASSROOM
Circle the number that best describes the extent to which you agree with the following items.

	Strongly Disagree			↔	Strongly Agree	
1. In my classroom, computer use is combined with other learning activities such as lecture, discussion, and use of workbooks.	1	2	3	4	5	6
2. In my classroom, the software used is appropriate for the learners.	1	2	3	4	5	6
3. In my classroom, I make sure that all computers work properly.	1	2	3	4	5	6
4. In my classroom, I help learners use computers to reach the goals and objectives of the program.	1	2	3	4	5	6
5. In my classroom, learners can decide to use computers without asking my permission.	1	2	3	4	5	6
6. In my classroom, the levels of computer technology match learners' technology skills.	1	2	3	4	5	6
7. In my classroom, learners sometimes use computers to work independently.	1	2	3	4	5	6
8. In my classroom, leaners are never expected to use computer technology they don't understand.	1	2	3	4	5	6
9. In my classroom, computers are often used as part of a larger learning session.	1	2	3	4	5	6
10. In my classroom, learners sometimes use computers to enhance their decision-making.	1	2	3	4	5	6
11. In my classroom, I help learners solve problems they encounter when using computers.	1	2	3	4	5	6

12. In my classroom, I actively guide the use of computers to meet learners' personal goals.	1	2	3	4	5	6
13. In my classroom, learners use computers to access materials that address their roles as family members, workers, and citizens.	1	2	3	4	5	6
14. In my classroom, there is movement back and forth between computer use and other learning activities.	1	2	3	4	5	6
15. In my classroom, learners use computers to learn more about the society in which they live.	1	2	3	4	5	6
16. In my classroom, there is each movement between the use of computers and other learning activities.	1	2	3	4	5	6
17. In my classroom, when learners want to use computers, I usually find ways to accommodate them.	1	2	3	4	5	6
18. In my classroom, learners feel empowered when they use computers.	1	2	3	4	5	6
19. In my classroom, computer technology can be accessed as easily as paper, pencils, books, and other educational resources.	1	2	3	4	5	6
20. In my classroom, learners sometimes use computers to engage in problem-solving activities.	1	2	3	4	5	6
21. In my classroom, the computer technology used is suitable for learners with different languages, cultures, and socioeconomic backgrounds.	1	2	3	4	5	6
22. In my classroom, I make sure learners are using computers properly.	1	2	3	4	5	6
23. In my classroom, learners gain self-confidence through the use of computer technology.	1	2	3	4	5	6
24. In my classroom, learners sometimes decide when it is appropriate to use computers.	1	2	3	4	5	6
25. In my classroom, I provide feedback to learners who use computers.	1	2	3	4	5	6
26. In my classroom, learners strengthen their higher level thinking skills through the use of computers.	1	2	3	4	5	6
27. In my classroom, the computer hardware is appropriate for learners.	1	2	3	4	5	6
28. In my classroom, accommodations are made for computer use by learners with special needs (including visual, hearing, cognitive, and mobility impairments).	1	2	3	4	5	6
29. In my classroom, learners are comfortable using computers.	1	2	3	4	5	6
30. In my classroom, learners sometimes use computer technology to engage in creative activities.	1	2	3	4	5	6

31. In my classroom, I plan activities using a range of materials available through computer technolgy.	1	2	3	4	5	6

SECTION II: YOUR PERSONAL BELIEFS ABOUT COMPUTER USE IN THE CLASSROOM
Circle the number that best describes the extent to which you agree with the following statements about computer use in the classroom.

	Strongly Disagree		↔			Strongly Agree
32. Teaching with computers is compatible with my beliefs about how adults learn.	1	2	3	4	5	6
33. Teaching with computers is compatible with my instructional approach.	1	2	3	4	5	6
34. Teaching with computers is compatible my socio-cultural values.	1	2	3	4	5	6
35. Teaching with computers fits into the way I prepare for class.	1	2	3	4	5	6
36. Teaching with computers is compatible with the way I have always taught.	1	2	3	4	5	6
37. Teaching with computers has become a necessity in my classroom.	1	2	3	4	5	6
38. Teaching with computers is something I enjoy.	1	2	3	4	5	6
39. When learners use computers, they have better access to information.	1	2	3	4	5	6
40. When learners use computers, they can make more informed personal choices.	1	2	3	4	5	6
41. When learners use computers, they have better opportunities to keep up with the world as it changes.	1	2	3	4	5	6
42. When learners use computers, they have more opportunities to voice their opinions.	1	2	3	4	5	6
43. When learners use computers, there is a better chance that their voice will be heard.	1	2	3	4	5	6
44. When learners use computers, their ideas can better influence important decisions.	1	2	3	4	5	6
45. When learners use computers, they have better opportunities to engage in problem-solving.	1	2	3	4	5	6
46. When learners use computers, they have better opportunities for independent decision-making.	1	2	3	4	5	6
47. When learners use computers, they have better opportunities to engage in independent action.	1	2	3	4	5	6
48. When learners use computers, they have better opportunities to learn how to learn.	1	2	3	4	5	6

SECTION III: RATING YOUR COMPUTER TECHNOLOGY
Please rate each of the following aspects of computer use in your classroom(s).

	Poor		↔			Excellent
49. Quality of hardware.	1	2	3	4	5	6
50. Quality of software.	1	2	3	4	5	6
51. Quality of technology support.	1	2	3	4	5	6

SECTION IV: BACKGROUND - This information will be totally confidential.

52. Which of the following best describes the location of your program?
☐Rural ☐Urban ☐Suburban

53. Which subjects do you teach? (Check all that apply)
☐Reading ☐Writing ☐Math ☐ESL ☐Others (specify)________________

54. What level students do you teach? (Check all that apply)

☐Literacy (1A-Pre Literacy)
☐English Language Program Literacy (1A/Pre Literacy)

☐Adult Basic Education (ABE) (1B-2/Grades 2-8)
☐English Language Program Literacy (ABE) (1B-2/Grades -8)

☐Adult Secondary Education (ASE) (3A-3B/Grades 9-12)
☐English Language Program Literacy (ASE) (3A-3B/Grades 9-12)

55. What is the highest degree you have completed?
☐H.S. ☐Associates ☐Bachelor ☐Master's ☐Other (specify)___________

56. How many years have you been teaching basic skills to adults?_______________________

57. How many years have you been using computers when you teach (at any level)?__________

58. What is your gender?____

59. What is your race/ethnicity?____

60. What year were you born?____

61. Have you had training in using computers to teach at any level? ☐Yes ☐No

62. What percent of your total work responsibilities are represented in the following activities? Make sure your figures add up to 100%.

Teaching____________________% Administrative Tasks____________________%

Program Planning____________% Other (Specify)____________ ____________%

Thank you for your participation

APPENDIX B

NATIONAL EXPERTS

APPENDIX B

DELPHI PANEL OF EXPERTS

Claudia Bredemus:	Director: Hubbs Center for Lifelong Learning 1030 University Avenue Saint Paul, MN 55104
David Collings:	Project Manager: Public Broadcasting System The Literacy Information aNd Communication System: LiteracyLink U.S. Department of Education: Star Schools Project Washington, D.C.
John Fleischman:	Executive Director: The Outreach and Technical Assistance Network The Adult Education Office, California Department of Education Sacramento, CA 95827-3399
Dr. Lynda Ginsburg:	Senior Researcher/Project Director Graduate School of Education: National Center on Adult Literacy University of Pennsylvania Philadelphia, PA 19104-3111
William Hawk:	Director of Web Design: National Institute for Literacy The Literacy Information aNd Communication System: Literacy LINCS U.S. Department of Education: Star Schools Project Washington, D.C.
Dougie Taylor:	Professional Development & Certification Coordinator Equipped for the Future National Center 5766 Shibles Hall Orono, ME 04469-5766
Dr. David J. Rosen:	Director: The Adult Literacy Resource Institute The Greater Boston Regional Support Center of the Massachusetts System for Adult Basic Education Support. Boston, MA 02215
Tim Ponder:	Chairperson: Adult Literacy and Technology Network The Literacy Information aNd Communication System: Midwest LINCS The Ohio Literacy Resource Center Kent State University Kent, Ohio 44242-0001
Linda Shohet:	Director: Center for Literacy of Quebec/Le center d'alphabetisation du Quebec Dawson College Montreal, Quebec, Canada H3Z 1A4
Dr. Richard Sparks:	Department Chair: College of Technology Director of Statewide Projects Idaho State University Pocatello ID 83209
Dr. Mary Ziegler:	Director: Center for Literacy College of Education: Educational Psychology Department University of Tennessee Knoxville, TN 37966

APPENDIX C

DELPHI LETTER OF INTENT

APPENDIX C
DELPHI LETTER OF INTENT
(Reduced Size Faxsimile)

1785

College of Education
School of Leadership and Lifelong Learning
Department of Adult Education

Elizabeth Dillon-Marble
Georgia Institute of Technology
490 Tenth Street, NW
Atlanta, GA 30332-0156

Dear Participant,

As you well know, computers are becoming increasingly important in adult literacy education. However, the way in which computers are used is inconsistent across pedagogical environments. Many of us talk about the integration of computer technology as an ideal, but do we know exactly what that means? The more I examine the concept of ideal integration, the more I'm inclined to think there is no general agreement as to what that concept means. Therefore, as a first step in my dissertation work at The University of Georgia, I am wrestling to operationalize that concept.

