

Preservice teachers' acceptance of information and communication
technology integration in the classroom:
Applying the Unified Theory of Acceptance and Use of Technology model

by

Amanda Birch
B.Sc., University of Victoria, 2003

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ABSTRACT

In this study, the researcher explores the factors that influence preservice teachers' acceptance of information and communication technology (ICT) integration in the classroom. A mixed methods design is used, where the qualitative results from two focus groups are used to help explain the initial findings of the quantitative survey. The survey is based on the Unified Theory of Acceptance and Use of Technology (UTAUT), which was developed by Venkatesh et al. in 2003 and shown to outperform eight preceding models, explaining 70% of the variance in user intentions. The role of the UTAUT variables (performance expectancy, effort expectancy, social influence, and facilitating conditions) are examined in this study and the resulting regression model accounts for 27% of the variance in user intentions to use ICT, with effort expectancy surfacing as the only significant predictor of behaviour intention. Results and recommendations for future research in the application of the UTAUT model are discussed to better understand the factors that influence preservice teachers' acceptance of the effective integration of ICT into the classroom.

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List of Abbreviations

The following abbreviations will be used throughout this paper:

1	BI	Behavioral Intention
2	BU	Behavioral Usage
3	C-TAM-TPB	The Combined TPB/TAM
4	EE	Effort Expectancy
5	FC	Facilitating Conditions
6	IS	Information Systems
7	ISTE	International Society for Technology in Education
8	MM	Motivational Model
9	MPCU	Model of PC Utilization
10	PEU	Perceived Ease of Use
11	PU	Perceived Usefulness
12	PE	Performance Expectancy
13	SCT	Social Cognitive Theory
14	SE	Self-efficacy
15	SI	Social Influence
16	TAM	Technology Acceptance Model
17	TPB	Theory of Planned Behavior
18	TRA	Theory of Reasoned Action
19	UTAUT	Unified Theory of Acceptance and Use of Technology

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Chapter 1: Introduction

Importance of Study

Information and communication technology (ICT) is becoming increasingly important in our daily lives, and therefore in our educational system. For example, the British Columbia (B.C.) Ministry of Education outlines the integration of ICT throughout the Kindergarten to Grade 12 curriculum (British Columbia Ministry of Education, 2005a) and such initiatives are prevalent elsewhere across the country (e.g. Alberta Learning, 2003; Ontario Ministry of Education, 1998). Current technology initiatives in B.C. include the Peace River North Wireless Writing (laptop) program (Jeroski, 2007) and E-Learning Research Sites in Prince George, Alberni and Coast Mountain school districts (B.C. Ministry of Education, 2005b). The integration of ICT into education is also encouraged by the British Columbia Premier's Technology Council: "in order for the education system to stay relevant and to engage our students more fully, it must make better use of technology in classrooms across this province" (2007). Technology use is constantly evolving and becoming more important in the workplace and our lives (Karsenti, Brodeur, Deaudelin, Larose & Tardif, 2002; Shapka & Ferrari, 2003; Teo, Lee & Chai, 2008). ICT in education is also a motivator for students (as represented by Burns & Ungerleider, 2003, in a systematic review of the literature on ICT in elementary and secondary education) as it relates to their interests and their lives.

Studies have also shown ICT to have the following effects on student learning: “increasing student achievement; improving higher order thinking skills and problem solving abilities; enhancing student motivation, engagement, and job preparation; and improving students’ abilities to work collaboratively” (White, Ringstaff & Kelley, 2002, p. 4). Keengwe, Onchwari and Wachira (2008) also suggest that ICT tools have the ability to help “address realistic situations, [which] is likely to promote the integration of disciplines, foster a team approach to problem solving, and enhance individual responsibility” (p. 82).

There are also times when an ICT tool makes something possible that could not have been accomplished without technology. ICT enables teachers to invite guest speakers to visit their classroom ‘virtually,’ allowing students to talk to scholars or artists that would not be able to visit the school in person (Burg & Cleland, 2001). ICT tools can also allow teachers to perform “experiments and demonstrations that are otherwise too dangerous, expensive, or impractical” (Burg & Cleland, 2001, p. 5). Technology can also be used to increase accessibility for students with disabilities, or those in remote locations (Burg & Cleland, 2001). This option can bring courses and opportunities to students who would otherwise be without.

Many studies point to the fact that ICT is beneficial for student learning when used for the right reasons. As stated by White et al., “a central theme of the research is that computer-based technology, like the more basic classroom tools of pencil and paper, is a means, not an end. Its power lies in how it is used” (2002, p. 4). The important question is not how can we integrate ICT into all of our lessons, but rather how can we make *effective* use of ICT in our classrooms. Technology should not be used for the sake

of technology – instead “instruction should drive the technological tools being used” (Keengwe et al., 2008, p. 83).

Research has examined the conditions that make ICT successful in the classroom. Lists of advice have been generated, including the following recommendations from a literature review conducted by White et al.: ensure that the ICT tool matches the learning goals, use ICT tools as one resource among many, provide professional development and technical support, make equipment available, and work to change teacher beliefs about teaching and learning (2002).

According to a Statistics Canada survey (2004), Canadian schools have the necessary infrastructure for implementing ICT into classroom learning. Findings indicate that 99% of schools in Canada have computers, with a student to computer ratio of five to one in B.C. (Statistics Canada). Over 97% of schools in Canada have internet access. The survey indicates that there is support from administration for technology: 92% of principals in Canada believe that ICT is worth the money and the benefits are important to students (Statistics Canada). Possible response bias must be considered when interpreting these results as ICT-poor schools or schools with leaders who do not value ICT may not have been motivated to participate in an ICT-based survey, while those that have already invested heavily in ICT could view this survey as an opportunity to showcase their efforts. Looker and Thiessen (2003) report differences in ICT access and use with respect to gender, social economic status, and rural/urban settings. Statistics Canada also recognizes the possible error resulting from non-responses and therefore used a “weighting methodology based on key auxiliary information” (Statistics Canada,

p. 32) to assign weights “to each school [that] represent the number of other schools in the population with similar characteristics” (p. 32).

