

Technology Acceptance in Education

Research and Issues

Timothy Teo (Ed.)



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Research and Issues

Edited by

Timothy Teo
*Nanyang Technological University
Singapore*



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FOREWORD

The potential of information technology (IT) for enhancing education is intuitively compelling. However, opinions about the value of information technology for teaching and learning range from blue-sky optimism to more doubtful views that educational technology may be wasteful or even harmful. Between these extremes, commentators acknowledge that educational technologies can, under proper conditions, deliver superior learning. We often read advice such as “9 key success factors for harnessing technology for learning” or “how to avoid 37 pitfalls of educational technology.” We need to move beyond simplistic debates about whether or not IT has anything to offer education, and anecdotal tips, toward establishing a base of scientific knowledge about how to get the best out of educational technology.

Clearly, there are noteworthy examples of both success and failure of educational technologies. The success of educational technology hinges on whether it truly delivers value, is perceived as doing so by human participants, and is adopted and used. Without user acceptance, educational technology cannot hope to deliver whatever value it may be capable of in principle. Such reasoning constitutes the theme of this edited collection: what motivates learners, educators, and other stakeholders to accept or reject new educational technologies? How can these motives be influenced by the design features of the technology? How does acceptance depend on contextual contingencies?

These chapters build upon and contribute to scientific knowledge about what motivates people to accept IT in general, based largely on the technology acceptance model (TAM). TAM was originally created in the 1980’s to predict and explain knowledge worker adoption of productivity applications such as word processing, e-mail, and graphics tools. Over the more than two decades since this introduction, the application domains for TAM and its many extensions and refinements have broadened out in several directions to encompass groupware, e-commerce, knowledge management, enterprise resource planning systems, and educational technology. TAM has emerged as a leading scientific paradigm for investigating acceptance of educational technology by students, teachers, and other stakeholders. This collection contains an exemplary sampling of current research in this tradition.

The chapters in this volume span a range of countries and cultures, multiple levels of education from K-12 to higher education to graduate school, a range of technologies including both synchronous and asynchronous, mobile, internet, and virtual reality, and address both teacher and student perspectives. As illustrated by these chapters, discussions of educational technology are moving beyond seemingly paradoxical assertions for and against the universal merit of educational technology toward a more nuanced, principled, evidence-based understanding of the condition for success. The following book makes a substantial contribution toward advancing this endeavor.

Fred D. Davis
University of Arkansas
United States of America

TIMOTHY TEO

1. TECHNOLOGY ACCEPTANCE RESEARCH IN EDUCATION

Technology acceptance can be defined as a user's willingness to employ technology for the tasks it is designed to support. Over the years, acceptance researchers have become more interested in understanding the factors influencing the adoption of technologies in various settings. From the literature, much research has been done to understand technology acceptance in the business contexts. This is understandable, given the close relationship between the appropriate uses of technology and profit margin. In most of the acceptance studies, researchers have sought to identify and understand the forces that shape users' acceptance so as to influence the design and implementation process in ways to avoid or minimize resistance or rejection when users interact with technology. This has given rise to the identification of core technological and psychological variables underlying acceptance. From these, models of acceptance have emerged, some extending the theories from psychology with a focus on the attitude-intention paradigm in explaining technology usage, and allowing researchers to predict user acceptance of potential technology applications.

Traditionally, it has been observed that developers and procurers of technological resources could rely on authority to ensure that technology was used, which is still true in many industrial and organizational contexts. However, with the increasing demands for educational applications of information technology and changing working practices, there is a need to re-examine user acceptance issues as they emerge within and outside of the contexts in which technology was implemented. This is true in the education milieu where teachers exercise the autonomy to decide on what and how technology will be used for teaching and learning purposes. Although they are guided by government policies on how to integrate technology in teaching and learning, teachers spent much of their planning time to consider how technology could be harnessed for effective lesson delivery and assessment to be conducted.

These circumstances have provided the impetus for researchers to examine technology acceptance in educational settings. Although these studies have typically involved students and teachers as participants, their findings have far-reaching implications for school leaders, policy makers, and other stakeholders. In recent years, technology acceptance research has been reported with increasing frequency in education-related journals and this is an indication of its growing importance in the realm of educational research. Against the above backdrop, this book aims to present a focused collection of articles in technology acceptance with special attention on education to inform both educational practitioners and researchers on the practical applications and research issues in technology acceptance.

EXAMINING TECHNOLOGY ACCEPTANCE

The first part of the book focuses on the general issues of technology acceptance research. In chapter 2, Smarkola investigated student teachers' and experienced classroom teachers' computer usage beliefs, intentions, and self-reported computer usage in the classroom using a mixed methodology approach (i.e., quantitative and qualitative), and compared the efficacy of the technology acceptance model (TAM) (Davis, 1989) and the decomposed theory of planned behavior (DTPB) (Taylor & Todd, 1995) for predicting computer usage intentions. Using questionnaire surveys and semi-structured interviews, Smarkola found that, although the TAM was a good predictor of intentions, the DTPB emerged as the more important model for predicting teachers' intentions. Similarities as well as significant differences were found between student teachers' and experienced teachers' computer usage.

In chapter 3, Wong and Teo investigated 245 student teachers' self-reported intentions to use (ITU) computers from a Malaysian higher education institution. Data were collected from student teachers and these were tested against the TAM using the structural modelling approach. The authors found that perceived usefulness (PU) of computer technology, perceived ease of use (PEU), and attitude towards computer use (ATCU) to be significant determinants of ITU. Additionally, the results of the study revealed that (1) PEU significantly influenced PU; (2) both PU and PEU significantly influenced ATCU, and (3) both PU and ATCU significantly influenced ITU. The results supported the efficacy of the TAM to predict student teachers' intention to use technology in Malaysia.

Chapter 4 is a qualitative study conducted by Bennett, Maton, & Carrington who investigated the reasons why digital technologies are adopted by university students in their everyday and academic lives. The findings provided insights into how the 'rules of the game' in different contexts influence the ways in which individuals perceived the utility of a technology and how they used it. This research drew on sociological concepts as an orienting theoretical framework to investigate and conceptualise these differences and considered what they meant for the integration of digital technologies in education. In chapter 5, Teo built a model to predict the level of technology acceptance by pre-service teachers. In this study, the relationships among variables associated with factors that influenced technology acceptance were examined and data were collected from 475 participants using a survey questionnaire. Structural equation modelling was employed to test the fit of a hypothesized model and results revealed that perceived usefulness, attitude towards computer use, and computer self-efficacy have direct effect on pre-service teachers' technology acceptance, whereas perceived ease of use, technological complexity, and facilitating conditions affect technology acceptance indirectly. These six variables accounted for approximately 27.1% of the variance of behavioural intention.

Part I of this book ends with a discussion on the equality of students' learning outcomes in technology-mediated learning. In Chapter 6, Hu and Hui used two experimental studies to examine the students' individual differences and focused on the influences of gender and learning style on technology-mediated learning. Specifically, the variables of interest included learning effectiveness, perceived learnability, and learning satisfaction in technology-mediated learning, with

classroom-based face-to-face learning as a comparative baseline. Overall, the authors found that students benefit from technology-mediated learning differently, depending on their gender. For example, female students considered technology-mediated learning more effective and satisfactory than male students, but their learning motivation was significantly lower than that of their male counterparts.

ACCEPTANCE OF SPECIFIC TECHNOLOGIES

The chapters in Part II discuss the acceptance of specific technologies in education. In chapter 7, Pynoo and his colleagues examined university students' acceptance of Minerva, a web-based course management system (CMS) at Ghent University (Belgium). Minerva allowed students to download and upload files, discuss course contents with their teachers and fellow-students, and consult the official bulletin board, among other functions. In this study, first-time enrolled students of two faculties (medicine and health sciences, and engineering) were surveyed. Data were collected two months after the start of the academic year via an online questionnaire which contained items on variables from the Technology Acceptance Model (TAM) (Davis, 1989) and the Theory of Planned Behavior (TPB) (Ajzen, 1985). The authors found no significant differences between students of the two faculties although an effect of perceived voluntariness of use was noted: the more students perceive use of Minerva as voluntary, the more positive their attitude and the higher their use, but the lower their intention to use Minerva. Turning to another application, Liaw and Huang examined learners' acceptance of mobile learning (m-learning) in chapter 8. In this study, m-learning was facilitated by the convergence of the Internet, wireless networks, mobile devices and e-learning systems. Guided by the Activity Theory, this study found that learner autonomy of using m-learning, perceived interaction of using m-learning, quality of m-learning functions, and perceived satisfaction of using m-learning were positive predictors on m-learning acceptance.

In chapter 9, Van Schaik explored the application of the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) to web sites usage by students in higher education. Both prescribed web sites and user-selected sites were studied using a non-experimental research design and questionnaire-based measures. The results supported direct and moderated effects of technology-acceptance variables on acceptance outcomes in the research model, supporting UTAUT. As predicted, the research model - based on UTAUT - was more successful in explaining the acceptance of a prescribed library site than that of a prescribed virtual learning environment. The model was also successfully applied to user-selected web sites in that user-selected sites were especially intrinsically motivating. The effect of intrinsic motivation on performance expectancy, mediated by effort expectancy, was also confirmed, demonstrating the broad scope of applicability of UTAUT.

In chapter 10, Cheung and Lee examined the gender differences in the relative impact of both extrinsic and intrinsic motivations, as well as the social influence on student acceptance of an Internet-based Learning Medium (ILM). A total of 504 students participated in this study. The results revealed that attitude had the strongest

direct effect on behavioural intention for both male and female students. Perceived usefulness influences attitude and behavioural intention to use an ILM more strongly for male students than it did for female students, whilst subjective norm was a more important factor in determining female students' intention to use an ILM than it was for male students.