My full study, Predictors of computer technology integration in adult literacy education, examines how teachers are integrating computer technology in adult literacy classrooms. As a first step, I'm asking you to be apart of an expert panel to help me refine this concept and validate the measurement. I really believe this plan will allow me to capture the best wisdom from the field and then put it to work.

What I'm designing is a 3-part study, none of which should prove too onerous. Participation is strictly voluntary, you are free to withdrawal at any time, and confidentiality is guaranteed. I am aware that time is a valuable and scarce resource. With that understanding, I have made every attempt to keep the data collection process to an absolute minimum in terms of time. The research will consist of three activities.

Participate in a 15 to 30 minute audio tape telephone interview on your notion of computer technology integration and, more generally, the ideal use of computer technology in adult literacy classrooms.

Participate in a 15 minute follow-up interview on your reaction to the accuracy of a brief concept paper describing what computer technology integration is an isn't, based on interviews with experts.

Rate the importance of a series of potential survey items measuring ideal computer technology integration as derived from the follow-up interviews. This process should take no more than ten to fifteen minutes.

I know how busy you are but an hopeful that you'll agree to lend your expertise to this research effort. I'll be calling shortly to ask if you are willing to participate. The data will be analyzed at The University of Georgia, and I am hopeful that the findings will be relevant to your work. I will be happy to provide you with an executive summary of the study, which will hopefully paint a realistic portrait of technology integration as practiced by adult basic education professionals. Thank you for your valuable contribution to this study. All questions and comments can be directed to Liz Dillon-Black at 404-894-9087 or liz.black@arch.gatech.edu.

Sincerely,

____
Elizabeth Dillon Black
Survey Coordinator

____
Dr. Thomas Valentine
University of Georgia
Faculty Advisor

> Research at The University of Georgia, which involves human participants, is overseen by the Institutional Review Board. Questions or problems regarding your rights as a participant should be addressed to Institutional Review Board; Office of V.P. for Research: The University of Georgia; 606A/Graduate Studies Research Center; Athens, Georgia 30602-7411; Telephone (706) 542-6514.

APPENDIX D

DELPHI LETTER #2: MEASUREMENT FRAMEWORK

APPENDIX D
DELPHI LETTER #2: MEASURE FRAMEWORK
(Reduced Size Facsimile)

1785

College of Education
School of Leadership and Lifelong Learning
Department of Adult Education

April 20, 2002

Dear Colleagues:

As you will recall, I am in the process of completing a dissertation about technology integration. As a part of that effort, I've set out to develop an expert-based theory of technology integration in adult literacy education.

In Stage 1, I interviewed you and ten other national experts about technology integration, asking questions like, "Ideally, what does technology integration look like in an adult literacy classroom?" I have studied the transcripts of those interviews and crafted my first formulation (See attached document: Toward a Theory of Technology Integration in Adult Literacy Classrooms). My "theory" at this point consists of four characteristics, each with a short list of indicators. These four characteristics constitute essential characteristics of classrooms with ideal levels of technology integration.

In Stage 2, I'm asking you to study my working theory and answer five questons:
1. What do I have right?
2. What do I have wrong?
3. Do all four characteristics belong here?
4. Are there any characteristics missing?
5. Is my language precise and appropriate?

Please be absolutely honest with me in your critique. I need your frank input if the theory is going to be as good as it can be.

If at all possible, I ope to review your e-mail responses by April 19, 2002. If you are unable to respond by that date, or prefer to comment via telephone. I'll call on the week of April 22, 2002.

After i get input from each of you. I'll enage in the next stage of my study. In Stage 3, I will develop potential survey items to measure the characteristics of ideal technology integration. I will send those items to you via e-mail for one last critique. I'll ask you to rate the items from less important to extremely important.

If you have any questions, please don't hesitate to contact me.

Thanks,
Liz Dillon-Marable
(AKA Liz Dillon-Black)
Georgia Institute of Technology: Research Associate II
University of Georgia: Ph.D. Candidate
Office: 404-894-9087
Home: 706-769-5413

Research at The University of Georgia, which involves human participants, is overseen by the Institutional Review Board. Questions or problems regarding your rights as a participant should be addressed to Institutional Review Board; Office of V.P. for Research: The University of Georgia; 606A/Graduate Studies Research Center; Athens, Georgia 30602-7411; Telephone (706) 542-6514.

APPENDIX D: DELPHI LETTER #2: MEASUREMENT FRAMEWORK
(Continued)
(Reduced Size Facsimile)

College of Education
School of Leadership and Lifelong Learning
Department of Adult Education

Four Characteristics of Optimal Computer Integration in Adult Literacy Classrooms

CHARACTERISTIC #1: COMPUTER USE IS SEAMLESS.

Definition: There is smooth transition between computer-based instruction and other forms of instruction.

Practices:
- ➤ Learners access computers as easily as they access more traditional learning tools, such as paper and books.
- ➤ Computer use is routinely augmented by class discussions.
- ➤ Computers are used in combination with other learning formats, such as lectures and books.
- ➤ Computers are used to enhance other learning activities.

CHARACTERISTIC #2: COMPUTER USE IS APPROPRIATE FOR LEARNERS

Definition: Learners are comfortably able to use hardware and software.

Practices:
- ➤ The level of computer-accessed content matches learners' literacy skills.
- ➤ Accommodations are made for learners with different languages, cultures, and socioeconomic backgrounds.
- ➤ Accommodations are made for learners with special learning needs.
- ➤ The levels of technology matches learners' technology skills.

CHARACTERISTIC #3: COMPUTER USE IS INSTRUCTOR-SUPPORTED.

Definition: Instructors facilitate learners' effective use of computers

Practices:
- ➤ Instructors actively assist learners in using computers to achieve individual learning goals.
- ➤ Instructors provide feedback to students on their computer-based learning.

CHARACTERISTIC #4: COMPUTER USE IS LEARNER-EMPOWERING.

Definition: Learners are proactive rather than reactive computer users..

Practices:
- ➤ Computer use enhances learners' ability to work independently.
- ➤ Computer use enhances learners' ability to work collaboratively.
- ➤ Learners choose from a range of learning materials available through computer use.
- ➤ Learners make choices about learning activities through computer use.
- ➤ Learners use computer technology to access materials that address their roles as family members, workers, or citizens.

APPENDIX E

DELPHI LETTER #3 - POTENTIAL SURVEY ITEMS

APPENDIX E
DELPHI LETTER 3: POTENTIAL SURVEY ITEMS
(Reduced Size Facsimile)

The University of Georgia
School of Leadership & Lifelong Learning
College of Education
Department of Adult Education

July 25, 2002

Dear Colleagues:

First, I want to thank you for helping me work toward a valid measure of technology integration in adult literacy and secondary classrooms. I have completed the first two stages of a three stage study. In Stage 1, I interviewed you and ten other national experts about technology integration, asking questions such as, "Ideally, what does technology integration look like in adult literacy?"

In Stage 2, I studied the interview transcripts and drew up a list of characteristics and indicators, which you then critiqued. After a careful review of your comments and suggestions, I have identified 35 "candidate" items for my questionnaire.

Now I'm beginning the final stage of the study, and I'm hoping you'll be willing to help me one more time. In Stage 3, I'm asking you to review the 35 items, critique them and rate their importance. I will use your ratings and suggestions to reduce the items to a more manageable number (perhaps 20-25) and to construct the final instrument.