Regardless of the level of available infrastructure and support from administration, there is concern as to whether teachers are prepared to integrate the technology that is available to them into effective lessons for their students (British Columbia Premier’s Technology Council, 2007; Brown & Warschauer, 2006; Firek, 2002; Ma, Andersson & Streith, 2005). Keengwe et al. (2008) argue that the integration of ICT into our classrooms is determined by “key factors, such as the contexts in which teachers interact, their beliefs, and their attitudes towards teaching and learning” (p. 80).

According to Statistics Canada, 76% of schools in Canada have more than 75% of their teachers “with the required technical skills to use ICT for administrative purposes” (2004, p. 25). Yet only 46% of Canadian schools have more than 75% of their teachers “with the necessary qualifications to engage students in using ICT effectively” (Statistics Canada, p. 25). Research shows that “although teachers in schools show great interest and motivation to learn about the potential of ICT, in practice, use of ICT is relatively low and it is focused on a narrow range of applications” (Sime & Priestly, 2005, p. 131). In order to successfully integrate ICT into our classrooms, teachers must be a priority (White et al., 2002). One study indicates that it is not possible to accurately evaluate the effectiveness of ICT use in the schools, since teachers aren’t using the technology: “detailed case studies point to the problem of the lack of use of computers, to such an extent that it would be hard to expect much impact” (McCormick, 2004, p. 160).

The International Society for Technology in Education (ISTE) has developed Educational Technology Standards and Performance Indicators for American students

and teachers. The ISTE National Educational Technology Standards for teachers (NETS-T) “focus on preservice teacher education [and] define the fundamental concepts, knowledge, skills and attitudes for applying technology in educational settings” (ISTE, 2000). Although the NETS-T standards are American, they are often referred to by educational technology academics in Canada (e.g., Kay, 2006). At a time when it is expected that many new teachers will soon be hired in Canada, proper training in instructional technology is critical. The education students being trained today will be our teachers of tomorrow. As represented in the above literature, if we value the integration of ICT in education, then it is important that we ensure that these new teachers are comfortable and capable to integrate ICT into our students’ education in pedagogically sound ways.

Many models of technology acceptance have been developed over the years, some of which have been used to examine preservice teachers’ acceptance of technology (see Chapter 2). In 2003, Venkatesh, Morris, Davis and Davis created the Unified Theory of Acceptance and Use of Technology (UTAUT). Venkatesh et al. “formulate[d] this unified model that integrates elements across eight [IT acceptance] models” (2003, p. 1). Gender, age, experience, and voluntariness of use were added to the model and were hypothesized to moderate the effect of four constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) on intention to use and usage behavior. Figure 1 illustrates the model. The UTAUT survey was tested by Venkatesh et al. and found to have an R^2 of 70%, indicating that the model explains 70% of the variance in user intentions to use information technology.

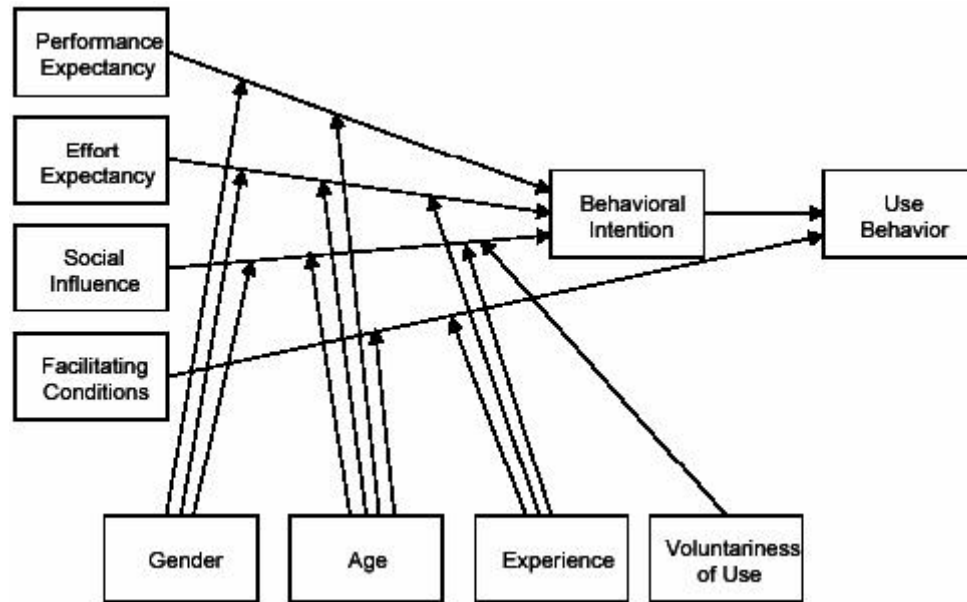


Figure 1. The UTUAT Model

Source: “User acceptance of information technology: Toward a unified view,” by Venkatesh et al., 2003, *MIS Quarterly*, 27(3), p. 447.

The UTAUT model has not yet been used to examine preservice teachers’ acceptance of ICT. Only three studies have been located that utilize the UTAUT model in an educational setting (see Chapter 2 for descriptions). The current study explores the use of the UTAUT model with preservice teachers in order to help identify one model that can be used consistently in future research in an educational context.