Part II concludes with chapter 11 in which Ma and Yuen investigated e-learning systems acceptance using the UTAUT as the framework. An instrument was designed and administered to 128 undergraduate students who were using an e-learning system, named Interactive Learning Network, within one semester of study. Data were collected at the beginning of the semester (Phase A) as well as at the end of the semester (Phase B). The same questionnaire was administered at both Phase A and Phase B and results showed that in both Phase A and Phase B, Behavioural Intention and Satisfaction were determined by Effort Expectancy and Social Influence ($p < 0.001$), with R-sq of 0.519 (Phase A) and 0.615 (Phase B) for Behavioral Intention; and at 0.695 (Phase A) and 0.635 (Phase B) for Satisfaction. Moreover, usage data were extracted from the system, and their correlations with the acceptance factors were examined. In Phase A, a convergent factor effect was found: only usage on "Tasks" was significantly correlated to Social Influence ($p < 0.001$). In Phase B, a divergent factor effect was found: usage on "Course Module" was significantly correlated to Performance Expectancy ($p < 0.05$), while usage on "Announcement" ($p < 0.01$), "My Folder" ($p < 0.05$), and "Resources" ($p < 0.001$) were significantly correlated with Effort Expectancy.

CONCLUSION

In this book, the acceptance of various technologies by teachers and students were examined using various acceptance models that have been employed and validated in the acceptance literature. In addition, various research methodologies were represented in the chapters. Beside traditional techniques, structural equation modelling was used in many chapters as the main technique for data analysis and this is consistent with an observation by Teo (2009) on the popularity of this technique in educational research and, evidenced by the chapters in this book, acceptance research as well. It is hoped that this book will provide insights on technology acceptance in education and motivate researchers to conduct further studies to gain an enhanced understanding of the factors, influences, and forces that drive users in educational settings to adopt and accept technology in ways they are designed, for the betterment of the teaching and learning process to meet educational outcomes.

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TECHNOLOGY ACCEPTANCE RESEARCH IN EDUCATION

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Timothy Teo
Nanyang Technological University
Singapore

EXAMINING TECHNOLOGY ACCEPTANCE

CLAUDIA SMARKOLA

2. A MIXED-METHODOLOGICAL TECHNOLOGY ADOPTION STUDY

*Cognitive Belief-Behavioral Model Assessments
in Predicting Computer Usage Factors
in the Classroom*

ABSTRACT

The purpose of this study was to: a) investigate student teachers' and experienced classroom teachers' computer usage beliefs, intentions, and self-reported computer usage in the classroom using a mixed methodology approach (i.e., quantitative and qualitative), and b) examine the efficacy of the technology acceptance model (TAM) and the decomposed theory of planned behavior (DTPB) for predicting computer usage intentions. This study consisted of a sample of 160 student teachers and 158 experienced teachers from classes within a large urban university. All participants completed a *Computer Usage Intention Survey*. This survey was developed using a theoretical framework of the technology acceptance model (TAM) (Davis, 1989, 1993; Davis, Bagozzi, & Warshaw, 1989). The survey determined participants' beliefs, future intentions usage (for the coming 6 months) and self-reported usage (for the past three months) of integrating computer applications (e.g. Word Processing, Spreadsheets, Database, Multimedia, Internet, Games, Drill and Practice, Simulations, Tutorials, Problem Solving, and educational subject-specific software) into subject-specific lessons. After completion of the *Computer Usage Intentions Survey*, a purposeful sample of the study's participants was selected for semi-structured interviews. This sample consisted of a total of 19 participants, 10 student teachers and 9 experienced classroom teachers. The interview questionnaire was developed using a theoretical framework of the decomposed theory of planned behavior (Taylor & Todd, 1995). Although the TAM was a good predictor of intentions, the DTPB emerged as the most important model for predicting teachers' intentions. Similarities as well as significant differences were found between student teachers' and experienced teachers' computer usage.

INTRODUCTION

With increasing global competition, mastery and application of technologies is vital in nearly every field of human endeavor (U.S. Department of Education Office of Educational Technology, 2004). According to Davis (1989, 1993) an individual's technology acceptance is a crucial factor in determining the success or failure of a

computer systems project. Integrating computers into the classroom in a meaningful way is essential when preparing teachers and students for the 21st century (U.S. Congress, 2000; U.S. Congress Office of Technology Assessment, 1995; U.S. Department of Education, 2002). For meaningful computer education integration to occur it is imperative to first understand teachers' beliefs and intentions toward technology adoption.

Student teachers and experienced teachers believe that it is important to learn to use computers as a tool to integrate computer applications into the classroom (Bliss & Bliss, 2003; Discoll, 2001; Doering, Hughes, & Hoffman, 2003; Schnackenberg, Luik, Nisan, & Servant, 2001; Willis & Sujo de Montes, 2002). Despite the advances made in educational technology, concerns regarding sufficient and competent technology adoption still exist (Brzycki & Dudd, 2005). Wedman and Diggs (2001) commented that teacher education programs have relied more on technology utilization courses rather than creating authentic learning environments where technology is pervasive and integral. Benson, Farnsworth, Bahr, Lewis, and Shaha (2004) found that student teachers felt comfortable with the technology they learned, but did not feel comfortable in teaching it to school children. Swanson (2006) noted in the Education Week Technology Counts Edition that only 26 states have policies in place to help ensure teachers are competent in technology. Hall (2006) found that faculty and K-12 teachers successfully modeled technology standards for student teachers, but many activities were focused on lower cognitive skills. Thus, it remains crucial that teacher technology adoption and acceptance issues be researched to better thoroughly understand teachers' behavior for using technology.

Technology Acceptance

Two technology acceptance models were used to measure teachers' computer usage beliefs and intentions: (a) the technology acceptance model (TAM) (Davis, 1989, 1993; Davis, Bagozzi, & Warshaw, 1989), and (b) the decomposed theory of planned behavior model (DTPB) (Taylor & Todd, 1995). Although TAM is a parsimonious model and a good predictor of computer usage, the DTPB is an extended model to better understand determinants of computer usage intentions. Descriptions of each of the models are explained below along with graphic representations depicted in Figures 1 and 2.

Technology Acceptance Model (TAM)

Davis's TAM was adapted from the theory of reasoned action (TRA) proposed by Fishbein and Ajzen (1975). Davis et al. (1989) found TAM to be a better predictor than TRA of intentions in using software. TAM predicts that user acceptance of technology is determined by three factors: (a) perceived usefulness, (b) perceived ease of use, and (c) behavioral intentions. Davis et al. found that both perceived usefulness and perceived ease of use directly mediated behavioral intentions (with perceived ease of use also having a direct effect on perceived usefulness). In turn, behavioral intentions were found to be a strong predictor of actual use (See Figure 1) (Davis et al.; Taylor & Todd, 1995).

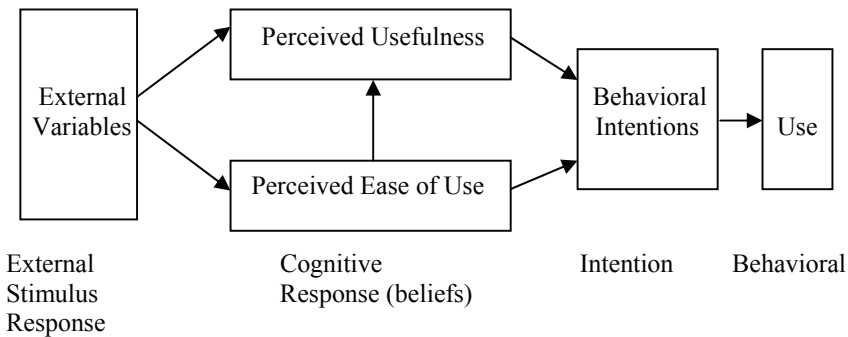


Figure 1. Technology acceptance model (TAM).

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The TAM instrument has been used extensively by researchers investigating a range of issues in the area of user acceptance, such as the World Wide Web and software utilization (Dishaw & Strong, 1999; Lederer, Maupin, Sena, & Zhuang, 2000; Moon & Kim, 2001). More recently, the TAM has been used in educational settings to investigate various issues including: a) student acceptance of online courses, b) course websites as effective learning tools, c) online student communication for a class project, d) e-learning (e.g., WebCT) in undergraduate courses, e) gender differences in preservice teachers, and f) student teachers' perceptions of computer technology in relationship to their intention to use computers (Drennan, Kennedy, & Pisarski, 2005; Gao, 2005; Kelleher & O'Malley, 2006; Ma, Anderson, & Streith, 2005; Ngai, Poon & Chan, 2007; Ong & Lai, 2006; Pan, Sivo, Gunter & Cornell, 2005; Pituch & Lee, 2006; Selim, 2003; Yuen & Ma, 2002).

Davis (1989,1993) suggested that further studies needed to be performed to extend TAM to determine the types of external variables, such as, computer self-efficacy and training that could influence the motivating belief factors of perceived usefulness and perceived ease of use. The decomposed theory of planned behavior was developed to further expand TAM to incorporate factors that were not addressed by Davis (Taylor & Todd, 1995).

Decomposed Theory of Planned Behavior (DTPB)

The decomposed theory of planned behavior (Taylor & Todd, 1995) was adapted from the theory of planned behavior (TPB) proposed by Ajzen's (1985). The TPB uses direct measures of *attitudes*, *subjective norms* (i.e. others' influence on a person's behavior), and *perceived behavioral control* [i.e. the extent to which users have control over their behavior which is determined by the person's internal (e.g., skills) and external (e.g., resources, opportunities, etc.) constraints] to predict intention and in turn behavior. In addition, the model includes cognitive belief-based determinants to measure attitudes, subjective norm and perceived behavioral control. Taylor and Todd specified relevant beliefs for attitudes, subjective norm and

perceived behavioral control regarding technological behavior. They identified *perceived usefulness*, *ease of use*, and *compatibility* beliefs to explain attitudes; *peer influence* and *superior's influence* to explain subjective norm, and; *self-efficacy* and *facilitating conditions* (i.e. resource constraints/support) to explain perceived behavioral control. See Figure 2.

The predictive power for behavior of the DTPB is similar compared to the TPB and TAM. Taylor and Todd (1995) stated that the DTPB is a more complex model than TAM and only slightly increases the predictor power of behavior. They advise colleagues that if the research goal is to predict computer usage then researchers may find TAM the preferred model because of its parsimonious construct. However, Taylor and Todd stated that those researchers who are looking for a more comprehensive perception of intentions should consider the decomposed theory of planned behavior model.