Attached you will find an MS Word document entitled *Technology Integration in Adult Literacy and Adult Secondary Education*. It is a questionnaire that should take no longer than 15 minutes to complete and return in one of three ways:

1. Download the document, fill it out, and email it back to me as an attachment (liz.marable@arch.gatech.edu);

2. Print it, complete it, and fax it back to me at 404-894-9320;

3. Print it, complete it, and mail it back to me at
   Liz Dillon-Marable
   Georgia Institute of Technology
   Center for Assistive Technology and Environmental Access
   490 Tenth Street, NW
   Atlanta, GA 30332-0156

If at all possible, I hope to receive your responses in two weeks (August 9, 2002). I sincerely appreciate all the help you have given me and thank you in advance for participating in the last stage of the Delphi study. If you have any questions, don't hesitate to contact me.

Thanks,
Liz Dillon-Marable (AKA Liz Dillon-Black)
Georgia Institute of Technology: Research Associate II
University of Georgia: Ph.D. Candidate
Office: 404-894-9087
Home: 706-769-5413

Research at the **University of Georgia**, which involves human **participants**, is **overseen** by the Institutional Review Board. **Questions** or problems regarding your rights as a participant should be addressed to Institutional Review Board; Office of V.P. for Research: The University of Georgia; 606A /Graduate Studies Research Center; Athens, Georgia 30602-7411; Telephone (706)542-6514.

Technology Integration in Adult Literacy and Adult Secondary Education

Directions
Please read each of the following items and decide to what extent it is an important indicator of technology integration in adult literacy and adult secondary classrooms. Then select one rating for each of the 35 items according of the following scheme:

0 = Not Important
1 = Somewhat Important
2 = Important
3 = Very Important
4 = Extremely Important

If you have additional comments, please include them in the spaces provided.

Note: The items are arranged in random order. It is important that all items be rated, because I want to establish validity using these ratings.

ITEM	RATING Enter a # from 0 to 4	COMMENTS AND/OR RECOMMENDED CHANGES
1. Learners feel empowered when they learn how to use computer technology in the classroom.		
2. Learners are proficient enough with computers that they feel at ease using them in the classroom		
3. Learners readily access computer technology much like they access paper, pencils, books, and other educational resources		
4. When learners want to use computer technology I try to find ways to accommodate them.		
5. Computer technology is located in my classroom rather than in a lab.		
6. Computer technology provides learners with new opportunities to feel more connected to the world in which they live.		

7. Learners feel that using computer technology is comparable to using books and/or writing on paper.		
8. Content accessed through computer technology is comfortable for learners' literacy levels		
9. I encourage learners to make individual choices about their learning when using computer technology.		
10. Learners feel better about themselves when they learn how to use computer technology.		
11. The use of computer technology minimizes discomfort for non-native speakers of English practicing language skills.		
12. Learners use computer technology in combination with other instructional tools such as lecture, discussion and textbooks		
13. Learners feel respected because it is their decision as to when and how to use computer technology.		
14. Learners feel comfortable using computers because they have learned how to use the technology		
15. I help learners use computer technology to reach their personal goals.		
16. Learners are not slowed down by obsolete computer technology.		
17. The use of computer technology creates opportunities to strengthen learners' higher level thinking skills.		
18. Computer technology creates new ways for learners to access materials that address their roles as family members, parents, workers and/or citizens.		

19. Learners are comfortable with the cultural appropriateness of content accessed through computer technology.		
20. I provide feedback to learners who are using computer technology.		
21. Learners move naturally between the use of books and the use of computer technology.		
22. Learners' decision-making techniques are enhanced through the use of computer technology		
23. I supplement computer technology content with other instructional tools.		
24. Learners feel at ease with computer technology content when it relates to their background of experience.		
25. I help learners use computer technology to reach the goals and objectives of the program.		
26. Computer technology provides learners with new tools for problem-solving.		
27. Learners do not feel the use of computer technology interferes with learning.		
28. Computer technology creates opportunities for learners to develop new ways to work collaboratively.		
29. Computer technology enhances learner's ability to work independently.		
30. The comfort level of learners' with disabilities is accommodated using assistive technology (i.e. large print for the visually impaired, track balls and key guards for spasticity, etc.)		
31. Computer technology provides new ways for learners to be creative.		

32. Discussion is sometimes a part of learning with computer technology.		
33. I encourage learners to choose from a range of materials available through computer technology.		
34. I use computer technology to enrich other learning activities.		
35. Learners say they feel more self-confident because they are able to use computer technology.		

Additional Comments or suggestions

Note: This is a work in progress. Please do not copy, cite or share this formulation with anyone at this time.

APPENDIX F

MEANS CHART POTENTIAL SURVEY ITEMS

APPENDIX F
MEANS CHART FOR POTENTIAL SURVEY ITEMS
(Reduced Size Facsimile)

CHARACTERISTIC #1: COMPUTER USE IS SEAMLESS Definition: There is seamless movement between computer-based instruction and other forms of instructional.	
ITEM	RATING Enter a # from 0 to 4
1. Learners use computer technology in combination with other instructional tools such as lecture.	**3.72**
2. Learners readily access computer technology much like they access paper, pencils, books, and other educational resources.	**3.27**
3. Learners move naturally between the use of books and the use of computer technology.	**3.18**
4. Discussion is sometimes a part of learning with computer technology.	**3.09**
5. Learners do not feel the use of computer technology interferes with learning	**2.9**
6. Learners feel that using computer technology is a lot like using textbooks.	**2.81**
7. Computer technology is located in my classroom rather than in a lab.	**2.63**
8. Learners are not slowed down by obsolete computer technology.	**2.46**

Practices:

- Learners access computers as easily as they access more traditional learning tools, such as paper and books.
- Computer use is routinely augmented by class discussions.
- Computers are used in combination with other learning formats, such as lectures and books.
- Computers are used to enhance other learning activities.

CHARACTERISTIC #2: COMPUTER USE IS APPROPRIATE FOR LEARNERS Definition: Learners are comfortably able to use hardware and software.	
ITEM	RATING Enter a # from 0 to 4
9. The comfort level of learners' with disabilities is accommodated using assistive technology (i.e. large print for the visually impaired, track balls and key guards for spasticity, etc.)	**3.45**
10. Content accessed through computer technology is comfortable for learners' literacy levels	**3.27**

11. Computer technology creates new ways for learners to access materials that address their roles as family members, parents, workers, and citizens	**3.27**
12. Learners are proficient enough with computers that they feel comfortable using them in the classroom.	**2.81**
13. Learners feel comfortable using computers because they have learned how to use the technology.	**2.72**
14. Learners are comfortable with the cultural aspects of content accessed through computer technology.	**2.54**
15. Computer technology reduces language barriers for learners whose first language is not English	**2.27**
16. Learners are comfortable reading the content they find using computer technology.	

Practices:
- ➤ The level of computer-accessed content matches learners' literacy skills.
- ➤ Accommodations are made for learners with different languages, cultures, and socioeconomic backgrounds.
- ➤ Accommodations are made for learners with special learning needs.
- ➤ The levels of technology matches learners' technology skills.

CHARACTERISTIC #3: COMPUTER USE IS INSTRUCTOR-MANAGED. Definition: Instructors facilitate learners' effective use of computers.	
ITEM	RATING Enter a # from 0 to 4
17. I use computer technology to enrich other learning activities.	**3.45**
18. I help learners use computer technology to reach their personal goals.	**3.27**
19. I provide feedback to learners who are using computer technology.	**3.27**
20. I encourage learners to choose from a range of materials available through computer technology.	**3.18**
21. I encourage learners to make individual choices about their learning when using computer technology.	**3.0**
22. When learners want to use computer technology I try to find ways to accommodate them.	**2.9**
23. I supplement computer technology content with other learning modalities.	**2.81**
24. I help learners use computer technology to reach the goals and objectives of the program.	**2.54**

Practices:
- ➤ Instructors actively assist learners in using computers to achieve individual learning goals.
- ➤ Instructors provide feedback to students on their computer-based learning.

CHARACTERISTIC #4: COMPUTER USE IS LEARNER-DRIVEN.

Definition:
Learners are proactive rather than reactive computer users.