Purpose of Study

The purpose of this study is to examine the UTAUT variables that influence preservice teachers’ acceptance of ICT integration and determine whether there are any other factors outside of these. Venkatesh et al. (2003) suggested that further research be done to “attempt to identify and test additional boundary conditions of the model [...] this might take the form of [...] different user groups [...] or other organizational contexts”

(p. 470). The study explores how to help our preservice teachers feel comfortable integrating ICT in order to prepare them for an educational system that values technology. These teachers will then be able to help prepare our K-12 students to use the technology they will require in the work place and their lives in effective, innovative ways. The study also identifies what teacher education programs and faculty can do to improve their programs to prepare preservice teachers for ICT integration in the classroom.

Research Questions & Hypotheses

This study seeks to answer the following quantitative and qualitative research questions:

Quantitative:

1. Do the UTAUT variables (performance expectancy, effort expectancy, social influence, and facilitating conditions) influence preservice teachers' acceptance of ICT integration (see "acceptance of technology" in the Definition of Terms section)
2. Do gender, age, and voluntariness moderate the effect of the four direct determinants in the UTAUT model (performance expectancy, effort expectancy, social influence and facilitating conditions)?

Qualitative:

3. Are additional factors or issues influential in preservice teachers' acceptance of ICT integration?

The following hypotheses, proposed by Venkatesh et al., are tested in the quantitative phase of the study:

H1: The influence of performance expectancy on behavioral intention is moderated by gender and age, such that the effect is stronger for men and particularly for younger men.

H2: The influence of effort expectancy on behavioral intention is moderated by gender and age, such that the effect is stronger for women, particularly younger women.

H3: The influence of social influence on behavioral intention is moderated by gender, age, and voluntariness such that the effect is stronger for women, particularly older women, particularly in mandatory settings.

H4: Facilitating conditions does not have a significant influence on behavioral intention.

Venkatesh et al. (2003) hypothesized that gender, age, experience, and voluntariness of use moderate the effect of four direct determinants or constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) on intention to use and usage behavior.

Self-efficacy and anxiety are hypothesized by Venkatesh et al. (2003) to “have no direct effect on intention above and beyond effort expectancy” (p. 455). Similarly, attitude towards technology is “significant only when specific conditions – in this case, constructs related to performance *and* effort expectancies – are not included in the model” (p. 453). Venkatesh et al. refer to these variables as indirect determinants, and they are not included in the study.

Limitations of the Study

The current study is limited by the sampling technique, as only secondary preservice teachers from one mid-sized Western Canadian university were asked to

participate in the study. This sample may not be representative of other universities and their preservice teachers.

The study is also limited by the fact that the preservice teachers were asked to complete the survey at one point in time. The opinions and attitudes of the participants may be altered as they continue with their university coursework and move into their practicum experience at local high schools. The researcher acknowledges the need for longitudinal research of preservice teachers in future research, which will be satisfied in the expanded version of this study.

Finally, although intention has been proven to be a critical predictor of technology use (Venkatesh et al., 2003), this study is limited by the decision to use behavioural intention (and not usage) as the dependent variable. However, this thesis component comprises of a T1 measurement, and research plans exist beyond this thesis to follow-up with T2 and T3 measurements that include usage.

Delimitations of Study

The following limitations are imposed by the researcher:

1. The study is limited to high school preservice teachers enrolled in a teacher education program at a mid-sized western Canadian university.
2. The study is limited to participants who completed the survey administered in education courses and to those selected from this sample to participate in follow-up focus group interviews.
3. The study is limited to the following variables: behavioral intention, performance expectancy, effort expectancy, social influence, and facilitating

conditions. The following information was also obtained from participants: age, gender, voluntariness, and teaching subject area.

4. The study is limited to data collected from November to December 2008.
5. All variables, conditions or populations not so specified in the study are considered beyond the scope of this investigation.

Definition of Terms

The following terms will be used throughout the thesis and are therefore defined here. For definitions of the UTAUT terms, please refer to page 49.

1. Acceptance of technology: acceptance of technology is determined by intention to use or usage of the technology by the individual. The goal is “to understand usage as the dependent variable,” with intention seen as a direct predictor of behavior (Venkatesh et al., 2003, p. 427).
2. Information Technology (IT): "the study, design, development, implementation, support or management of computer-based information systems, particularly software applications and computer hardware" (Information Technology Association of America, 2007).
3. Information and Communication Technology (ICT): “recently it has become popular to broaden the term [IT, as defined above] to explicitly include the field of electronic communications” (Information Technology Association of America, 2007).
4. Preservice teacher: An education student who is currently enrolled in a teacher education program and has not yet been certified as a teacher.

Assumptions

The following assumptions are expected to prevail throughout this study:

1. The participants are expected to be honest with their responses to the survey and focus group interview questions.
2. The participants are expected to accurately carry out the instructions provided within the survey.
3. The participants are expected to refer to the ICT tools/technologies listed at the beginning of the survey when responding to all questions.

Summary

In this chapter, the purpose of the study, research questions, and hypotheses were outlined. The importance of ICT in education was discussed, as well as the concern as to whether our teachers are prepared to use the ICT tools that are available to them. Teo, Lee and Chai assert that “as we move into such a technology-based society, it is important that classroom experiences with computers are made available to all students, [and the success of this] will depend largely on the attitudes of teachers and their willingness to embrace the technology” (2008, p. 128). Research on preservice teachers’ acceptance of ICT is necessary if our educational communities value ICT in the classroom. In order to determine how to best prepare our teachers, it is essential to know what factors influence their decisions to utilize ICT in the classroom.

In Chapter 2, a literature review will look at previous studies that have examined factors that affect preservice teachers’ acceptance of technology. Prior use of the

UTAUT model will also be discussed, with a focus on three studies that have used the UTAUT model in an educational context.