PURPOSE

The present study was conducted to investigate student teachers' and experienced classroom teachers' self-reported computer usage and computer usage intentions in the classroom using a mixed methodological approach. The primary purpose of the study was to investigate student and experienced teachers' a) self-reported computer usage of computer integration activities in a K-12 school environment, and b) future intentions to integrate computer applications within a K-12 school environment. The secondary purpose was to assess the efficacy of the technology acceptance model (TAM) and the decomposed theory of planned behavior (DTPB) for predicting intentions to use computers.

A Computer Usage Intentions Survey and semi-structured interviews were undertaken to address the following research questions:

Self-Reported Usage

1. What factors predict student teachers' and experienced classroom teachers self-reported computer usage?
2. Do student teachers and experienced classroom teachers differ in their self-reported computer usage?

Intentions to Use

3. Does the field practicum experience change student teachers intentions to use computers?
4. Do student teachers and experienced classroom teachers differ in their intentions to use computers?
5. What factors predict student teachers' and experienced teachers' computer usage intentions?

Assessment of Technology Behavioral Models

6. How effective are the technology acceptance model and the decomposed theory of planned behavior in predicting intentions to use computers.

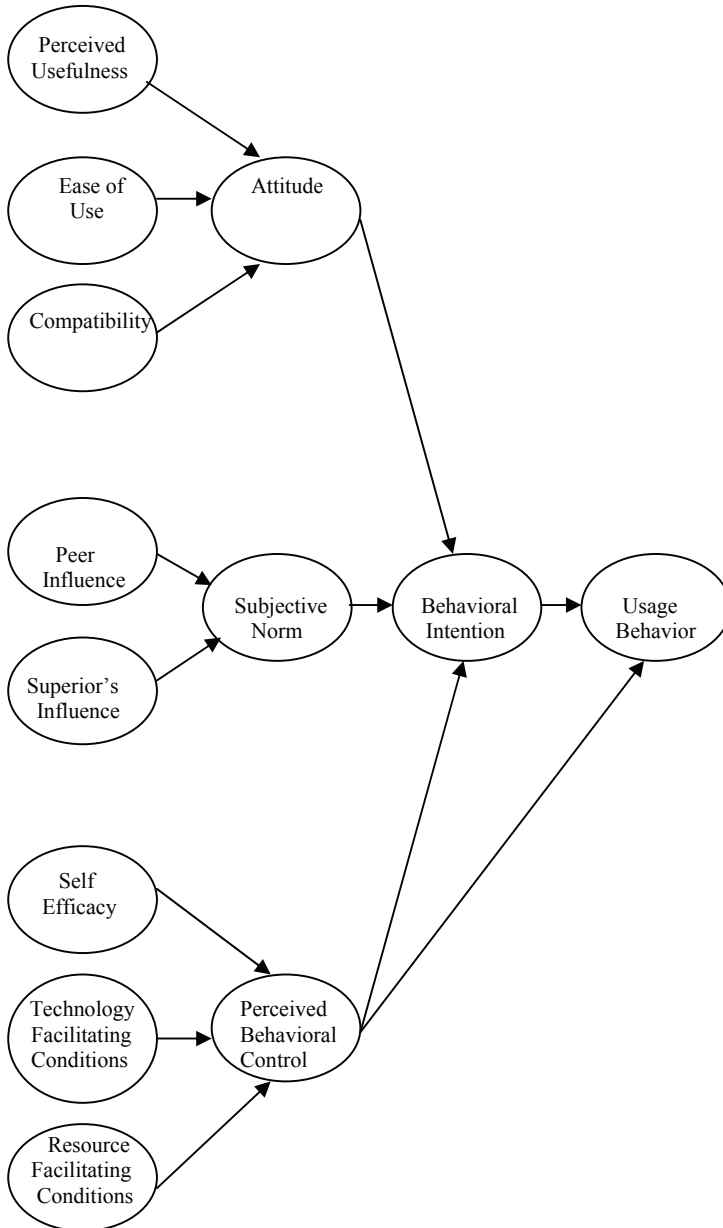


Figure 2. Decomposed theory of planned behaviour.

Reprinted by permission, S. Taylor and P. Todd, *Understanding information technology usage: A test of competing models*, *Information Systems Research*, 6(2), 1995. Copyright (1995), the Institute for Operations Research and the Management Sciences (INFORMS), 7240 Parkway Drive, Suite 300, Hanover, Maryland 21076, USA.

METHODOLOGY

This study consisted of a dominant quantitative-less dominant qualitative, sequential, mixed-method design to explain factors in computer usage intentions and behavior among educators (Tashakkori & Teddlie, 1998). The quantitative design consisted of a total of 318 teachers who completed a Computer Usage Intentions Survey (Smarkola, 2007) followed by qualitative design with a purposeful sample of 19 teachers who participated in an interview (Smarkola, 2008a). The survey was adapted from the TAM and the interview questions were adapted from the DTPB.

QUANTITATIVE METHODS

Sample and Procedures

The present study employed a convenience sample of 160 student teachers and 158 experienced classroom teachers from classes within a large urban university. Participants completed a Computer Usage Intentions Survey that consisted of four sections: (a) demographic characteristics, (b) self-reported computer integration usage (for the preceding three months), (c) future intentions usage (for the upcoming six months) of integrating computer applications (e.g. Microsoft Office, Multimedia, Internet, etc.) into subject-specific lessons, and (d) perceived ease of use and perceived usefulness of integrating computer applications into subject-specific lessons.

A pre-test and post-test Computer Usage Intentions Survey was distributed to student teachers during one spring semester period. To ensure informed consent, the survey was accompanied by a cover letter mandated by the University IRB office. Students were asked to put the last four digits of their social security number on the survey so that students felt they could remain anonymous and so that pre-post test analysis could be conducted by the researcher. Student participants completed the pre-test within the first two weeks of the semester. They completed the post-test within the last two weeks of the semester. The students were given 10 minutes to complete the survey. Of the 160 student teachers who completed the survey, 110 participated in both the pre- and post-tests. The pre-post test attrition rate was largely due to the fact that graduating seniors did not feel committed to attending their final classes.

The same Computer Usage Intentions Survey was also distributed to K-12 experienced classroom teachers who were students in two College of Education Graduate Programs (i.e., Teacher Apprenticeship Program and Master of Science in Education). There were 158 experienced teachers that participated in a one-time only completion of this survey. Both student and experienced teacher respondents voluntarily provided their contact information on this survey to participate in a 30–45 minute interview.

Instrument

The TAM instrument (Davis, 1989, 1993) uses multiple item scales for its three measures of perceived usefulness, perceived ease of use, and behavioral intentions. The TAM can be readily adapted as an assessment instrument in a variety of technology contexts. An item can be revised by substituting the type of technology

in question in the sentence stem, for example, "WordPerfect is often frustrating," "software maintenance tools are often frustrating," or "integrating computer application use into subject specific lessons is often frustrating." The Computer Usage Intentions Survey for the present study focused on the sentence stem of integrating computer application use into subject specific lessons.

The item format is a 7-point (from strongly agree to strongly disagree) Likert type rating. A high degree of convergent and discriminant validity was found for perceived usefulness and perceived ease of use (Davis, 1989). Reliability testing (Davis; Davis & Venkatesh, 1996) showed Cronbach alpha coefficients exceeding .90 for perceived usefulness, perceived ease of use and behavioral intentions. The TAM instrument has been widely validated (Davis & Venkatesh; Doll, Hendrickson, & Deng, 1998; Hendrickson & Collins, 1996; Karahanna & Straub, 1999; Szajna, 1996).

For the current study, the instrument consisted of five items for the perceived usefulness scale, four items for perceived ease of use scale, and two items for behavioral intentions scale. The item format was a 7-point Likert scale (i.e., 7 = *strongly agree* to 1 = *strongly disagree*). A principal axis factor analysis with varimax rotation was performed on the combined student and classroom teacher data. The factor analysis yielded the following factors: (a) behavioral intentions, (b) perceived usefulness, and (c) perceived ease of use. Thus, this survey maintained the three main constructs of behavioral intentions, perceived usefulness and perceived ease of use that constitute the technology acceptance model (Davis et al., 1989).

A Cronbach alpha reliability analysis was done to determine the internal consistency for the items within each of the three factors. Reliability scores for intentions, perceived usefulness and perceived ease of use were .92, .93 and .75, respectively.

QUALITATIVE METHODS

Sample

Of the 160 student teachers and 158 experienced teachers who completed the Computer Usage Intentions Survey, 54 student teachers and 64 experienced classroom teachers volunteered to be interviewed. The goal of choosing interviewees was to get participants who best represented each of their teacher groups' beliefs and intentions. It was important to acquire a homogeneous interview group for the student teachers and for the experienced teachers to make conclusions about *typical* units of analysis regarding each groups' normative (i.e., most common) computer beliefs and intentions (Tashakkori & Teddlie, 1998). Thus, teachers of their respective groups were purposefully selected at or near the mean of their groups' beliefs and intentions from the Computer Usage Intentions Survey until saturation of content emerged during the interview process (Merriam, 1998). This resulted in an interview sample of 19 participants, specifically 10 student teachers and 9 experienced teachers. The interviews were held at a time and location most convenient to the participants (i.e., researcher's office, participants' K-12 school, or participants' college course classroom-before or after class). All interview participants agreed to be tape recorded and signed an Audiotape Consent Form.

All interviewees were demographically identified through an 11 digit interviewee identification key code (see Appendix A). Demographic totals for both teacher

groups were diverse in nature. The sample of 10 student teachers consisted of 8 females and 2 males; 7 were White, 1 Black, 1 Asian, and 1 other. Five student teachers taught in the city and 5 in the suburbs; there were 5 elementary, 2 middle school, and 3 high school teachers. The sample of 9 classroom teachers consisted of 3 males and 6 females; 8 were white and 1 black. Five classroom teachers taught in the city and 4 in the suburbs; there were 4 elementary, 3 middle school, and 2 high school teachers.

Interview Instrument

The DTPB framework was chosen for the qualitative procedure because it provided for a more in-depth analysis of computer acceptance that was fundamental for acquiring participants' perceptions during the interview process. Interview questions for this study were written to be consistent with the variables associated with the DTPB.