ITEM	RATING Enter a # from 0 to 4
25. Computer technology enhances learner's ability to work independently.	**3.36**
26. Computer technology provides new ways for learners to be creative.	**3.18**
27. Computer technology creates opportunities for learners to work collaboratively.	**3.18**
28. Computer technology provides learners with new tools for problem-solving.	**3.18**
29. Learners say they feel more self-confident through the use of computer technology.	**3.0**
30. Learners are able to decide when it is appropriate to use computer technology.	**2.45**
31. Learners feel empowered when they use computer technology in the classroom.	**2.45**
32. Learners feel more connected to society when they learn to use computer technology.	**2.36**
33. The use of computer technology strengthens learners' higher level thinking skills.	**2.9**
34. Learners' decision-making techniques are enhanced through the use of computer technology.	**2.54**
35. Learners feel better about themselves when they learn to computer technology.	**2.09**

Practices:
- ➤ Computer use enhances learners' ability to work independently..
- ➤ Computer enhances learners' ability to work collaboratively.
- ➤ Learners choose from a range of learning materials available through computer use.
- ➤ Learners make choices about learning activities available through computer use.
- ➤ Learners use computer technology to access materials that address their roles as family members, workers, or citizens.

APPENDIX G

VALIDITY SORT

APPENDIX G
VALIDITY SORT
(Reduced Size Facsimile)

DIRECTIOINS FOR VALIDITY SORT

COMPUTER INTEGRATION IN ADULT LITERACY CLASSROOMS

STEP 1: LEARNING THE CATEGORIES. Study the four "characteristics" as defined on the envelopes. Spead the envelopes out on the table in front of you.

STEP 2: LEARNING THE ITEMS. Read each item (on the slips of paper) and rate its clarity using this scheme:

If the item is Clear and understandable, rate it "C" (or leave the rating blank)

If the item is Unclear or confusing, rate it "U".

STEP 3: SORT THE ITEMS INTO THE CATEGORIES. Sort each slip of paper into the appropriate category.

Different categories can contain different numbers of items.

Don't place the item slips into the envelopes until all items are sorted. Group the slips by category, spreading them out so that you can see them all.

Move items around among the categories until you think you have them all in the best place.

Most items should fit into one of the four categories. However, if you cannot place an item into a category with confidence, place it in the "Unable to Sort" envelope.

When you are done sorting, place the item slips into the appropriate envelopes.

STEP 4: PLACE EVERYTHING INTO THE LARGE ENVELOPE AND WRITE YOUR NAME ON THE OUTSIDE.

THANKS FOR HELPING US WITH THIS IMPORTANT RESEARCH

ITEM CONSTRUCTS FOR VALIDITY SORT

CHARACTERISTIC #2: COMPUTER USE IS ***APPROPRIATE FOR LEARNERS***.
Definition: Learners are able to use the computer technology in the classroom.

CHARACTERISTIC #3: COMPUTER USE IS ***INSTRUCTOR-SUPPORTED***.
Definition: Instructors facilitate learners' effective use of computer technology in the classroom.

CHARACTERISTIC #4: COMPUTER USE IS ***LEARNER-EMPOWERING.***
Definition: Learners are proactive in using computer technology for learning.

UNABLE TO SORT: Does not fit into any category.

ITEM STRIPS TO SORT
:

024	In my classroom, computer use is routinely enhanced by discussion.	*Clarity Rating:*
046	In my classroom, I plan activities using a range of materials available through computer technology.	*Clarity Rating:*
050	In my classroom, computer use is combined with other learning activities such as lecture, discussion, and use of workbooks.	*Clarity Rating:*
074	In my classroom, the software used is appropriate for the learners.	*Clarity Rating:*
099	In my classroom, I make sure that all computer technology works properly.	*Clarity Rating:*
104	In my classroom, I help learners use computer technology to reach the goals and objectives of the program.	*Clarity Rating:*
135	In my classroom, learners sometimes use computer technology to work	*Clarity*
211	In my classroom, learners can decide to use computer technology without asking my permission.	*Clarity Rating:*
276	In my classroom, the levels of computer technology match learners' technology skills.	*Clarity Rating:*
298	In my classroom, learners sometimes use computer technology to work independently.	*Clarity Rating:*
299	In my classroom, learners are never expected to use computer technology they don't understand.	*Clarity Rating:*
305	In my classroom, I plan computer learning activities that promote learner- choice.	*Clarity Rating:*
318	In my classroom, computers are often used as part of a larger learning session.	*Clarity Rating:*
325	In my classroom, learners sometimes use computer technology to enhance their decision-making techniques.	*Clarity Rating:*
357	In my classroom, I help learners solve problems they encounter when using	*Clarity*
400	In my classroom, I actively guide the use of computer technology to meet learner-goals.	*Clarity Rating:*
419	In my classroom, learners use computers to access materials that address their roles as family members, workers, and citizens.	*Clarity Rating:*
422	In my classroom, there is movement back and forth between computer use and other learning activities.	*Clarity Rating:*
437	In my classroom, learners use computer technology to learn more about the society in which they live.	*Clarity Rating:*
450	In my classroom, there is free movement between the use of computer technology and other learning activities.	*Clarity Rating:*
498	In my classroom, when learners want to use computer technology, I try to find ways to accommodate them.	*Clarity Rating:*
509	In my classroom, learners feel empowered when they use computer technology.	*Clarity Rating:*
512	In my classroom, computer technology can be accessed as easily as paper, pencils, books, and other educational resources.	*Clarity Rating:*
519	In my classroom, computer use makes learning easier.	*Clarity Rating:*
523	In my classroom, learners sometimes use computer technology to engage in problem-solving activities	*Clarity Rating:*

538	In my classroom, the use of computers is suitable for learners with different languages, cultures, and socioeconomic backgrounds.	*Clarity Rating:*
547	In my classroom, learners know how to fix minor glitches that occur when they are using computer technology.	*Clarity Rating:*
572	In my classroom, I make sure that learners are using computer technology wisely.	*Clarity Rating:*
631	In my classroom, learners gain self-confidence through the use of computer technology.	*Clarity Rating:*
696	In my classroom, learners sometimes decide when it is appropriate to use computer technology.	*Clarity Rating:*
722	In my classroom, I provide feedback to learners using computer technology.	*Clarity Rating:*
731	In my classroom, I plan computer technology use that enriches other learning activities.	*Clarity Rating:*
732	In my classroom, learners strengthen their higher level thinking skills through the use of computer technology.	*Clarity Rating:*
786	In my classroom, I supplement computer technology with other learning activities.	*Clarity Rating:*
815	In my classroom, the hardware used is appropriate for the learners.	*Clarity Rating:*
853	In my classroom, accommodations are made for computer use by learners with special needs (including visual, hearing, cognitive, and mobility impairments).	*Clarity Rating:*
868	In my classroom, learners are comfortable using computer technology.	*Clarity Rating:*
944	In my classroom, learners sometimes use computer technology to engage in creative activities.	*Clarity Rating:*

APPENDIX H

VALIDITY/FREQUENCY AND MEANS CHART

APPENDIX H
VALIDITY FREQUENCY AND MEANS CHART
(Reduced Size Facsimile)

Item	1: Seamless	2: Appropriate	3: Instructor	4: Learner	5: None	TOTAL
024	√√√√√ √		√		√√√	6 / 10
050	√√√√√ √√√√				√	9/ 10
318	√√√√√ √√√√				√	9 / 10
419		√		√√√√√ √√√	√	8/ 10
422	√√√√√ √√√√√					10/ 10
450	√√√√√ √√√√√					10 / 10
512	√√√√√ √√	√√√				7/ 10
519	√	√√√		√√	√√√√	1 / 10
074		√√√√√ √√√√√				10/ 10
278		√√√√√ √√√√√				10 / 10
299		√√√√√ √√√√√				10/ 10
536		√√√√√ √√√√√				10 / 10
547		√√√√√		√√	√√√	5 / 10
815		√√√√√ √√√√√				10/ 10
853		√√√√√ √√√√√				10/ 10
868	√√	√√√√√ √√√				8/ 10
046	√√		√√√√√ √√		√	7/ 10
099	√	√√	√√√√√√ √√			7/ 10
104			√√√√√ √√√√√			10 / 10
305			√√√√√	√√√√√		5 / 10
357			√√√√√ √√√√√			10 / 10
400			√√√√√ √√√√√			10 / 10
498			√√√√√ √√√√	√		9/ 10

Item	1: Seamless	2: Appropriate	3: Instructor	4: Learner	5: None	TOTAL
572			√√√√√ √√√√√			10/ 10
722			√√√√√ √√√			10/ 10
731	√√√√	√	√√√√		√	4 / 10
786	√√√		√√√√√ √		√	6/ 10
135	√√			√√√√√ √	√√	6 / 10
211		√		√√√√√ √√√	√	8 / 10
298	√			√√√√√ √√√	√	8 / 10
325		√		√√√√√ √√√√		9/ 10
437	√			√√√√√ √√√	√	8 / 10
509				√√√√√ √√√√√		10 / 10
523	√√	√		√√√√√ √√		7/ 10
631				√√√√√ √√√√	√	9/ 10
898		√√		√√√√√ √√√		8/ 10
732	√	√		√√√√√ √√√		8/ 10
944	√√			√√√√√ √√	√	7/ 10

APPENDIX I

REFINED MEASUREMENT FRAMEWORK

APPENDIX I: REFINED MEASUREMENT FRAMEWORK
SECTION I: HOW COMPUTER TECHNOLOGY IS USED IN YOUR CLASSROOM

Circle the number that best describes the extent to which you agree with the following items.