Chapter 2: Literature Review

Introduction

The literature review presented here in Chapter 2 will discuss previous research conducted on preservice teachers' acceptance of ICT integration, in order to discover common influential factors and models of technology acceptance. Studies that have used the UTAUT model will also be reviewed to see how the model has been used previously and in what disciplines or contexts. This review will identify a gap in the literature, as previous studies have all used different variables when examining the factors that influence preservice teachers' acceptance of ICT. There is a need for a consistent model that includes all relevant factors. The current study attempts to fill this gap in the knowledge base.

Preservice teachers' acceptance of ICT integration

The preliminary sources used in this literature search were the ERIC, Web of Science, and CBCA Education databases. Each database was searched using the following keyword logic: “(education majors OR preservice teachers OR student teachers OR teacher education OR teacher intern) AND (computers OR information technology OR technology OR educational technology OR technology integration OR information and communication technology) AND (attitudes OR attitude change OR adoption OR behaviour change OR acceptance).” Only journal articles from 2002 and later were included and the search was limited to those studies which examined secondary level preservice teachers. Reference lists from articles obtained through these searches were also examined and used to locate additional articles of relevance. A total

of fifteen articles were located, each describing a study that examined secondary preservice teachers' acceptance of technology. Those studies that operated at the faculty or program level, as opposed to the education student level, were removed (such as studies on faculty development or program development). This choice was made because the focus here is on the factors that influence preservice teachers' acceptance of technology integration, not particular programs of study.

Each of the fifteen studies from the literature review examined secondary level preservice teachers. Every study reported the sample size used, and these varied from 76 to 609 preservice teachers. The average sample size was 155. Only three of the fifteen articles reported the teaching areas of the preservice teachers' that were surveyed. Of these, one study used only mathematics preservice teachers (Kadijevich, 2006), while another study only indicated that the participants were from eleven various teaching majors (Bai & Ertmer, 2008). The third study gave an exact breakdown of the areas that the preservice teachers were studying: early ages (33%), natural sciences and math (21%), general education/other major subject areas (18%), and pedagogy (28%) (Ma, Andersson, & Streith, 2005). In order to accurately explore the findings on this topic, it is important that future studies report the relevant details regarding the participants in the sample: teaching area, grade level, and sample size should all be reported.

The following studies are presented according to year of publication, beginning with the earliest work. Yuen and Ma (2002) used the Technology Acceptance Model (TAM) with preservice teachers to examine the influences of perceived usefulness and perceived ease of use on the dependent variable intention to use. Yuen and Ma concluded that perceived usefulness had a positive significant effect on intention and

usage, while perceived ease of use had a significant effect on usefulness but not intention. Therefore it “may be necessary to help [preservice teachers] develop a positive perception of the ease of use of computers” (p. 378). The authors also discovered that perceived ease of use has much more of an influence on females’ intention to use technology, versus males where ease of use is not a significant factor of intention.

Wishart and Ward (2002) conducted a study that compared preservice teachers to nursing students, with the hypothesis “that those who have a more internal locus of control are more likely to enjoy being put in control of a computer” (p. 232). The authors defined internal locus of control as “people who are sure that they influence what happens to them”(p. 232). This is in contrast to individuals who have an external locus of control, meaning that they are “sure that anything that happens to them is the result of fate or the work of others” (p. 232). Their results indicated that “students having a more internal locus correlated slightly but significantly with more positive attitudes towards computers” (p. 234). Also, preservice teachers had a stronger relationship “between being more internally controlled and being less scared of using a computer” (p. 236) than the nurse trainees. Although these conclusions may not be enough to restructure any existing programs, the researchers assert that more work is necessary in this area.

Dexter and Riedel (2003) conducted a study that examined the factors that affected preservice teachers’ use of various forms of educational technology. The survey was performed after the education students had completed their teaching practicum, and the study explored their use of technology to perform professional duties as well as the technology they used when teaching students in the classroom. Comfort with technical skills used for administrative tasks was rated the highest, then technology for

instructional enhancement, and finally troubleshooting. The most common forms of technology were word processors and internet browsers.

Dexter and Riedel (2003) also discovered that “the frequency of student teachers' use of technology was predicted nearly equally by the availability of computers for their use during class and the requirements or encouragement by the cooperating teacher and university supervisor to use educational technology” (p. 342). Unfortunately, when the preservice teachers were asked to comment on the statement ‘during student teaching, my cooperating teacher used and modeled technology integration’, the majority of responses were ‘strongly disagree’ (p. 340). The quality of the technology, technology support, and preparation to use technology were not significant factors in the preservice teachers’ use of educational technology.

In his study of 189 preservice teachers, Chen (2004) examined strategies to help increase preservice teachers’ confidence in using computer technology: both “pedagogical strategies that a computer instructor may apply and methods that computer learners should use to increase their comfort level towards the technology” (p. 54). The results indicated that the most helpful instructor strategies are: demonstrating computer assignment samples (92.6%), allowing students to engage in individual hands-on practice (81.4%), visual demonstrations of the skills with a projector (77.7%), and opportunities for co-operative learning activities (74.7%). The most important factors for students to increase their own comfort level with computers during their teacher education program are: prior computer skills and knowledge (74.1%), owning a nice computer to use at home (70.3%), having a friend or relative with computer skills (70.3%), understanding “what computer skills you already [know], and what new computer skills you [need] to

know" (p. 55) (44.4%) and experience from a previous computer course (40.7%). Chen asserts that "teachers need to have the confidence and positive attitudes towards computers that will motivate them to integrate computers into their instructional strategies" (p. 50). He feels that the above suggestions can help teacher educators (and thus preservice teachers) to move in the right direction.