In this study, the semi-structured interview computer usage questionnaire focused on the following four main categories supported in the DTPB: intentions, attitudes, subjective norms (i.e., peer influence and superior's influence), and perceived behavioral control (i.e., self-efficacy, external constraints, support, training). An additional belief, *perceived consequence*, was not proposed in the DTPB but was included in this study's interview computer usage questionnaire. According to Triandis's (1971) behavioral intentions model, perceived consequence is an individual's evaluation of potential rewards gained by performing an act. Thus, perceived consequence is a belief measure for an individual's choice of behavior based upon potential rewards (i.e., teachers' job opportunity, job security, and meaningful work). Additionally, the interview began with a *grand tour* question that asked what the interviewee thought about the role of computers and education.

Qualitative Analysis

A qualitative analysis of participant interviews was made using the Constant Comparative Method (Merriam, 1998). An independent transcriber was hired to transcribe all interviews verbatim. After this transcription process, the transcripts were repeatedly read by the researcher and initial content codes (e.g., high/low computer confidence, more/less computer training, etc.) were created from content found in the transcripts. These initial content codes were documented on the transcripts. The initial content codes were then analyzed to determine how they were related to support or reflect a general theme or topic. Themes were created and placed into a category development table (Constatas, 1992).

Qualitative Verification

Peer examination was performed on the typed interviews. An impartial researcher not involved in the study examined the category development of the interview data, looking for disconfirming or negative cases. Method triangulation was also used in the research process to aid in the trustworthiness of the analysis. Participants' responses from the interviews were matched to their responses on the Computer Usage Intentions Survey. Additionally, conversations were audio taped during the

interviewing process and verbatim quotes were used as part of this study's results. Furthermore, a code mapping analysis procedure of student teachers' and classroom teachers' interviews was documented. According to Anfara, Brown, and Mangione (2002) code mapping is part of an audit trail that provides readers with disclosure of the interview process and adds to the trustworthiness of the analysis. Additionally, multiple theories, specifically, the technology acceptance model and the decomposed theory of planned behavior were used to help interpret and explain the data (Tashakkori & Teddlie, 1998).

RESULTS

Demographic Statistics

The sample of 160 student teachers consisted of 69.6% (n = 110) females and 30.4% (n = 48) males. Eighty percent (n = 125) were White, 9% (n = 14) African American, 1 % (n = 2) Hispanic, 5 % (n = 8) Asian/Pacific Islander, and 5 % (n = 8) Other. In the sample of 158 experienced classroom teachers, 71.7% (n = 114) were female and 28.3% (n = 45) were male. Eighty-five percent (n = 135) were White, 7.5% (n = 12) African American, 2.5 % (n = 4) Hispanic, 1 % (n = 2) Asian/Pacific Islander, and 4 % (n = 6) Other. (Demographic data do not equate to original samples sizes because some participants did not complete all items.) Experienced teachers varied in number of years in teaching: (a) 57.9% had 1 to 3 years of teaching experience, (b) 17.6% had 4 to 6 years, (c) 6.9% had 7 to 9 years, and (d) 17.6% had over 10 years.

Forty-two percent of student teachers taught in the city, 51% in a suburban area and 7% in a rural district. Thirty-one percent of experienced teachers taught in the city, 66% in a suburban area and 3% in a rural district. Percentages of student teachers teaching in the following grades were: (a) 58% in K-5 grades, (b) 10% in 6-8 grades, and (c) 32% in 9-12 grades. Percentages of experienced classroom teachers teaching in the following grades were: (a) 48% in K-5 grades, (b) 24% in 6-8 grades, and (c) 28% in 9-12 grades.

Approximately 94% of student and classroom teachers had four or more years of computer experience, and 95% had a home computer. About half (46%) of the student teachers were skilled at using both MacIntosh and PC; half (50%) were skilled at using only the PC, and a small percent (3%) were skilled using only the MacIntosh. About half (51%) of classroom teachers were skilled at using both MacIntosh and PC; nearly half (44%) were skilled at using only the PC, and a small percent (5%) were skilled using only the MacIntosh.

Although computer usage experience between student and experienced teachers are similar, a significant difference was found among types of training that student teachers and classroom teachers felt most contributed towards their computer skill development, $\chi^2(3, N = 318) = 14.369, p = .002$. Approximately 60% of student teachers reported being self-taught, 28.1% took college courses, 8.8% learned on-the-job, and 2.5% received other types of training. Approximately 44% of experienced teachers reported being self-taught, 29.1% took college courses, 20.3% learned on-the-job, and 6.3% received other types of training. About 85% of both student and classroom teachers noted that their school made computer resources readily available to them.

Demographic data of the 160 student teachers and 158 experienced teachers regarding their self-reported computer software usage is given in Tables 1, 2, 3 and 4.

Table 1. Percentage of teachers' requiring student assignments using computer software

	<i>Student teachers</i>	<i>Experienced teachers</i>
Word processing	69%	67%
Spreadsheet	08%	06%
Database	03%	04%
Multimedia/Presentation	25%	28%
Internet	68%	75%
Subject Specific	29%	42%

Table 2. Percentage of teachers' using the computer to complete work assignments (e.g., lesson planning, teaching, grading, etc.)

	<i>Student teachers</i>	<i>Experienced teachers</i>
Word processing	96%	96%
Spreadsheet	44%	56%
Database	13%	21%
Multimedia/Presentation	35%	33%
Internet	88%	91%
Subject Specific	26%	45%

Table 3. Percentage of teachers facilitating types of instructional software with students

	<i>Student teachers</i>	<i>Experienced teachers</i>
Drill and Practice	42%	46%
Tutorial	36%	34%
Problem Solving	25%	34%
Games	44%	51%
Simulations	17%	17%
Research & Searches	42%	50%

Table 4. Teachers' computer usage in the past three months

	Times Used Computer in Past Three Months						
	None	1-6	7-12	13-18	19-24	25-30	>30
Student Assignments							
Student Teachers	29%	40%	13%	10%	2%	1%	5%
Experienced Teachers	26%	39%	17%	4%	5%	2%	7%
Teach Lessons to Students							
Student Teachers	44%	40%	10%	2%	1%	2%	1%
Experienced Teachers	40%	39%	9%	4%	3%	2%	3%
Administrative Work							
Student Teacher	5%	8%	6%	5%	8%	6%	62%
Experienced Teacher	2%	12%	9%	11%	10%	5%	51%

*Results for Self-Reported Usage**Research Question #1 – Factors Predicting Self-Reported Computer Usage*

A multiple regression analysis (see Table 5) of student teacher data was performed to investigate student teachers' perceived ease of use, perceived usefulness, and intention factors predicting: (a) student assignments requiring computer usage, (b) student teachers using the computer to teach lessons to students, and (c) student teachers using the computer to complete work assignments (e.g., lesson planning, grading, etc.). Results showed that both perceived ease of use and perceived usefulness predicted student teachers' computer usage in teaching lessons to their students. However, perceived ease of use and perceived usefulness explained only 15% of the variance for this computer usage. No statistical significance was found for factors predicting student assignments requiring computer usage or student teachers using the computer to complete their work assignments.

A regression analysis (see Table 6) of experienced teacher data was performed to investigate teachers' perceived ease of use and perceived usefulness predicting: (a) student assignments requiring computer usage, (b) teachers using the computer to teach lessons to students, and (c) teachers using the computer to complete work assignments (e.g., lesson planning, grading, etc.). Results showed that perceived usefulness predicted teachers' computer usage to teach lessons to their students. Perceived usefulness explained 14% of the variance in computer usage. Teachers' perceived usefulness predicted student assignments requiring computer usage. Perceived usefulness explained 15% of the variance in student computer usage.

Table 5. Regression analysis for student teachers' self-reported usage

<i>Variables</i>	<i>β</i>
Computer Usage for Teaching Lessons	
Perceived Ease of Use	.242**
Perceived Usefulness	.250*
Adj. $R^2 = .146$	

* $p < .05$.** $p < .01$.*Table 6. Regression analysis for experienced teachers' self-reported usage*

<i>Variables</i>	<i>β</i>
Assigning Student Computer Lessons	
Perceived Usefulness	.297**
Adj. $R^2 = .138$	
Computer Usage for Teaching Lessons	
Perceived Usefulness	.371**
Adj. $R^2 = .146$	

** $p < .01$.

Research Question #2 - Differences in Teacher Groups' Self-Reported Computer Usage

An omnibus MANOVA (Wilks' Lambda = 2.597, $p = .053$) showed that there were no significant differences among the usage activities (i.e., student assignments requiring computer usage, teachers using the computer to teach lessons to students, and teachers using the computer to complete work assignments in lesson planning, grading.). Within a three month period, over half of student and experienced teachers used the computer at least 30 times to complete administrative tasks. During the same time period, about 40% of student and experienced teachers used computer software one to six times in their teaching and for student computer-related assignments.

Analysis revealed a statistically significant difference between the types of software used by the teacher groups. Results showed a statistically significant difference between the teacher groups for spreadsheet use, $\chi^2(1, N = 292) = 3.949$, $p = .047$. About 44% of student teachers and 56% of experienced teachers used spreadsheets in their jobs. There was also a difference between the groups for subject specific software, $\chi^2(1, N = 293) = 10.708$, $p = .001$. Twenty-six percent of student teachers used subject specific software compared to 45% of experienced teachers who used this type of software. There were no statistically significant differences between the teacher groups' usage of database, multimedia/presentation, Internet and Word processing; however, Internet and Word processing were used much more than the other types of software.

Additional analysis showed a significant difference between the teacher groups in educational software usage with their students, $\chi^2(1, N = 289) = 6.312$, $p = .012$. Seventy four percent of student teachers used educational software compared to 86% of classroom teachers who did so. There were no significant differences between the teachers groups as to the kinds of educational software used (i.e. drill and practice, tutorials, games, simulations, problem solving, research searches). There was a statistically significant difference between student teachers and classroom teachers in their students' use of subject-specific software, $\chi^2(1, N = 293) = 4.342$, $p = .037$, (29% and 42%, respectively). There were no significant differences between the teacher groups engaging their students in using general utility programs such as, word processing, spreadsheet, database, multimedia/ presentation software, and the Internet. However, both teacher groups asked their students to use Internet and Word processing more than the other general utility and subject-specific programs.