Circle the number that best describes the extent to which you agree with the following items.

	Strongly Disagree		↔			Strongly Agree
1. In my classroom, computer use is combined with other learning activities such as lecture, discussion, and use of workbooks.	1	2	3	4	5	6
2. In my classroom, the software used is appropriate for the learners.	1	2	3	4	5	6
3. In my classroom, I make sure that all computers work properly.	1	2	3	4	5	6
4. In my classroom, I help learners use computers to reach the goals and objectives of the program.	1	2	3	4	5	6
5. In my classroom, learners can decide to use computers without asking my permission.	1	2	3	4	5	6
6. In my classroom, the levels of computer technology match learners' technology skills.	1	2	3	4	5	6
7. In my classroom, learners sometimes use computers to work independently.	1	2	3	4	5	6
8. In my classroom, leaners are never expected to use computer technology they don't understand.	1	2	3	4	5	6
9. In my classroom, computers are often used as part of a larger learning session.	1	2	3	4	5	6
10. In my classroom, learners sometimes use computers to enhance their decision-making.	1	2	3	4	5	6
11. In my classroom, I help learners solve problems they encounter when using computers.	1	2	3	4	5	6
12. In my classroom, I actively guide the use of computers to meet learners' personal goals.	1	2	3	4	5	6
13. In my classroom, learners use computers to access materials that address their roles as family members, workers, and citizens.	1	2	3	4	5	6
14. In my classroom, there is movement back and forth between computer use and other learning activities.	1	2	3	4	5	6

15. In my classroom, learners use computers to learn more about the society in which they live.	1	2	3	4	5	6
16. In my classroom, there is each movement between the use of computers and other learning activities.	1	2	3	4	5	6
17. In my classroom, when learners want to use computers, I usually find ways to accommodate them.	1	2	3	4	5	6
18. In my classroom, learners feel empowered when they use computers.	1	2	3	4	5	6
19. In my classroom, computer technology can be accessed as easily as paper, pencils, books, and other educational resources.	1	2	3	4	5	6
20. In my classroom, learners sometimes use computers to engage in problem-solving activities.	1	2	3	4	5	6
21. In my classroom, the computer technology used is suitable for learners with different languages, cultures, and socioeconomic backgrounds.	1	2	3	4	5	6
22. In my classroom, I make sure learners are using computers properly.	1	2	3	4	5	6
23. In my classroom, learners gain self-confidence through the use of computer technology.	1	2	3	4	5	6
24. In my classroom, learners sometimes decide when it is appropriate to use computers.	1	2	3	4	5	6
25. In my classroom, I provide feedback to learners who use computers.	1	2	3	4	5	6
26. In my classroom, learners strengthen their higher level thinking skills through the use of computers.	1	2	3	4	5	6
27. In my classroom, the computer hardware is appropriate for learners.	1	2	3	4	5	6
28. In my classroom, accommodations are made for computer use by learners with special needs (including visual, hearing, cognitive, and mobility impairments).	1	2	3	4	5	6
29. In my classroom, learners are comfortable using computers.	1	2	3	4	5	6
30. In my classroom, learners sometimes use computer technology to engage in creative activities.	1	2	3	4	5	6
31. In my classroom, I plan activities using a range of materials available through computer technolgy.	1	2	3	4	5	6

APPENDIX J

INSTRUCTORS' COVER LETTER

APPENDIX J
INSTRUCTORS' COVER LETTER
(Reduced Size Facsimile)

The University of Georgia
College of Education
School of Leadership and Lifelong Learning
Department of Adult Education

Dear Literacy Colleague,

In recent years, educators have been encouraged to integrate computer technology into instruction. However, despite the opinions of experts and policy makers, it is ultimately up to you, the instructor, who is in the best position to determine how to use computer technology in your classroom.

Although there have been numerous studies on technology integration in the K-12 system, few have examined it in adult literacy classrooms. Therefore, we are coming to you, the full-time adult literacy teachers of Georgia, to find out how you view the use of computers in the classroom. Data will be analyzed at The University of Georgia, and findings will help establish a realistic understanding of educators' beliefs and practices regarding computer use in ALE.

Three questions guide this study. Is computer use in the classroom compatible with what you believe about teaching adults? Is computer use effective in achieving the goals and objectives of your students and program? What does technology integration actually look like in terms of how educators use computers in real classrooms to teach real content to real adult learners?

We know that time is a valuable and scarce resource, especially for ALE instructors, so we have made every attempt to keep data collection to an absolute minimum in terms of time. It will take approximately 10 minutes to complete the enclosed survey. Your answers are completely confidential. Only the researchers will handle the surveys, and individual names will not be reported in the findings. An executive summary of the findings will be available for all participants upon request.

To assist us with this study, please do the following:

- Read the enclosed "RESEARCH INFORMATION SHEET."
- Complete the attached survey.
- Place the completed survey in the stamped, self-addressed envelope.
- Mail it back by January 14, 2002.

Your opinions are very important to us, and we hope you will agree to work with us on this study.

Sincerely,

Elizabeth Dillon-Marable (Formerly: Elizabeth Dillon Black)
Survey Coordinator
The University of Georgia

Thomas Valentine
Associate Professor
The University of Georgia

Research at the University of Georgia which involves human participants is overseen by the Institutional Review Board. Questions or problems regarding your rights as a participant should be addressed to Institutional Review Board; Office of V.P. for Research: The University of Georgia; 606A /Graduate Studies Research Center; Athens, Georgia 30602-7411; Telephone (706) 542-6514

APPENDIX K

POST CARD REMINDER

APPENDIX K: POST CARD REMINDER
(Reduced Size Facsimile)

SURVEY REMINDER

January 14, 2003

Dear Literacy Colleague,

We recently sent a survey to you on ***Computer Technology Integration In Adult Literacy***. Perhaps you did not receive it, or your busy schedule has prevented you from replying. Whether or not you use computers in your classroom, your expertise in adult literacy would really inform this study.

Please fill out the survey and return it in the stamped self-addressed envelope by **January 21, 2002**. We really need and appreciate your input.

If you have misplaced the survey, we'd be happy to send another. Call me at 706-769-5413 or email lizdillonmarable@yahoo.com.

Sincerely,
Liz Dillon-Marable
Department of Adult Education
University of Georgia

APPENDIX L

RESEARCH INFORMATION SHEET

APPENDIX L: RESEARCH INFORMATION SHEET
(Reduced Size Facsimile)

1785

The University of Georgia
College of Education
School of Leadership and Lifelong Learning
Department of Adult Education

TECHNOLOGY INTEGRATION STUDY

Research Information Sheet

We are conducting a study about computer technology integration in adult education classrooms to better understand what technology integration looks like in adult literacy environments. The study is being conducted by Elizabeth Dillon-Marable and Dr. Thomas Valentine from the University of Georgia, Department of Adult Education.

Your participation in this study is strictly voluntary. If you agree to participate, you will complete a questionnaire that should take no more than 15 minutes. We hope that you will choose to return a completed questionnaire; however, if you choose not to participate, let us know that you want no further correspondence regarding this study, by simply writing "NO" on the first page of the survey. Then place it inside the self-addressed envelope, and drop it in the mail.

If you choose to participate, you will be one of many people in the state completing this questionnaire. We promise strict confidentiality in this study. Each questionnaire contains a code number on the back so we can send up to two reminders to participants who have not returned the questionnaire. As soon as the research is complete, code numbers linking participants will be destroyed. Only the researchers will handle the surveys, and individual names will not be reported in the findings. The executive summary will be available to all participants upon request.