Liu, Maddux and Johnson (2004) completed a study to determine whether time is an intermediate variable between computer attitude and achievement: is the amount of time a student spends learning and using computer technology influential? Liu et al. surveyed 609 preservice teachers, using the students' final grades in a computer technology course as the measurement for the achievement variable and self-reported times for the time variable. An instrument based on Aikens was used to measure computer attitude.

Liu et al. made two significant discoveries. First, they showed that time is a function of the four computer attitude variables (enjoyment, motivation, importance, and freedom from anxiety) and these factors account for 78.1% of the variance in time. Enjoyment and importance were the most predictive. These results indicate that "students who have more positive attitudes tend to spend more time on learning and using technologies" (Liu et al., 2004, p. 602). Second, the researchers discovered that computer achievement is predicted by time, with 77% of the variance accounted for. Thus, "students who spend more time learning about, or using, technology tend to have higher computer achievement scores" (p. 603).

Kadijevich, Haapasalo and Hvorecky (2005) examined the influences of two variables (computer attitudes and received professional support) on mathematics

preservice teachers' interest in attaining ISTE standards. Their results showed that "interest [in attaining the standards] is primarily influenced by computer attitude" (p. 50) and not professional support.

Kadijevich (2006) later revisited this work and again studied the factors that influence preservice teachers' interest in achieving educational technology standards (interest). Kadijevich discovered that for both elementary and secondary preservice teachers, professional support for the preservice teachers (support) had a significant positive effect on attitude towards computers (attitude), and attitude had a direct positive effect on interest. It was concluded that "in order to develop interest, support should focus on developing [positive computer] attitudes" (Kadijevich, 2006, p. 440).

Ma, Andersson and Streith (2005) used a modified version of the TAM to examine the key intention determinants for preservice teachers' use of computer technology. They discovered that preservice teachers' perceived usefulness and ease of use of the technology were the key factors. They concluded that preservice teachers need to feel comfortable with the technology and need to be shown how it can be useful to them.

Smarkola (2007) also used the TAM to examine both preservice and experienced teachers' computer usage. A study of 160 preservice teachers and 158 experience teachers revealed that computer usage intentions were predicted by both perceived ease of use and perceived usefulness. These two factors accounted for 48% of the variance in usage intentions before the preservice teachers' practicum and 50% afterwards. The two factors only accounted for 15% of the variance in predicting preservice teachers' computer usage in teaching lessons. The results "indicate that both student teachers and

experienced teachers use computers for mostly administration work” (p. 76). The study also found that perceived usefulness had a bigger influence on computer usage intentions than perceived ease of use, a finding that is consistent with other studies.

Kay (2007) compared four strategies used by preservice teachers learning new technology, in order to determine the most helpful methods. The four strategies were: collaboration, using authentic tasks, formal instruction and exploratory learning. Kay discovered that traditional formal instruction had the lowest ratings for helping the students to learn technology. Collaboration “significantly and positively correlated with significant increases in higher level technology skills” (p. 337). The results also indicated that “preservice teachers who preferred authentic tasks were significantly more likely to use tech to support their teaching and their students learning in the classroom. Students who favored collaboration, on the other hand, used computers for teaching-related tasks only” (p. 377). These conclusions suggest that authentic tasks are an extremely important aspect of teacher education, as this strategy encourages preservice teachers to take what they learn with them into the classroom.

Anderson and Maninger (2007) investigated “the factors that best predicted the extent to which education students intended to use a variety of software at the end of the semester” (p. 158). The researchers surveyed 76 preservice teachers, 28% who were at the high school level, regarding the following factors: software abilities, self-efficacy, value beliefs, computer access, and gender. The resulting regression equation explained 32% of the variance in intentions, with self-efficacy counting as the most significant factor (20%). Software abilities and computer access did not contribute. Value beliefs, gender and the above mentioned self-efficacy were found to be significant predictors.

Bai and Ertmer (2008) studied the effect that teacher educators' attitudes have on preservice teachers' beliefs about technology. They examined four variables: teacher educators' pedagogical beliefs, preservice teachers' pedagogical beliefs, teacher educators' use of technology in instruction, and preservice teachers' attitudes toward the use of technology in instruction. The researchers concluded that "the instructor's learner-centered beliefs and nonlearner-centered beliefs about learning and teaching had a [small] influence on the preservice teachers' beliefs" (p. 106). Bai and Ertmer hypothesized that the limited influence of the teacher educators' beliefs could be due to the fact that preservice teachers enter an education program with pre-formed, well-established beliefs. These beliefs and attitudes are difficult to change in only one short semester.

The results of the study also suggested that "teacher educators' technology uses, in terms of using computer tools/applications and requiring preservice teachers to use technology in different ways, did not positively predict preservice teachers' technology attitudes" (Bai & Ertmer, 2008, p. 108). One possible explanation the researchers suggested for this finding is that the technology used by the teacher educators might not have been at a level that was considered to be important and inspiring to the preservice teachers. The authors concluded that this hypothesis requires future research.

Teo, Lee and Chai (2008) used an extended version of the TAM to examine preservice teachers' attitudes towards computers. In addition to the two TAM variables (perceived usefulness and perceived ease of use), the researchers included subjective norm and facilitating conditions. In contrast to previous studies, the study treated attitude (which is thought to predict usage) as a dependent variable.

The authors discovered that “PU and PEU were key determinants of [the preservice teachers’] computer attitude” (Teo et al., 2008, p. 136). Subjective norm, defined as “a person’s perception that most people who are important to that person think whether the behaviour in question should or should not be performed by the person” (Teo et al., 2008, p. 131), was found to have a direct and indirect effect on computer attitude. Facilitating conditions “influenced computer attitude indirectly through PEU, [but] did not influence computer attitude directly in a significant way” (p. 136). These results suggest that teacher education programs should focus on developing perceived ease of use, perceived usefulness, and subjective norm.