Results for Intentions

Research Question #3 - Pre-Post Testing on Student Teachers' Computer Usage Intentions during their Student Teaching Experience

A statistically significant difference on computer usage intentions, $t(108) = -2.557$, $p < .05$ was found between student teachers' in their pre-test ($M = 10.71$, $SD = 2.85$) and post-test responses ($M = 11.49$, $SD = 2.55$). A statistically significant difference was also found between student teacher pre-test data ($M = 17.56$,

$SD = 4.64$) and post-test data ($M = 18.60$, $SD = 3.79$) on perceived ease of use $t(107) = -2.849$, $p < .05$. No statistically significant difference was found for perceived usefulness.

Research Question #4 – Teacher Group Differences in Intentions to Use Computers

A MANOVA was performed between teacher groups on: (a) perceived ease of use, (b) perceived usefulness, and (c) intentions. No statistically significant differences were found between student teachers (using the post-test data) and experienced classroom teachers in their perceived ease of use, perceived usefulness, and intentions (Wilks' Lambda = 1.0312, $p = .379$). Mean differences between teacher groups in their perceptions and intentions are shown in Table 7.

Table 7. Mean ratings of student and experienced teachers in computer usage perceptions and intentions

	<i>Student teachers</i>	<i>Experienced teachers</i>
Perceived Ease of Use	4.63	4.39
Perceived Usefulness	5.07	5.01
Intentions	5.69	5.38

Note: Mean ratings scaled to item Likert scale 1 = Strongly Disagree to 7 = Strongly Agree.

Research Question #5 – Factors Predicting Computer Usage Intentions

Quantitative Results

A multiple regression analysis of student teacher pre-test data showed that perceived ease of use ($\beta = .281$, $p < .001$) and perceived usefulness ($\beta = .576$, $p < .001$) predicted computer usage intentions. Both perceived ease of use and perceived usefulness explained 48% (Adj. $R^2 = .478$) of the variance in computer usage intentions. A regression analysis of student teacher post-test data showed that perceived ease of use ($\beta = .180$, $p < .01$) and perceived usefulness ($\beta = .634$, $p < .001$) predicted computer usage intentions. These variables explained 50% (Adj. $R^2 = .498$) of the variance in computer usage intentions.

A multiple regression analysis for experienced teachers showed that perceived ease of use ($\beta = .201$, $p < .001$) and perceived usefulness ($\beta = .601$, $p < .001$) predicted computer usage intentions. These variables explained 50% (Adj. $R^2 = .500$) of the variance in computer usage intentions.

Qualitative Results

Student Teacher Results

The following four themes emerged from the student teacher interviews: (a) The Value of Computers to Teaching and Learning, (b) Make Way for Learning Through

the Internet (c) Wanted – Computer Training in First Year Teaching, and (d) High Personal Computer Confidence. Details of each theme for the student teacher participants are discussed below (Note: Comments are followed by teachers' identification key code, see Appendix A for more details):

The value of computers to teaching and learning. When student teacher participants were asked about the role of computers and education, all 10 participants in some way made a point about the value and/or importance of computers in education. Examples of student teacher comments are documented below.

- I think now today more than ever it's more important than it has been....whether it's in the classroom or outside the classroom....It's kind of a necessity as I said before, you can't get around it. Either use it and keep up or get left behind and that's not really an option in education. (ST-FW-SMI)
- I think they are important. If you don't have a computer you're left behind and none of these students have them. (ST-FB-CHI)
- I feel it plays a very important role in education because technology is involved more in the students' everyday lives. (ST-FA-CEL)
- I think the biggest thing is it's there, so use it like any other resource you have. (ST-MW-CHI)

Student teachers saw the value and usefulness of computer usage within the classroom; this usefulness was driven by internal and external motivations. During the interview, student teachers described their internal motivations for computer usage as: (a) feeling computer usage was compatible with the way they work, (b) recognizing the need for their students to learn computers to facilitate learning within the classroom, and (c) seeing the necessity to enhance students' future prospects outside the classroom (e.g. within society). External motivations for computer usage within the classroom were driven by student teachers' perception of societal and school administration needs. Additionally, all participants thought that having computer experience was valuable because it would make them more marketable and provide them with more job opportunities. Examples are documented below:

- Increase (job opportunity) because if you say no I don't like to do computers – you can't do that, you have to that's what they (administration) look for. (ST-FW-SMI)
- ...I think a lot of schools are now trying to integrate technology as much as possible because technology is such a big part of our lives now. (ST-FW-SEL)
- I think it would increase. You see even administrators may not know anything about computers but it is such that technology is a buzzword. You should know it...(ST-MW-CHI)
- Increase (job opportunity)....I think that if I said I hate computers, you will get a red check on your interview sheet. (ST-FW-SEL)

The Value of Computers to Teaching and Learning theme supports findings in the Computer Usage Intentions Survey (quantitative part of the mixed-method research), where perceived usefulness (a factor of TAM) was found to be a statistically significant predictor of student teachers' computer usage intentions to integrate computer applications within their subject-specific lessons.

Make way for learning through the Internet. When asked about the role of the computer in the classroom and the student teachers' intentions on using the computer, it became apparent that all 10 participants were primarily discussing computer integrated lessons using the Internet as opposed to the use of other types of software applications. This theme was reasonably supported by the self-reported usage data from the Computer Usage Intentions Survey that showed 88% of student teachers used the Internet (e.g., planning, teaching, etc.) for their job, and 69% of these teachers asked their students to use the Internet. The survey data showed that student teachers ranked only word processing usage higher than the Internet.

While discovering a pattern of Internet usage during the interviews, the participants were asked *why* they seemed to focus on the Internet.

- I like to look through and find things (on the Internet) like that because software is so expensive to buy especially if you're going for different subject areas and stuff....But I like to find things on the Internet also so that my children can go home and actually use them too. Cause you can't lend out that software. (ST-FW-SEL)
- The Internet is so up-to-date, it's so here. The Internet is so immediate and there are so many activities....A lot of things that software does provide, is becoming available on the Internet, either downloadable from the Internet or on the Internet. And software gets outdated quickly. And the stuff can be really expensive.... I think that could be a great family connection because teachers are always looking for ways for students to transfer - what I have heard in school I can do at home. (ST-FW-SEL)
- Through a lot of my grade programs we've had to search the Internet sources and I've found simulations on the Internet where you don't have to buy them....There is software, but it costs more money. So I think I could have benefited from seeing a dissection and having it on the Internet and that way an animal is not being harmed and students aren't getting yucky and throwing organs around and you could actually see systems. (ST-FW-SMI)
- I couldn't even name any software. I focus on the Internet cause that's all I know about realistically and I'd be overjoyed with what I can do with all these different things. It's so accessible to people, it's everywhere....I think about communications with people around the world. Even if you could only pull it off once a semester or once a year. Some country where there might be a lot of stereotypes.... Just communicate with this classroom or this group of people. (ST-MW-CHI)

The student teachers' own experiences with the Internet were positive. The participants saw the Internet as a useful, accessible, and an inexpensive source, and thus, related the relevance of the Internet to the students they would be teaching. The student teachers felt comfortable using the Internet and saw how they could transfer these positive experiences to teach their children to use and learn from the Internet.

Wanted – computer training in first year teaching. Although the student teachers found their college educational technology course extremely valuable, this experience alone was not enough for them to feel fully prepared in applying computer-integrated lessons within their classrooms. Even though the Computer Usage Intentions

Survey (quantitative results) reported that student teachers mostly used the Internet and Word to support their field experience, the interviews (qualitative results) indicated that only 5 of the 10 of the student teachers had the opportunity to actually use computers within a classroom during their practicum or student teaching experiences.

As training and support issues were discussed with the participants, a pattern of responses emerged indicating that most of the student teachers wanted more training and support using computers in their classroom during the first year of their teaching. Much of their discussions centered on learning how to use computers within their lessons rather than technical hardware/software support. Below are examples of the types of training student teachers would like to see as a first year teacher.

- Training of different software and the different ways of using the computer integrating it into your curriculum. (ST-FA-CEL)
- Probably another mentor teacher who knows exactly what they're doing by computers or who has example lessons of how to integrate computers and lessons. I would like to see that teacher in action. (ST-MW-SEL)
- But I would ask teachers who have been in this thing for a while what kind of lessons would they choose to do with computers. Cause it is real important what you decide to do and how you decide to do it. (ST-FB-CHI)
- I'm looking for a school that has good professional development and a good curriculum reader that I can go to for curriculum ideas. I would like to see one person in the school who knows a lot about computers to brainstorm with. (ST-FW-SMI)
- I know that you're suppose to have a teacher with you now as kind of a mentor so it would be nice if they were up on technology and how to use it. (ST-FW-CEL)
- I would like to see some kind of presentation made to me as to what the possibilities are available to me....something that would clue in the staff what can be done on the computer. (ST-MW-CHI)

High personal computer confidence. Although the participants felt there was a severe lack of computer resources in the schools, they still felt confident that they would infuse technology into their own classrooms. On a scale on 1–10 (1 = low confidence and 10 = high confidence), the average confidence rating among the student teachers for carrying out computer-integrated lessons in their classrooms was an eight. Although, student teacher participants had high computer confidence, they discussed the use of computers in a limited way, primarily focusing on Internet usage (see theme, Make Way for Learning Through the Internet)

During the interview process, the participants discussed their valuable prior training which contributed in providing a foundation for the student teachers' high confidence and willingness to use computers in their classroom. Examples are documented below:

- Yea, the technology in the classroom (course) was really a valuable one. They gave us valuable websites that they knew about and how to demonstrate to children how to use certain programs like PowerPoint and Word. And they also gave us some interesting activities to do with the kids related to computers.... I actually feel more comfortable doing something with a computer... (Rated herself a confidence of 9.) (ST-FW-SEL)

- The 255 class was when I actually had to use the software....I didn't even think of educational software at that time....I wasn't in the educational set yet. But it was great to be able to learn how to do that....There are probably some things I don't know yet, like educational software. I feel like I have to play around with this stuff and then I would be Okay. (Rated herself a confidence of 8.) (ST-FW-CEL)
- But the one that actually taught you how to use it (computer) in the classroom was 255....Yes I did, definitely (find it valuable). Cause there are things you might not have thought about, that class helps you think about. Oh, Wow, I could do that with this...plus it becomes more familiar. There's nothing worse than going on a computer and not knowing how to tell the kids how to use it. (Rated herself a confidence of 8.) (ST-FW-SMI)

Experienced Teacher Results. The following four themes emerged from the classroom teacher interviews: (a) School Support Necessary, (b) Personal Perseverance for the Computing Cause, (c) More Computer Integrated Training Wanted, and (d) High Personal Computer Confidence with Support. Details of each theme for the experienced teacher sample are discussed below (Note: Comments are followed by teachers' identification key code, see Appendix A for more details):

School support necessary. Overall, classroom teachers who received support reported using many different types of software. Computer Usage Intentions Survey data (quantitative results) from this study support this finding. Statistical results from the survey showed that experienced teachers significantly used more spreadsheet and subject-specific software than did student teachers. Experienced teachers also asked their students to use subject-specific software more often than did student teachers. Furthermore, classroom teachers used educational software (e.g. drill and practice, problem solving, games, and research) in their classroom with their students more often than did student teachers.