We do not foresee this study causing you any harm or discomfort. You are free to decline to participate at any time. If you have any questions about this research, now or in the future, feel free to contact Elizabeth Dillon-Marable at 404-894-8067 / lizdillonmarable@yahoo.com or Dr. Thomas Valentine at 706-542-2214. We can be reached by mail c/o The Department of Adult Education at 407 River's Crossing, The University of Georgia, Athens, GA, 30602.

Please note: Completion and return of this questionnaire implies that you have read this information and consent to participate in the research.

Thank you for your help with this important research.

For questions or problems that may arise during this study, please call or write: Chris A. Joseph, Ph.D., Human Subjects Office, The University of Georgia, 606A Boyd Graduate Studies Research Center, Athens, Georgia 30602-7411; Telephone No. (706) 542-6514; E-Mail Address: IRB@uga.edu.

APPENDIX M

FINDINGS TABLE AND RELATED LITERATURE

Findings Chart: Computer Technology Integration – Conceptualization and Predictors

1993 Burge, E., and Roberts, J. M. (1993). Classrooms with a difference: A practical guide to the use of conferencing technologies. Toronto: Distance Learning Office, Ontario Institute for Studies in Education. (ED 364 206).	"(Technology) use will reflect whatever values the educator holds--consciously or subconsciously--about her/his relationship with learners, and their use will invariably bring advantages and disadvantages" (Burge and Roberts 1993, p. 35).	Compatibility
2004 Boone, R., Kingsley, D. V. (2004). Teacher beliefs about educational software: A Delphi Study. Journal of Research on Computing in Education. (36)3. Retrieved April 1, 2004, from http://www.iste.org/jrte/36/3/abstracts/williams.cfm	Abstract A Delphi method was used to determine the extent to which current educational software was meeting the needs of teachers; as well as what changes needed to occur in educational software to make it more effective. Five overarching themes emerged: (a) instructional design issues, (b) curriculum, (c) materials, (d) cost, and (e) meeting specific needs. The cost of software was a concern throughout the study. The belief that educational software should be grounded in both content and purpose was also a major concern. Deficiencies and suggestions for improvement were found.	Compatibility
2003 Selwynn, N. ICT in non-formal youth and adult education: Defining the territory. International Roundtable, November 12-14, Philadelphia, PA.	"… serious questions have been raised regarding the 'fit" of ICT – especially given the narrow paradigms used in much current e-learning which tends to rely on one-way transmissions of information and communication. ICT-based adult learning is or should be, critical and emancipatory rather than about the transfer of information and determinate skills." P 11	
1996 Wave Technologies International, Inc. (1996).	Pedagogy and Andragogy " The great teachers of ancient times, from Confucius to Plato, didn't pursue such authoritarian techniques. Major differences exist between	Compatibility

Learning: The critical technology. A whitepaper on adult education in the information age. St. Louis, Missouri.	what we know of the great teachers' styles, yet they all saw learning as a process of active inquiry, not passive reception." Malcolm Knowles (l990O. The adult learner: A neglected species (4th ed.). Houston, TX: Gulf Publishing. ISBN 0-87201-074-0. "Constructivists emphasize the flexible use of pre-existing knowledge rather than the recall of prepackaged schemes. R. J. Spiro, P. J. Feltovich, M. J. Jacobson, and R. I. Colson. (1999). Cognitive flexibility, constructivism, and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. Educational Technology. 31(9), pp. 28-33. " The role of instruction in the constructivist view is to show (learners) how to construct knowledge, to promote collaboration with others, to show the multiple perspectives that can be brought to bear on a particular problem, and to arrive at self-chosen positions to which they can commit themselves, while realizing the basis of other views with which tey may disagree. D. J. Cunningham. (1993). Assessing constructions and constructing assessments: A dialogue. Educational Technology. 31(5), pp. 13-17.	
2001 Shohet, L. (2001). Adult literacy, learning disabilities and technology: An annotated bibliography. Centre for Literacy of Quebec.	"Most literacy workers in Canada are new to, apprehensive about, or perhaps resistant to technology."	Compatibility
1999 Trow, M. (l199). Lifelong learning through the new information technologies. Higher Education Policy, (12)2, pp 201-217.	"Despite the introduction of new powerful information technologies, into distance education, most continuing education will continue t be provided in its familiar forms of teacher and students together in classrooms and workshops. This is important if we are to keep the new developments in perspective." p. 207	Compatibility
2003	"In education it is widely accepted that an important aspect of one's knowledge is socially constructed. Although learners derive knowledge	Compatibility

Askov, E. N., Johnson, J., Petty L. L., & Young, S. J. (2003). Expanding access to adult literacy with online distance education. National Study for Adult Learning and Literacy [Monograph]. Harvard Graduate School, Cambridge, MA.	from reading, seeing, and hearing the expertise presented in textbooks, videos, and audiotapes, deep understanding results when students construct their own understanding of that information. An important ingredient in constructing that knowledge derives from interacting with classmates and the material." P. 67	
2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum.	"Stites notes one particular study that found the overall impact of new learning technologies in improving learning to be mixed but identified four fundamental characteristics of effective applications of learning technology also considered by many to be effective in adult learning in general: 1) active engagement of learners; 2) participation in groups; 3) frequent interaction and feedback, and 4) connection to real-world contexts.	Compatibility
2004 Vannatta, R. A., and Fordham, N. (2004) Teacher dispositions as predictors of classroom technology use. Journal of Research and Computing in Education. (36)3. Retreived April 1, 2004, K"http://www.iste.org/jrte/36/3/abstracts/vannatta.cfm"http://www.iste.org/jrte/36/3/abstracts/vannatta.cfm	Abstract This study examined various teacher dispositions that predict technology use among K12 teachers. The Teacher Attribute Survey was administered to 177 K12 teachers from six Northwest Ohio schools. This instrument measured a variety of teacher attributes, such as teacher self-efficacy, philosophy, openness to change, amount of professional development, and amount of technology use in the classroom. A forward multiple regression was conducted to identify the best combination of variables that predicts classroom technology use among K12 teachers. Results indicate that the factor combination of amount of technology training, time spent beyond contractual work week, and openness to change best predicted classroom technology use.	Compatibility
2003	"Teachers must feel comfortable with the technology if they are going to gelp their students become comfortable with it." P. 65-66	Compatibility

Askov, E. N., Johnson, J., Petty L. L., & Young, S. J. (2003). Expanding access to adultliteracy with online distance education. National Study for Adult Learning and Literacy [Monograph]. Harvard Graduate School, Cambridge, MA.		
1995 Burge, L (1995) 'Electronic Highway or Weaving Loom? Thinking about conferencing technologies for learning' in Open and Distance Learning Today, Fred Lockwood (ed), London: Routledge, pp. 151-163.	ABSTRACT: Information highways are high speed data networks used to transport information and link people together. As more limitations of and problems with the information highway ("potholes") become apparent, the highway metaphor may have to be revisited, and the information highway must be examined with a critical eye. Distance educators confront much fast-paced activity and hype in the use of conferencing technologies (CTs) and have to choose among them. Technologies such as audio, audio graphic, video, and computer conferencing are explored with respect to concepts, new knowledge, and guides to decision-making. Four key areas are selected for metaphorical and analytical thinking about CTs: (1) mass media and its biased presentation of information and its inflexibility of use; (2) constructivist learning theory and its focus on creativity, multiplicity, and growth, and learners' use of CTs; (3) adult characteristics and how they help or hinder learning; and (4) gender issues, especially the existing learning skills and preferences of women. Educators appear to be using the technologies to carry out much the same activities as within traditional classrooms, but with more efficiency. In exploring new CTs and their use, the challenge is to develop collaborative styles of learning and to change teaching functions without reducing academic rigor and the teacher's sense of importance. Educators must ask the why and when questions of CT use to determine appropriateness before asking how.	Compatibility
2001	"The question should not be whether to use technology simply because it is available but rather whether it can be used to create learning	Relative Advantage