Smarkola (2008) used the decomposed theory of planned behavior to examine preservice teachers’ (and inservice teachers’) intentions to use computer applications in their teaching. The referenced article provides the results from the qualitative portion of the study, where Smarkola used the decomposed theory of planned behavior to construct interview questions which were administered to 160 preservice teachers (and 158 inservice teachers).

Four major themes emerged from the preservice teacher interviews:

- (1) Value of computers to teaching and learning
- (2) Make way for learning through the internet
- (3) Wanted - computer training in first year teaching
- (4) High personal computer confidence

All of the preservice teachers mentioned the importance of computers and saw the potential uses of technology within their own teaching. The preservice teachers had internal motivations for using technology - "computer usage was compatible with the

way they work," "need for their students to learn computers to facilitate learning within the classroom" and "the necessity to enhance students' future prospects outside the classroom"(Smarkola, 2008, p. 1202) – as well as external or administrative pressures.

Through the survey, it was discovered that word processing, followed by the internet, were the two technology skills that preservice teachers cited as most useful to them. Yet, the preservice teachers did not feel that the technology course they completed during their teacher education program was enough to prepare them to teach successfully with technology - "most of the student teachers wanted more training and support using computers in their classroom during the first year of their teaching" (Smarkola, 2008, p. 1203). They wanted to be given examples of how to incorporate the technology into their own lessons.

Yet, despite these results, the average confidence rating “for carrying out computer integrated lessons in their classrooms was an eight" (Smarkola, 2008, p. 1204). Although this may seem impressive, Smarkola notes that the preservice teachers spoke about the use of technology in a very limited way, mentioning only a small number of possible applications or tools. Smarkola concludes that "a major finding of this study indicated that student teachers had a limited understanding of how computers could be used to enhance their teaching" (p. 1209).

Finally, Hammond, Crosson, Fragkouli et al. (2009) used a combination of classroom observations and interviews with both elementary and secondary preservice teachers (24 secondary) to discover the reasons why some preservice teachers make good use of ICT in their teaching. The researchers discovered that access to ICT is the most important factor. Also, those preservice teachers who taught their class in a room that

was equipped with ICT tools were even more likely to make use of ICT. Use of ICT by others (social influence) was also an important factor, with mentors, other teachers, and sometimes even other preservice teachers having influence on whether the participants made use of ICT. The third influential factor was the preservice teachers' personal experience with ICT. Their prior technology skills were not directly transferable into their classroom teaching, but the researchers found that preservice teachers with a high level of prior experience with ICT were 'more inclined' to make use of ICT in their teaching.

It is difficult to compare the previous fifteen studies in order to get an accurate picture of the current state of preservice teachers' acceptance of ICT. Many of the studies do not indicate the grade level or subject area of the preservice teachers, and each study utilized a different technology acceptance model, with a different set of constructs. Many of the studies developed their own theory or model, and did not use an existing instrument. All of these variables make it difficult to objectively compare the results.

Technology acceptance models

The studies mentioned above have all examined factors that influence preservice teachers' acceptance of ICT use and integration, yet each study utilized a different instrument and examined different variables. Two of the studies used an instrument called the Technology Acceptance Model (TAM), which examines key factors in acceptance of technology. Many models of technology acceptance have been developed over the years, including: Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behavior (TPB), Combined Theory of Planned Behavior/Technology Acceptance Model (C-TPB-TAM),

Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and the Social Cognitive Theory (SCT). The key dependent variable in all of these models is intention and/or usage. Table 1 examines these models and the factors which they investigate.

The Theory of Reasoned Action (TRA) is “one of the most fundamental and influential theories of human behaviour” (Venkatesh et al, 2003, p. 428). The TRA states that an individual’s attitude toward a behaviour and the surrounding subjective norms (whether the individual believes that people important to them think they should perform the behavior) influence their behavioral intention (York University, 2007). Figure 2 shows a schematic of the model.

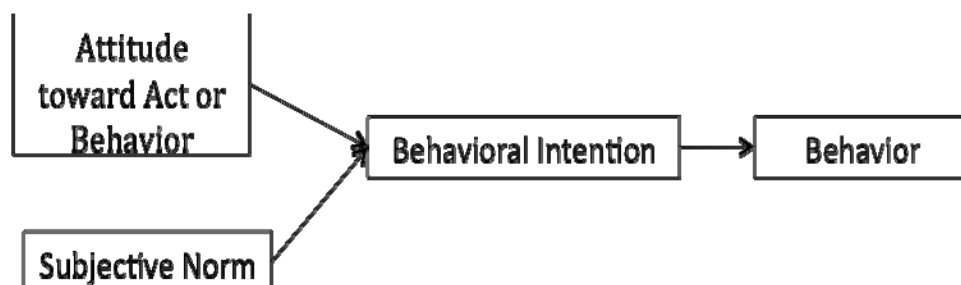


Figure 2. The Theory of Reasoned Action

Source: Fishbein, M., & Ajzen, I. (1975). *Belief, attitude, intention, and behavior: An introduction to theory and research*. Reading, Mass.; Don Mills, Ontario: Addison-Wesley Pub. Co.

The Technology Acceptance Model (TAM), developed by Davis and Davis, “is tailored to IS contexts, and was designed to predict information technology acceptance and usage on the job” (Venkatesh et al., 2003, p. 428). TAM was adapted from the TRA, but does not include attitude as a construct (York University, 2007). TAM instead uses perceived usefulness and perceived ease of use (and TAM2 extends these by adding subjective norm). Figure 3 shows a drawing of the TAM model.