Experienced teachers depended on both equipment resources and personal support from school administrators to successfully integrate technology into their classroom. Three of the nine teachers who did not have the appropriate resources and support could not integrate computer applications into their classroom as they would have liked, and expressed aggravation or frustration with the situation. Psychologically, it appeared that the teachers who had more school support appreciated this support and felt good about providing their students opportunities to enhance their learning. Examples of supportive and non-supportive remarks are noted below.

Supportive statements.

- So, um, over the years, we've had trainings as we got new computers in our classroom and in our building....And, of course, the principal likes seeing that cause I'm working on the computer....But obviously the more that we do with computers and technology, the more he likes it. So, I have tried like I said, at least once a day, the children are on the computer or they're using some kind of technology, even those centers. (CT-FW-SEL16)
- I've always had support from my principals....I guess you could say that I've gotten support from the district in some way because they put the computer in

the classroom....and luckily I did get support from the cluster leader. They (the students) using pick one of the software disks that we have out that are available, they've gotten to know the different programs....It's not like one program is stuck in there and that's all they can use. (CT-MW-CEL08)

- Well, a lot of it (computer application usage) was mandated by the district. (Note: She has three computers in her classroom and the school has a mobile laptop lab.) Like CCC and Earobic, these are things that they (students) are required to do. The other programs are just to support my teaching in the curriculum. (CT-FW-SEL05)
- Our school just purchased new textbooks for each grade which comes with two CDroms....Our school also purchased five mobile labs for the students to use so we constantly have them on the mobile labs whether it's just for word processing or research over the Internet. Every room is hooked up to the converter box where you can do PowerPoint presentations over the televisions. A lot of students are involved with that. Prentice Hall came in and trained us on the available CDroms.... The principal does (support us) in certain ways, like he had a guy come in for one of our inservices and teachers had to build their own websites with assignments where the students actually go on and get their assignment online. (CT-FW-SHI03)

Non-supportive statements (expressing frustration).

- When they (computers) are available they are really great.... Now the computer teacher is out sick and when we send work to his printer we don't even get it so it's like a whole thing where when I want the kids to work on the computer, they can't print stuff and it's a problem....I guess the word processing software would be good if I could use it and I would use it for them (students) to do their writing on. (CT-FW-CMI02)
- Well the school I'm at has very limited resources. I have been unable to implement any kind of Webquest and those relevant types of various drills and practice. I would certainly like to learn more about them and incorporate them when I move on to better school districts. (CT-MW-CHI01)
- I think our principal has gone to great lengths to make sure that every classroom has at least one working computer with Internet access....but the problem is there's the assumption that now that you have the computer, use it and people don't necessarily know how to incorporate it. How to generate a lesson that's technology centered, that's assisted. (CT-FB-CMI03)

Personal perseverance for the computing cause. Experienced teachers implied a belief system of perseverance in using computers in the classroom, despite their lack of compatibility with handling the technology within the classroom. These teachers expressed a resilience to use computers when faced with obstacles, seeing that a bigger purpose was at stake, a purpose for children to gain necessary computer skills to prepare them for real world experiences. The teachers' comments showed a belief that society's reliance on computers transcended many of their trepidations to use computers.

- I don't have a computer personality....Yea. I do use computers....If computers were not a part of education then we would be doing children a huge disservice because the job market is leaning more and more towards computers and if you

do not have that experience, it's getting harder and harder to get a job. (CT-FW-SEL05)

- I didn't grow up in a generation of computers in classrooms so it's still kind of foreign learning how to incorporate it as an instructional tool....Being a new teacher you just have to learn....in general the role of the computer is pretty significant. (CT-FB-CMI03)
- I don't know I can say it's compatible with who I am. I think actually I would say contrary to that....But at the same time my focus around using it is because I think there's an understanding it's necessary for them (students) to gain certain skills that are offered in all these programs. (CT-MW-CHI01)
- It's a struggle to learn as much as I can about computers, but it's essential....It is essential for the way society is moving. (CT-MW-CMI02)
- Definitely (feel computers are compatible)....I don't handle situations where the technology goes caput and I can't carry on. I tend to get flustered, however, since I've had alternative assignments ready it hasn't been as much of a problem....I think that they (computers) are extremely important....If you can get them (students) working with technology especially, computers, I think it only enhances learning for them because it's something they enjoy doing. (CT-FW-SHI03)

This theme depicts teachers' perceived usefulness of computers in the classroom and supports findings in the Computer Usage Intentions Survey, where perceived usefulness (a factor of TAM) was found to be a statistically significant predictor of experienced classroom teachers' computer usage intentions to integrate computer applications within their subject-specific lessons.

More computer integrated training wanted. Six of nine teachers stated that a person in their household (i.e., mother, father, niece, husband, girlfriend, and daughter) had influenced them to use computers in some way. All nine teachers felt that their educational technology college course was extremely valuable. Yet, all the teachers wanted additional computer integrated training from their school. Overall, teachers felt they needed more specific computer training that related to their personal classroom experiences.

Seven teachers specifically mentioned or implied onsite training and eight teachers specifically mentioned or implied computer integration training. Examples of teachers needs are documented below:

- I would like some more inservice training where like somebody outside comes in, that would be nice. Give us fresh ideas. Actual samples of lessons. (CT-FW-SEL05)
- I would certainly like to have some onsite training....I never saw any kind of staff development in anything let alone focusing on making sure that lesson plans incorporate areas of technology... (CT-MW-CHI01)
- I think there needs to be more aides involved as far as the computer themselves and what we use them for... (CT-FW-SHI03)
- I guess I would like some more training into exactly what can be done. A lot of it I kind of felt my way through....There's not a lot out there resource wise, training wise, so it would be nice to have more of that. (CT-MW-CEL08)

- The training is what we need....It's not enough to put computers in every classroom, you have to say here are workshops, not every teacher is on the same blanket....Here is the lesson and goals and here is the computer. Infusing the two is where I have difficulty. (CT-FB-CMI03)

High personal computer confidence with support. Although most experienced teachers felt there was a lack of computer resources in the schools, 8 of 9 teachers still felt confident about integrating technology into their classrooms. On a scale on 1–10 (1 = low confidence and 10 = high confidence), the average confidence rating among the experienced teachers for carrying out computer-integrated lesson in their classrooms was approximately an eight. These teachers commented on the contribution their valuable college computer course had on their computer confidence level.

Overall, teachers innocently communicated their inability to segregate confidence and support issues when discussing computer classroom integration. Classroom teachers indicated they felt confident about infusing computers into their classrooms when supported by their school administration and students. It was apparent that having support notably contributed to most teachers' high personal confidence.

- Pretty confident because when there's questions that I can't answer one of the students can do it. I'm constantly asking students. (Rated herself a confidence of 9.) (CT-FW-SHI03)
- Pretty confident. My kids are the same way at school. If I need something done there at school, there are people in there who can do it for me. Go do this and they know how to do it. (Rated herself a confidence of 8.) (CT-FW-CMI02)
- On my level, what I need to do in my classroom, I feel I'm right up there, a 10 (confidence)....We have a fifth grader here who takes over for the support tech when she's not available....We told him that we were going to get him a pager next year so that he can come back and help us. He knows so much. He can teach me a thing or two. (CT-FW-SEL05)
- I would say an 8 (confidence). An especially if we're looking at using it in just my classroom....She (grade teacher partner) is very much into the computer and using it. She just kind of reeled me in and I knew that I could go to her for help or if I had any questions. So knowing that she was there to help was I think something that influenced me to use it (computer) a little bit more. (CT-FW-SEL16)
- I'm not fully confident but I'm not – that doesn't prevent me from doing it. There's some things I know I don't know and we (students and teacher) struggle through it together....It's basically in school like either the tech assistant, other teachers who might know more than I do. Everyone is helpful here. Even the student teacher. (Rated herself a confidence of 7.) (CT-FW-SEL05)

DISCUSSION

Self-Reported Computer Usage

In this study, beliefs did not predict as well for student and experienced teachers' computer usage as it did for their usage intentions. (see computer usage intentions

section below). Overall, belief predictor factors explained a low percentage of variance for the teacher groups' self-reported computer usage. Specifically, perceived usefulness and perceived ease of use predicted student teachers' computer usage to teach lessons to their students. Perceived usefulness predicted experienced teachers' computer usage to teach lessons and to assign students' computer related work.