Imel, S. (2001). Learning technologies in adult education. Myths and Realities 17, pp. 1-2.	opportunities that were impossible or impractical without it; a related question is how new learning technologies can be used appropriately in conjunction with traditional teaching and learning tools." (Ginsburg 1999; Phillips and Kelly 2000).	
2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum.	"Teachers may have to invest considerable time and effort to adapt existing learning technologies to the needs of their students." "Information available on the Internet may not relate well to curriculum content," "Information available on-line may not fit well with learning goals and interests of adult literacy students." Connection to real-world contexts	Relative Advantage
(Burge 1994; Cahoon 1998; Eastmond 1998; Field 1997).	"Technology can enhance adult learning because it has the potential to increase flexibility, provide access to expertise, facilitate discussion among learners who cannot meet face to face, reduce feelings of isolation often experienced by nontraditional learners, increase learner autonomy, and support and promote constructivist and collaborative learning."	Relative Advantage
2003 Selwynn, N. ICT in non-formal youth and adult education: Defining the territory. International Roundtable, November 12-14, Philadelphia, PA.	"Therefore, one of the very real barriers faced by ICT-based education is the pre-existing micro-politics that characterize all education sectors" p. 9 Crucially, access to ICT does not, in itself, seem to make people anymore likely to participate in education and (re)engage with learning. P. 9. "There is maybe a need here to reconsider the 'relative advantage' (Rogers & Shoemaker1971) and situational relevance" (Wilson 1993) of ICT-based education for the vast majority of adults who remain non-learners. The notion of 'digital choice' is an important one – recognizing the fact that significant proportions of the adult population in Europe and North America are simply choosing not to engage in ICT and ICT-based education – not through the barrier of access or cost – but due to a lack of interest, motivation, need or usefulness. " " ICT enhances rather than replaces 'real-life' learning. " p. 11	Relative Advantage

	" There are also many practical ' human' problems to learning with new technologies." P. 12 advises to adopt a "cautiously realistic approach" to adopting technology p. 12	
2003 Wagner, D. A. and Kozma, R. (2003). New technologies for literacy and adult education: A global perspective. International Literacy Institute, National Center on Adult Literacy, University of Pennsylvania.	Access to computers and network systems is limited p. 26	Technology Resources
2001 Shohet, L. (2001). Adult literacy, learning disabilities and technology: An annotated bibliography. Centre for Literacy of Quebec. Retrieved March 5, 2004, http://gseweb.harvard.edu/~ncsall/ann_rev/v2_c6.html	Recognizes that practitioners and students do not have equal access to various technologies Recognizes that a permanent technical infrastructure and support system are required	Technology Resources
2003 Organization for Economic Cooperation and Development. (2003) Beyond rhetoric: adult learning policies and practices. Paris OECD.	"Many adults lack the skills needed to handle the necessary software and hardware; ICT can be difficult to access and expensive to purchase, and access via the internet can be costly. Where distance education is built into access policies, a face-to-face component is still often important for adults."	Technology Resources
1999 McKenzie, J. (1999). How Teachers Learn Technology Best December 1999 The Twiggs	We have evidence (Becker, 1999) that as many as seventy per cent of the teachers in American schools fall into the "reluctant" or "late adopter" categories when it comes to computers and other new technologies. Some fall into these categories because they have	Technology Resources

Company; ISBN: 0967407818,	been given little support, few opportunities and <u>marginal equipment</u>. Others, like Sally Jane, may knowingly resist.	
2000McKenzie, J. (2000). <u>Planning Good Change with Literacy and Technology</u> 2000 The Twiggs Company; ISBN: 0967407834	Armed with visionary statements and promises from politicians and business folks intent on creating a "knowledge economy," we have committed a fortune to a venture severely flawed by its lopsided focus on equipment and connectivity rather than learning. What we have failed to do is demonstrate a connection between all of this new equipment and the outcomes for which schools, teachers and principals are now rewarded (or punished). Evidence is accumulating from early studies that the billions of technology dollars spent each year for the past 3-4 years have had minimal impact on the daily practice of teachers across the land and scant impact on how students spend their time in schools. Education Week's Technology Counts'99 reported that networking of schools is proceeding at a rapid pace and Internet access to classrooms is much greater now than several years ago, but teacher use remains disappointing: . . . a new Education Week survey has found that the typical teacher still mostly dabbles in digital content, using it as an optional ingredient to the meat and potatoes of instruction. Almost two-thirds of teachers say they rely on software or Web sites for instruction "to a minimal extent" or "not at all." Trotter, Andrew. "Preparing Teachers For the Digital Age." Technology Counts '99. Education Week, 1999. September 23, 1999. **http://www.edweek.org/sreports/tc99/articles/teach.htm**	Technology Resources
2003	"Much of the focus of such training has been on learning software (how to make slide presentations or use spreadsheets) rather than on curriculum blending and classroom strategies."	Training

McKenzie, J. (2003). Stories of adult learning. *The Educational Technology Journal.* (12)11. pp. 1-8. Retrieved March 5, 2004, **http://www.fno.org/sum03/adult.html**	"Sadly, much of the "digital revolution" urged on schools has proceeded without noting the research describing how teachers learn challenging new strategies"	
1999 McKenzie, J. (1999). How teachers learn technology best. Retrieved March 5, 2004, **http://www.fno.org/sum99/reluctant.html**	A 1995 report from the Office of Technology Assessment, Making the Connection, (ftp://gandalf.isu.edu/pub/ota/teachers.tech/01readme.txt) estimated that less than a quarter of our teachers had managed to integrate these tools into regular classroom programs. In addition, the annual Technology in Education 1998 Report from Market Data Retrieval reports that Internet access has increased dramatically while just seven percent of schools claim that the majority of their teachers are at an Advanced skill level (able to integrate technology use into the curriculum). (http://www.schooldata.com) The CEO Forum School Technology and Readiness Report (Year Two) states that "Only 20% of teachers report feeling very well prepared to integrate educational technology into classroom instruction."	Training
2001 http://www.fno.org/sum03/adult.html Shohet, L. (2001). Adult literacy, learning disabilities and technology: An annotated bibliography. Centre for Literacy of Quebec.	Recognizes a need for long-term professional development	Training
2004 Wang, L., Ertumer, P. A., Newby, T. J. (2004) Increasing preservice teachers' self-efficacy beliefs for technology integration. Journal of Research and Computing in Education. (36)3. Retreived April 1, 2004, http://www.iste.org/jrte/36/3/abstracts/wang.cfm.	Abstract This study was designed to explore how vicarious learning experiences and goal setting influence preservice teachers' self-efficacy for integrating technology into the classroom. Two hundred and eighty students, enrolled in an introductory educational technology course at a large Midwestern university, participated. Students were divided into eighteen lab sections, which were assigned to one of four conditions (three experimental and one control). Pre- and post-surveys were administered to examine participants' self-efficacy beliefs for technology integration. Results showed significant treatment effects for vicarious experiences and goal setting on participants' judgments of self-efficacy for technology integration. A significantly more powerful effect was found when vicarious learning experiences and goal setting were both present compared to when only one of the two factors was present. Therefore,	Training

	from the perspective of teacher educators, the use of vicarious learning experiences and the incorporation of specific goals may help preservice teachers develop the confidence they need to become effective technology users within their own classrooms.	
2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum.	Recommends special attention to professional development Need for teachers to increase their competence in using new technology to support their own and their students' learning	Training
1998 Imel, S. (1998). Technology and adult learning: Current perspectives. ERIC Digest No. 197, pp. 1-4.		Seamlessness: Computer use is routinely augmented by class discussion
2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum..	"Stites notes one particular study that found the overall impact of new learning technologies in improving learning to be mixed but identified four fundamental characteristics of effective applications of learning technology also considered by many to be effective in adult learning in general: 1) active engagement of learners; 2) participation in groups; 3) frequent interaction and feedback, and 4) connection to real-world contexts.	Seamlessness: Computer use is routinely augmented by class discussion
2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum..	Recommends emphasis on content and pedagogy, not just hardware	Seamlessness: Computers are used in combination with other learning formats, such as lectures and books

1999 Ginsburg, L. (1999). Educational Technology: Searching for the value added. Adult Learning (10)4, pp.12-15.	When technology is used as an instructional tool, it is integrated into instructional activities. Technology is frequently used to complement instruction and extend learning	Seamlessness: Computers are used to enhance other learning activities
2003 McKenzie, J. (2003). Stories of adult learning. The Educational Technology Journal. (12)11. pp. 1-8	"Toolishness is foolishness." Toolishness is an obsession with tools, toys and technology for their own sakes	Seamlessness: Computers are used to enhance other learning activities
In Press 2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum..	Recommends a focus on learning with technology, not about technology;	Seamlessness: Computers are used to enhance other learning activities
2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum..	Information available on-line may not be at the right level for adult literacy students.	Appropriate: The level of computer-accessed content **matches learners' literacy skills.**
2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J.	Information available on-line may not fit well with learning goals and interests of adult literacy students	Appropriate: Accommodations are made for learners with different languages,

Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum..		cultures, and socioeconomic backgrounds.
2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum....	Recommends ensuring equitable, universal access	Appropriate: Accommodations are made for learners with different languages, cultures, and socioeconomic backgrounds.
Peling, W., Hank, W., Tenopir, C. (1999). Users' interaction with World Wide Web resources: An exploratory study using a wholistic approach. Contributed paper to Special Topic Issue of Information Procedssing and Management, Web Research and Information Retrieval.	The problem is that the (web) designers do not appear to understand users' cognitive needs, *** and event he users themselves may not be aware of their cognitive needs or the cognitive approaches considered in the design of the interfaces before them. ***	learners with different languages, cultures, and socioeconomic backgrounds.
2003 Wagner, D. A. and Kozma, R. (2003). New technologies for literacy and adult education: A global perspective. International Literacy Institute, National Center on Adult Literacy, University of Pennsylvania.	Many virtual schools do not meet the social needs of the most disadvantaged learners. Jp. 20	learners with different languages, cultures, and socioeconomic backgrounds.
1999 Blum, K. D. (1999). Providing equitable adult education. Feminista! (2)8. Retrieved April 1, 2004, http://www.feminista.com/archives/v2n8/blum2.html	Knupfer and Rust (1997) suggested that for those organizations striving to provide equitable instruction, "it is important to work together to find common ground between males and females" (p. 1). Therefore, by selecting those pedagogues which not only are successful for CMC-based distance education, but also incorporate elements following those models which allow flexibility for either the separate or connected learner to thrive, distance education can be successful for both male and female students.	. languages, cultures, and socioeconomic

		backgrounds.
2003 Wagner, D. A. and Kozma, R. (2003). New technologies for literacy and adult education: A global perspective. International Literacy Institute, National Center on Adult Literacy, University of Pennsylvania.	"It is clear that the poorest populations (with few exceptions) have neither the literacy (or ICT literacy) skills, not the user-fee resources to take advantage of kiosk-like approaches to ICT access.	Appropriate: The levels of technology **match learners' technology skills**
Wang, P., Hawk, W. B., & Tenopir, C. (1999). Users' interaction with World Wide Web resources: An exploratory study using a holistic approach. Proceedings of the 61st Annual Meeting of the American Society of Information Science, October 25-29, Pittsburgh, PA. pp. 389-399.	The problem is that the (web) designers do not appear to understand users' cognitive needs, *** and event he users themselves may not be aware of their cognitive needs or the cognitive approaches considered in the design of the interfaces before them. ***	Appropriate: The levels of technology **match learners' technology skills**
2001 Daley, B., Watkins, K., Williams, S., Courtenay, B., Davis, M., and Dymock, D. (2001). Exploring learning in a technology-enhanced environment. Educational Technology and Society 4, 3.	In summary, findings of this study indicated that students' attitudes and perceptions towards technology [and the ways in which technology foster the learning climate and structure the learning task] have a major impact on learning outcomes. Students who viewed technology from a negative perspective did acquire and integrate knowledge, but most stopped short of extending and refining that knowledge or using that knowledge in a meaningful way. Students who viewed the technology as positive were able to demonstrate Dimension 2, 3, and 4 of the DOL framework. These findings are consistent with those of Marzano and Pickering (1997).	Appropriate
2003 OECD (2003) Beyond rhetoric: adult learning policies and practices. Paris OECD.	"Many adults lack the skills needed to handle the necessary software and hardware; ICT can be difficult to access and expensive to purchase, and access via the internet can be costly. Where distance education is built into access policies, a face-to-face component is still often important for adults."	Appropriate: The levels of technology **match learners' technology skills**
Imel (l998)	However, because "technology in and of itself does not promote learning" (Burge and Roberts 1993, p. 35), its use does not obviate the educator's responsibility for structuring the learning to ensure these benefits result.	Instructor-Facilitated: Instructors actively assist learners in using

		computers to achieve individual learning goals
2001 Daley, B., Watkins, K., Williams, S., Courtenay, B., Davis, M., and Dymock, D. (2001). Exploring learning in a technology-enhanced environment. Educational Technology and Society 4, 3.	"First, the importance of the students' attitudes and perceptions of the technology is paramount. How students perceive the technology will impact their learning. Thus, on-line instructors need to spend energy, time, and thought in carefully developing the learning climate with the idea that this will impact not only student attitude, but learning outcomes as well" "Second, instructors in on-line environments need to pay careful attention to the structure of the learning tasks. The level of participation and time commitment required will impact both attitude and learning. Clear explanations of the learning task, discussion of the time required, and the creation of learning tasks based on learner interests are all teaching strategies that can be developed in a technology-enhanced environment. " p. 12. "The exciting part of this finding is that facilitating learning climate and developing learning tasks to foster positive attitudes is an activity that instructors can adopt. What surprised the researchers was the strength of the impact that the students' attitudes and perceptions had on their learning in a technology-enhanced environment."	Instructor-Facilitated: Instructors actively assist learners in using computers to achieve individual learning goals
2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum..	Frequent interaction and feedback	Instructor-Facilitated: Instructors provide feedback
2003 Askov, E. N., Johnson, J., Petty L. L., & Young, S. J. (2003). Expanding access to adult literacy with online distance education. National Study for Adult Learning and Literacy [Monograph]. Harvard	" The teacher provides corrective feedback about the tasks (homework), administers and corrects progress tests, and facilitates learning by enhancing students' motivation to stay focused on the learning task." P. 66	Instructor-Facilitated: Instructors provide feedback

Graduate School, Cambridge, MA.		
Imel (l998)	Their (educators) primary role should be to ensure that the focus is on the learning and not the technology.	Instructor-facilitated Actively assist learners in using computers to achieve individual learning goals ‘
1999 Blum, K. D. (1999). Providing equitable adult education. Feminista! (2)8. Retrieved April 1, 2004, http://www.feminista.com/archives/v2n8/blum2.html	"CMC-based distance education which is modeled upon humanistic pedagogues typically follow Roger's assumption that learning will continue through life in a self-directed manner (DeCarvalho, 1991), and is self-initiated. Results of literatures searches suggested that these elements are more attributed to successful male learning than female. However, other aspects of Roger's model suggested that one cannot teach another person directly; we can only facilitate his or her learning (Rogers, 1951). Brookfield's learning theory is similar; it is based on the assumption that adults learn best through facilitation. In addition, Knowles's (1980, 1984) model suggests that adults need a process model of learning which involves the teacher as a facilitator."	Instructor-facilitated
Jamie McKenzie (2003)	The teacher moves about the room, lending a hand, offering a nudge, and patting a back as needed, managing the flow of activities and the well focused hubbub of the classroom with calm and comfort.	
Imel (l998)	In formal learning settings, leadership for using technology effectively rests with the instructor.	Learner-Empowering: Computer use enhances learners' ability to work independently.
Pobega (1996);	Participation in groups;	Learner-Empowering: Computer use enhances learners' ability to work collaboratively
2004 Stites, R. (2004). Implications of new learning	Participation in groups;	Learner-Empowering: Computer use enhances learners' ability to work

technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum..		collaboratively
2003 Wagner, D. A. and Kozma, R. (2003). New technologies for literacy and adult education: A global perspective. International Literacy Institute, National Center on Adult Literacy, University of Pennsylvania.	"First, ITC should be used in the context of group situations to support social engagement related to learning." P. 17	Learner-Empowering: Computer use enhances learners' ability to work collaboratively
2004 Stites, R. (2004). Implications of new learning technologies for adult literacy and learning. In J. Coming, B. Garner & C Smith (Eds.), Review of Adult Learning and Literacy. (Vol 4) Mawah, NJ: Erlbaum..Literacy. (Vol 4) Mawah, NJ: Erlbaum.	Active engagement of learners	Learner-Empowering: Learners choose from a range of learning materials available through computer use.
Cowles (1997); Imel (l998)	Skills are learned best when embedded in context of interest to the learner and when learning is active.	Learner-Empowering: Learners choose from a range of learning materials available through computer