Table 1
The Technology Acceptance Models used to create UTAUT

Name of Model	Acronym/ alternate name	Level of Analysis	Main dependent constructs/factors	Main independent constructs/factors	Originating Authors
Theory of Reasoned Action	TRA	Individual	Behavioural intention, behaviour	Attitude toward behaviour, & subjective norm	Fishbein (1967); Ajzen and Fishbein (1973); Fishbein and Ajzen (1975)
Technology Acceptance Model	TAM (adaptation of TRA)	Individual	Behavioral Intention to Use, System Usage	Perceived usefulness, perceived ease of use & subjective norm (only in TAM2)	Davis (1986); Davis (1989)
Motivational Model	MM	Individual	Behavioral intention	Extrinsic motivation & intrinsic motivation	Vallerand (1997)
Theory of Planned Behavior	TPB	Individual	Behavioural intention, behaviour	Attitude toward behaviour, subjective norm, perceived behavioural control	Ajzen (1985); Ajzen (1991)
Combined Theory of Planned Behavior/Technology acceptance Model	C-TAM-TPB	Individual	Behavioral usage	Attitude toward behaviour, subjective norm, perceived behavioral control & perceived usefulness	Taylor & Todd (1995)

Name of Model	Acronym/ alternate name	Level of Analysis	Main dependent constructs/factors	Main independent constructs/factors	Originating Authors
Model of PC Utilization	MPCU	Individual	Behavioral intention	Job-fit, complexity, long-term consequences, affect toward use, social factors & facilitating conditions	Thompson et al. (1991)
Innovation Diffusion Theory	IDT/DOI, Diffusion of Innovations	Group, Firm, Industry, Society	Implementation Success or Technology Adoption	Relative advantage, ease of use, visibility, result demonstratability, image & compatibility	Lazarsfeld et. al. (1949); Rogers (1962); Rogers and Shoemaker (1971); Rogers (1995)
Social Cognitive Theory	SCT	Individual/Group	Learning, Change in behavior	Outcome expectations-performance, outcome expectations-personal, self-efficacy, affect & anxiety	Bandura (1986)

Information on the models was obtained from:

Venkatesh, V., Morris, M., Davis, G. & Davis, F. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478.

York University (2007). Theories used in IS research. Retrieved October 2, 2007 from <http://www.istheory.yorku.ca/>

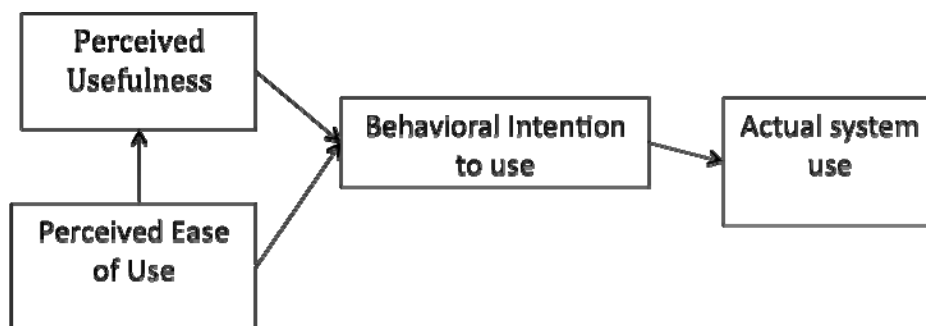


Figure 3. The Technology Acceptance Model

Source: York University (2007). Theories used in IS research. Retrieved January 1, 2009 from http://www.fsc.yorku.ca/york/istheory/wiki/index.php/Technology_acceptance_model

The Motivational Model (MM) uses extrinsic and intrinsic motivation as the two key factors in predicting behavioral intention. The use of motivation as a factor is supported by a large body of research in psychology (Venkatesh et al., 2003).

The Theory of Planned Behavior (TPB) “extend[s] TRA by adding the construct of perceived behavioral control” (Venkatesh et al., 2003, p. 428). Attitude toward behaviour and subjective norm remain as the other two key constructs of the model. Figure 4 shows a diagram of the TPB model.

The Combined Theory of Planned Behavior/Technology acceptance Model (C-TAM-TPB) “combines the [three] predictors of TPB with perceived usefulness from TAM to provide a hybrid model” (Venkatesh et al., 2003, p. 429).

The Model of PC Utilization (MPCU) uses six core constructs to predict usage behaviour (rather than intention). “The nature of the model makes it particularly suited to predict individual acceptance and use of a range of information technologies” (Venkatesh et al., 2003, p. 430).