The findings in this study for self-reported usage are not altogether consistent with other studies. Many researchers have found perceived usefulness, perceived ease of use and intentions explain a moderately low to high percentage of variance of computer usage, with only a few studies indicating an accounted variance of less than 20% (Davis, 1993; Dishaw & Strong, 1999; Hendrickson & Collins, 1996; Igbaria, Guimaraes & Davis, 1995; Igbaria, Schiffman, & Wieckowski, 1994). In the present study, predictor factors explained only roughly 15% of the variance for the teachers groups' computer usage. This self-reported usage finding indicates that the TAM instrument does not comprehensively account for teachers' usage. Thus, it appears that the TAM instrument may need to include more items (within a new content domain) to better predict teachers' usage. Due to the qualitative findings in this study, a likely new content domain that may increase the amount of accounted variance accounted for is *planned behavioral control* (PBC). Ajzen's (1985) theory of planned behavior and the decomposed theory of planned behavior (Taylor & Todd, 1995) include PBC as a variable that affects intentions. This added variable addresses users' perceived internal and external constraints that could control for their behavior. Given the findings in this study and in the research by Venkatesh, Morris, Davis, and Davis (2003) the addition of this item construct to the TAM theory and instrument may better predict teachers' use of computers.

Overall there were statistically significant differences among the types of software used but not the usage activities between the two teacher groups. Experienced classroom teachers used spreadsheets, subject-specific and educational software more than did student teachers. Experienced teachers also asked their students to use subject-specific software more often than did student teachers. One possible explanation is that teachers who are more experienced with their subject matter are more adept at using new tools, including computers, to help facilitate teaching and learning. However, both teacher groups in the present study primarily used word processing and the Internet for administrative purposes and for student assignments.

There were no statistically significant differences between student and experienced teachers for usage activities (i.e., student assignments requiring computer usage, teachers using the computer to teach lessons to students, and teachers using the computer to complete work assignments in lesson planning and grading). Findings from this study indicate that both student and experienced teachers use computers for mostly administrative work.

COMPUTER USAGE INTENTIONS

Quantitative

After completing their student teaching experience, student teachers indicated greater intention to integrate computer applications into their subject-specific lessons and

perceived this integration as easier to use than they originally thought. These findings substantiate student teaching literature (Brent, Brawner & Van Dyk, 2002; Doering et al., 2003; Willis & Sujo de Montes, 2002) that indicates actual classroom technology experience is a critical contributing component to pre-service teachers' computer usage in the classroom.

There were no statistically significant differences between experienced classroom teachers and student teachers (after practicum completion) in their intentions to integrate computer applications into subject-specific lessons. In this study, both teacher groups indicated positive perceived usefulness, perceived ease of use, and intentions of using computers in their classroom lessons.

Experienced classroom teachers and student teachers, both prior to and after their practicum, indicated that their perceived ease of use and perceived usefulness of integrating computer applications within subject-specific lessons predicted their computer usage intentions. These factors explained about 45–50% of the variance in computer usage intentions. Additionally, both student and experienced teachers indicated that perceived usefulness of computer integration had a stronger effect on their computer usage intentions than did their perceived ease of use with computers.

The findings that perceived usefulness and perceived ease of use predicted intentions are consistent with other studies. Davis et al. (1989) and Taylor and Todd (1995) found that both perceived ease of use and perceived usefulness explained 45–57% of the variance in computer usage intentions. Additionally, Davis et al. found that perceived usefulness had a direct effect on behavioral intentions with perceived ease of use having an indirect effect through perceived usefulness. Although approximately 50% of both student and experienced teachers' intentions are not explained by the instrument in this study, this instrument does provide a reasonable and parsimonious way to measure computer acceptance.

Qualitative

The decomposed theory of planned behavior framework used in this study substantiated and extended TAM findings. DTPB results indicate that there are more similarities than differences in computer usage beliefs between neophyte and experienced teachers. Both student and classroom teachers believed that preparing children to use computers had an important societal purpose; thus, these teachers saw the necessity to acquire appropriate computer classroom integration training. Both student and classroom teachers expressed their confidence to use computers in their classroom. However, student teachers revealed some naivety in the degree to which they were competent in their computer classroom integration skills (focusing on the Internet). Classroom teachers understood the importance of administrative support, and exhibited resourcefulness when infusing computers into their lessons when supported.

A major theme that supported the TAM is that teachers will use computers if perceived useful. Student and experienced teachers saw the value and usefulness of computer usage within the classroom. This usefulness was driven by the teachers' need to enhance children's learning and prepare them for the real world (internal

motivation). In this study, experienced teachers had a philosophy that they would persevere in using computers in the classroom despite their lack of compatibility with handling the technology to give their students the necessary computer skills for future endeavors. Student teachers generally felt comfortable with computers and thought it was imperative that students learn to use computers. This finding is supported by Doering et al. (2003) who found student teachers believed it was imperative to have children use technology for learning. Additionally, student teachers in this study believed that the general population and school administrators (external motivation) regarded computers an important component in educational learning. The student teachers believed that having computer knowledge would increase their job opportunities.

Computer training related to student and experienced teachers' personal classroom lessons emerged to be a critical component for successful computer classroom integration implementation. A major finding of this study indicated that student teachers had a limited understanding of how computers could be used to enhance their teaching. Although student teachers discussed using the Internet in a variety of ways, they scarcely reported teaching strategies using other technological methods. This theme reasonably supports the quantitative finding in this study that student teachers mostly used the Internet and word processing for their job. This finding is comparable to findings from other studies indicating that student teachers have a limited perspective of computer classroom integration techniques (Doering et al., 2003; Gibson & Nocente, 1998; Moursund & Bielefeldt, 1999; Mowrer-Popiel, Pollard, & Pollard, 1994; Willis & Sujo de Montes, 2002). In this study, student teacher discussions centered on learning how to integrate computers in their own classroom lessons, indicating that actual classroom technology experience is a critical component that contributes to student teachers' future computer usage. In this study, only 5 of 10 student teachers interviewed had taught with technology in their classrooms. Yet studies have shown that preservice teachers' placement with a cooperating technology competent teacher was crucial in students' educational technology preparation (Brent et al., 2000; Doering et al.; Willis & Sujo de Montes).

Professional development studies show that classroom teachers believe it is important to acquire training on how to better integrate technology into their pedagogical practices to effectively facilitate teaching and learning (Bliss & Bliss, 2003; Driscoll, 2001; Schnackenberg et al., 2001). This study found that experienced classroom teachers depended on having both equipment resources and personal support from school administrators to successfully integrate technology into their classroom. This finding is consistent with a research outcome from the U. S. Department of Education, Office of Educational Research and Improvement that found teachers are mostly likely to use the Internet for classroom instruction when they had both computer classroom level access and support in the form of training and assistance (Lanahan, 2002). Similarly, Mouza's (2003) study of 15 teachers in a professional development program noted that the major influences in teachers' use of technology included: (a) support received from school administration, (b) availability of school resources, (c) collaboration with other teachers, and (b) student population and needs. Studies have also shown that K-12 school principals do influence the level of technology integration into their school's curriculum (Dawson & Rakes, 2003; Granger, Morbey, Lotherington, Owston, & Wideman,

2002). This study found that teachers who had more available resources from administration were more successful integrating computers into their classroom lessons. This theme may well support the quantitative finding in this study that experienced teachers significantly used more spreadsheet, subject-specific and educational software than did student teachers.

Although both teacher groups explicitly communicated a high degree of competence in using computers for teaching, their conversations revealed limitations. For student teachers, their self-confidence was at odds with their limited knowledge of using computers outside of the Internet. For practicing teachers, their self-confidence was constrained by their felt need for greater administrative support. The discrepancy between confidence and actual ability is of concern. According to Bandura (1986), it is important that an individual's self confidence is reasonably aligned with their actual ability, else one's self-efficacy could be damaged and result in a variety of negative consequences.

ASSESSMENT OF TECHNOLOGY BEHAVIORAL MODELS

The secondary purpose of this study was to investigate the efficacy of using the TAM and the DTPB for predicting intentions to use computers. Comparatively, the DTPB allows researchers to identify a variety of external and internal beliefs that the TAM does not allow for to make predictions regarding the teachers' computer usage (see Figures 1 and 2 for conceptual comparison). The DTPB addresses belief-based measures pertaining to attitudes (e.g., usefulness and compatibility) subjective norms (i.e., peer influence and superior's influence), perceived behavioral control (i.e., self-efficacy, resource constraint/support) and intentions. Compared to the TAM (that focuses on perceived usefulness, perceived ease of use, and intentions), the DTPB has the capability to provide educators and researchers with a more comprehensive view into belief systems that can contribute classroom computer usage issues.

Unlike the TAM, the DTPB includes perceived behavioral control factors (i.e., internal and external issues) that have shown to be important in explaining teachers' computer usage intentions. Previous research has identified the following external constraints for integrating computers into the classroom: (a) time, (b) training, (c) technology-related support, and (d) access to current hardware (Becker, 1994, 1998; Cuban, 2001; Ertmer, Addison, Lane, Ross, & Woods, 1999; Hadley & Sheingold, 1993; Smerdon, et al., 2000; U.S. Congress Office of Technology Assessment, 1995). Results from this study support previous research regarding teachers' beliefs about external limitations regarding their computer usage. Teachers in this study reported training and resource support as external factors that played a role in their behavioral intentions to use computers in the classroom. This study also supports the body of computing literature (Compeau & Higgins, 1995; Davis et al., 1989; Marcinkiewicz, 1994) that suggests teachers' internal beliefs regarding their self-efficacy and perceived usefulness of computer integration can contribute toward their behavioral usage intentions.

Mathieson (1991) stated that although TAM is capable of explaining user behavior across a broad range of end-user computer technologies and user populations, TAM does not explicitly include social behaviors. Social norms and perceived

behavioral control variables can tap into important concerns that may be specific to situations, capturing idiosyncratic barriers of use. Educational technology research literature has addressed fundamental external and internal control barriers regarding the teacher population; thus, I recommend that the TAM instrument include an additional content domain that deals with these perceived behavioral control issues.

Since the inception of this study, Venkatesh et al. (2003) have made efforts toward creating a unified view of technology acceptance model; their unified theory of acceptance and use of technology (UTAUT) is a combination of the TAM and DTPB. This model extends the TAM to include social influence and perceived behavioral controls of self efficacy and support resources that explained 70% of the variance in their computer usage intention study. I support the authors' efforts to refine the measurement of core behavioral technology acceptance constructs, as it appears the UTAUT may give researchers a better tool to understand the dynamic influences of technology adoption.

There are many competing models in technology acceptance research that have their own set of determinants for technology adoption. Venkatesh et al. (2003) examined eight prominent behavioral models for technology acceptance, specifically: a) theory of reasoned action, b) technology acceptance model, c) motivational model, d) theory of planned behavior, e) model of PC utilization, f) innovation diffusion theory, g) social cognitive theory, and h) unified theory of acceptance and use of technology (combination of TAM and DTPB). Although one model makes for an efficient research study, I suggest that using multiple models in a study can make for a more thorough understanding of technology adoption and broaden technology acceptance research in our ever-growing technological culture.

LIMITATIONS OF THE STUDY

There were a series of non-random samples taken in the present study that could impair external validity, specifically: (a) the original study consisted of convenience sample of 160 student teachers and 158 classroom teachers, (b) from this original sample, 54 student teachers and 64 experienced classroom teachers volunteered to be interviewed.

IMPLICATIONS FOR PRACTICE AND RESEARCH

Implications for practice and research can be made from the findings in this study. Suggestions for the educational profession are partitioned into three areas: (a) Practical Applications for Teacher Preparation Programs, (b) Practical Applications for School Administrators, and (c) Practical Applications for Educational Technology Researchers.

Practical Applications for Teacher Preparation Programs

This study is consistent with findings from other studies that showed student teachers had greater intentions to integrate computers after their student teaching experience.

However, one type of college experience is not enough to assure that student teachers will be more likely to use computers in their own classroom. Research indicates that the effect on pre-service teachers' use of computers was more pervasive when multiple teacher preparation strategies were used with them (Kay, 2006; Mims, Polly, Shepherd & Inan, 2006). Thus, it is necessary to provide for university field placement initiations to develop new approaches/models to restructure teacher placement experiences to support the integration of technology in the classroom. However, other methods, such as enhancing faculty technology training, and providing pre-service teachers with mentoring/role modeling and online support can also be critical components that contribute to pre-service teachers' computer usage in the classroom.

Additionally, this study showed that student teachers are internally motivated to use technology in the classroom to prepare their students for future endeavors. Thus, it is recommended that college classrooms and training courses validate and reinforce student teachers' desire to have students succeed in a technology-driven world.

A point of significant interest is that experienced classroom teachers used spreadsheet, subject-specific and educational software more than did student teachers. Considering that classroom teachers are more experienced with their subject matter, and may be more adept at finding new tools that complement their teaching, experienced classroom teachers have the opportunity to inform student teachers of the various practical types of software that student teachers would not otherwise be aware of while in their teacher education program. Additionally, unlike the student teachers, experienced teachers' perceived usefulness of computer integration predicted student computer assignment. Moreover, experienced teachers asked their students to use subject-specific software more often than did student teachers. Thus, it appears that experienced teachers have the opportunity to mentor student teachers in integrating computer assignments in a purposeful manner.

Practical Applications for School Administrators

School administrators must provide the necessary resources to support technology-based teaching and learning. A variety of different ways for personally supporting teachers in using technology should be investigated and facilitated before administration can reasonably expect teachers to successfully integrate technology into their classroom.

This research found that it was essential for administrators to make provisions for: a) personalized computer training that is directed toward teachers' specific instructional needs, and b) support resources that include both knowledgeable support personnel as well as up-to-date technologies.

This research showed that teachers were internally motivated to persevere through their own uncomfortable feelings with computers to provide their students with the necessary technology skills to prepare them for real world experiences. It is hoped that administrators can build upon this dedication by working together with teachers to further encourage and inspire classroom teachers to use technology in the classrooms more readily.

Practical Applications for Educational Technology Researchers

Mathieson (1991) noted that the TAM instrument was able to explain user behavior across a broad range of computer usage professions. However, in this study the lengthy DTPB model compared to the more parsimonious TAM was able to provide educators and researchers with a deeper understanding into belief systems. From this research study, it is suggested that at a minimum, a planned behavioral control (PBC) content domain that addresses external and internal computer barrier usage issues specific to the teacher population (e.g., time, training, support, access, etc.) be added to the TAM instrument to provide for a more comprehensive computer usage questionnaire so that better teacher computer acceptance predictions can be made. Venkatesh et al. (2003) made efforts toward creating a unified view of technology acceptance model; their unified theory of acceptance and use of technology (UTAUT) may give researchers the best tool to date to understand the influences of technology adoption.

According to Kay (1993), different professions have a variety of needs, goals and motivations regarding computer usage. Kay further notes that there are several computer instruments that measure various types of attitude/behavior/usage constructs. Venkatesh et al. (2003) examined eight prominent behavioral models for technology acceptance and noted that educational technology researchers have a variety of behavioral models to choose from for their studies. Given the multitude of psychological issues that can affect acceptance of technology, the use and assessment of a variety of models for a particular technology adoption study can give researchers better insights into the most salient points regarding technology intention and behavior.

Not only are multiple behavioral models important to apply within a study but using mixed methods also adds depth to the research. This current research demonstrates the significance of conducting a mixed methodological study. The qualitative findings allowed the researcher to identify weaknesses in the quantitative model and explain the divergence between the survey findings and personal interviews. Mixed method studies can support and verify findings in a unique way; qualitative findings supplement quantitative results that can allow researchers to more readily identify purposeful conclusions.

FUTURE RESEARCH

More technology adoption research that aids local, state, national or international technology standards has potential to promote application and mastery of technology for citizens to compete in the global economy. Technology acceptance research that supports educational technology standards to promote national and international goals for students and teachers can be a complex venue, but can offer great insights into the challenges that face students and teachers so that they may improve themselves as productive citizens (Smarkola, 2008b).

The proliferation of portable electronic devices and wireless networking is creating a change from e-learning to m-learning (Lee & Chan, 2005) and handheld device studies show that m-learning extends the flexibility of anytime, anywhere learning (Motiwalla, 2007). To support m-learning adoption research, *personal innovativeness* (a stable trait) and *anxiety* (a state trait) may better help explain

technology acceptance issues. In particular, personal innovativeness (i.e., a form of openness to change) can be used to extend the TAM model to give better insights in adapting new systems and processes in the educational environment (Raaij & Schepers, 2008). Additionally, to further educational technology adoption research, reproduction studies are needed using the unified theory of acceptance and use of technology (UTAUT) to reproduce Venkatesh's et al. (2003) fine work and leadership in technology acceptance research.

It is advised that actual computer usage data (e.g., observations, computer audit trail logs) instead of self-reported computer usage data be used with a technology acceptance instrument for more accurate reporting. Due to the No child Left Behind Act (U.S. Department of Education, 2002) there has been a boom of educational computerized assessment tools, data-analysis tools and built-in monitoring systems to manage student and teacher information in America. According to the Editorial Projects in Education Research Center: a) two-thirds of the states provide educators with access to interactive databases which can analyze school-level information, b) forty-four states provide teachers and administrators with tools that let them download data files from the statewide system, and c) over half the states provide access to students' test performance over time (Edwards, Chronister, & Hendrie, 2006). As a result of the recent national effort to establish computerized educational accounting systems (Trotter, 2006) it may now be easier to acquire actual computer usage data.

CONCLUSION

Findings from this study suggest that educational technology use issues should not merely be perceived as a classroom technology integration process but as a human process regarding beliefs and behaviors in computer usage for teaching and learning. Windschitl and Sahl (2002) suggested that an institutional vision (of a school district, school, etc.) could not be separated from beliefs about effective teaching, signifying the importance of all belief systems being discussed before a commitment is made to introduce teachers to technology. Once computer integration is incorporated into a school, teacher assessments of computer classroom integration are needed. Appropriate methodological approaches and theoretically justified models that support the teacher education culture help valid the assessment process.

Careful evaluation of the numerous behavioral models (Venkatesh et al., 2003) is essential before an educational technology research project begins. Proper use and assessment of these models and their complementary instruments in technology adoption studies are key in our hi-tech psychological field. Culp, Honey and Mandinach (2005) suggested future research in designing more sensitive evaluation instruments, and in defining conditions for effective technology use to increase the understanding of how technology can improve teaching and learning activities. Although there are several instruments to measure general computer beliefs and attitudes, educational technology researchers have found that several particular problem conditions exist for teachers (e.g., time, training, support, access, etc.) to effectively integrate computers into the classroom. Thus, it is recommended that any instrument/tool used to evaluate novice and experienced teachers' technology acceptance include items that measure teachers' perceived internal and external

constraints regarding their computer classroom usage. An educational technology instrument needs to be sensitive to teaching and learning issues to provide teachers with the appropriate conditions for effective computer use.

Every profession has distinctive cultural environments with different objectives, ambitions, and drives that influence individuals' computer usage intentions and actual usage. Thus, to properly ascertain computer acceptance within an organization it is important that organizational behavior be thoroughly evaluated so that an appropriate model(s) can be used to best assess employees' computer behavior. Leaders in technology acceptance need to take into consideration that assessment of computer usage within any profession be based upon a behavior model(s) that complements the profession's cultural environment. Making a commitment to create technology acceptance studies that utilize suitable methodological approaches and appropriate cognitive belief-behavioral models establish a crucial foundation to provide for successful assessments and predictions in technology adoption.

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A MIXED-METHODOLOGICAL TECHNOLOGY ADOPTION STUDY

APPENDIX A INTERVIEWEE IDENTIFICATION KEY CODE
(7 TO 11 CHARACTER CODE)

1 st & 2 nd Characters = PARTICIPANTS	ST = Student Teacher	CT = Classroom Teacher
3 th Character = GENDER	F = Female	M = Male
4 th Character = ETHNICITY	A = Asian B = Black O = Other H = Hispanic W = White	
5 th Character = SCHOOL DISTRICT	C = City S = Suburban R = Rural	
6 th & 7 th Characters = SCHOOL LEVEL TEACHER	EL = Elementary (K - 5 th grades) MI = Middle (6 th - 8 th grades) HI = High (9 th - 12 th grades)	
8 th & 9 th Characters = EXPERIENCE (Classroom Teachers Only)	Ranges from 01 to 16 Years Teaching	

**(e.g., CT-FW-CEL17 = Classroom Teacher, – Female, White – City
Elementary Teacher, 17 Years Teaching Experience)**