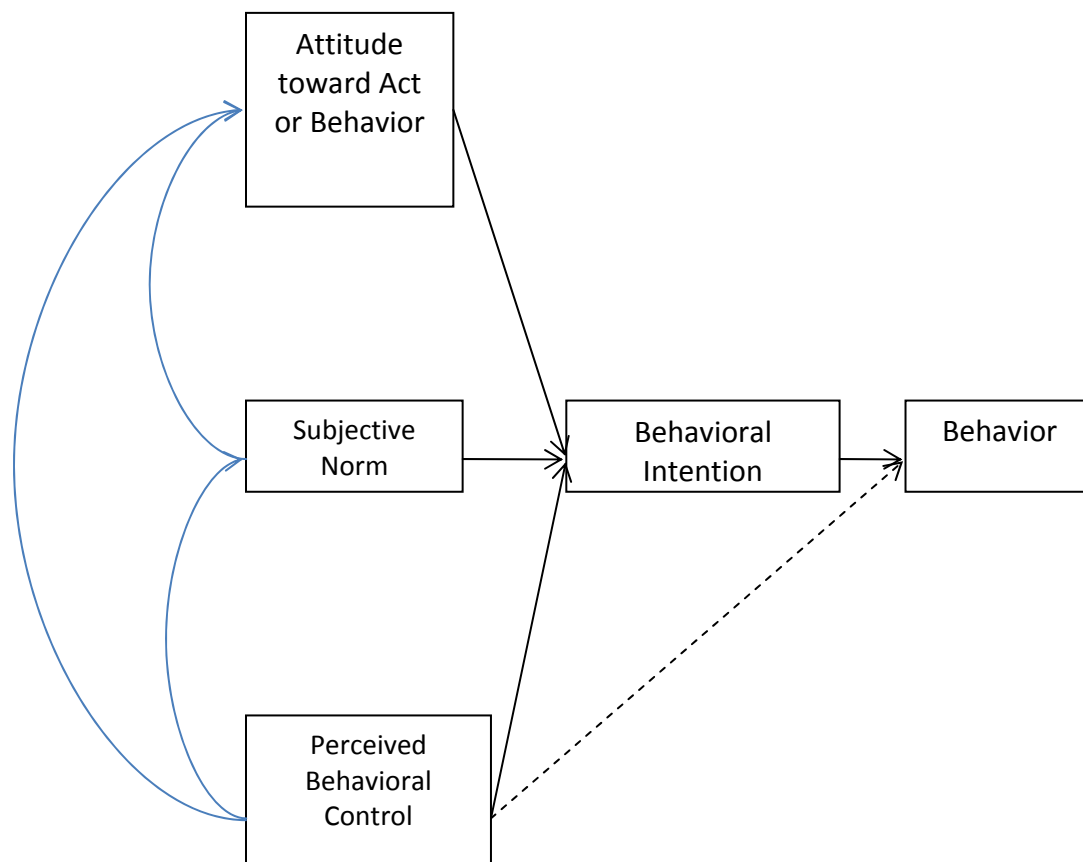


Figure 4. The Theory of Planned Behavior

Source: Source: York University (2007). Theories used in IS research. Retrieved January 1, 2009 from http://www.fsc.yorku.ca/york/istheory/wiki/index.php/Theory_of_planned_behavior

Innovation Diffusion Theory (IDT) began in sociology, but was then modified for use in predicting technology acceptance. IDT uses seven core constructs, including ease of use and voluntariness of use.

Social Cognitive Theory (SCT) is “one of the most powerful theories of human behaviour” (Venkatesh et al., 2003, p. 432). SCT “identifies human behavior as an interaction of personal factors, behavior, and the environment” (York University, 2007) and uses five key constructs.

Venkatesh et al. (2003) empirically tested and compared the preceding eight models and used this data to create the UTAUT model – a single unified theory that has been proven to outperform all eight models.

Use of the UTAUT model

Recently, research has been conducted that utilizes Venkatesh et al.'s UTAUT model to examine the acceptance of specific technologies, many in a business setting. A two-tiered search was conducted to locate journal articles published 2003 or later that made specific use of the UTAUT model:

1. A broad cross-disciplinary search of UTAUT (both abbreviated and expanded terms) was performed in PsychInfo, ERIC, Business Source Premier, Business Source Complete, CBCA Business, Web of Science, and Psychology and Behavioral Sciences Collection.
2. An expanded search in ERIC was conducted for UTAUT and related technology acceptance models in education by using keyword terms with the following logic: “(technology OR computers OR information technology) AND (acceptance OR adoption).” These articles were examined manually and only those that specifically made use of the UTAUT model were kept.

From the two-tiered search, fifteen studies were located, ranging from 2006 to 2009 (a summary of these studies is presented in Table 2). Venkatesh et al.'s original paper was also located in the search (the sixteenth article). Of these fifteen other articles, nine discuss businesses or organizations, three articles focus on health care, and three explore an educational setting. Fourteen of these fifteen studies use the UTAUT model to examine the acceptance of a specific technology: desktop computer applications,

Table 2
Studies that have used the UTAUT Model

Article	Author/ Date	Discipline	Technology	Brief Summary
1. Information Technology in Saudi Arabia: Culture and the acceptance and use of IT	Al-Gahtani, S., Hubona, G.S & Wang, J. 2007	BUSINESS	desktop computer applications	Objective was to test UTAUT in a non-western environment. UTAUT explained 39.1% of intention to use variance and 42.1% of usage variance
2. The Drivers for Acceptance of Tablet PCs by Faculty in a College of Business	Anderson, J.E, Schwager, P.H & Kerns, R.L 2006	EDUCATION	Tablet PC	Uses UTAUT to assess user acceptance of Tablet PCs by the faculty of a college of Business. Model explained 44.6% of the variance in usage of Tablet PCs
3. The Effect of Culture on User Acceptance of Information Technology	Bandyopadhyay, K. & Fraccastoro, K. 2007	BUSINESS	Prepayment Metering Systems	Examines the effect of culture through the social influence variable in UTAUT. SI, PE and EE are significant factors on BI
4. Physicians' acceptance of pharmacokinetics-based clinical decision support systems	Chang, I., Hwang, H. Hung, W. & Li, Y. 2007	HEALTH CARE	clinical decision support systems	Objective: determine whether UTAUT is predictive of physician's behaviour

Article	Author/ Date	Discipline	Technology	Brief Summary
5. User acceptance of a Picture Archiving and Communication System-applying the unified theory of acceptance and use of technology in a radiological setting	Duyck, P., Pynoo, B., Devolder, P., Voet, T., Adang, L. & Vercruyse, J. 2008	HEALTH CARE	PACS system for radiology	Tested UTAUT model with radiologists. UTAUT found to be a good model for this environment. PE and FC were the only significant factors in predicting BI. Explained variance was 48%
6. Who influences whom? Analyzing workplace referents' social influence on IT adoption and non-adoption	Eckhardt, A., Laumer, S. & Weitzel, T. 2009	BUSINESS	CV databases	Discovered that the effects of SI on adoption significantly differ with regard to both source (peer groups) and sink (adopters and non-adopters) of the influence
7. The Effects of Perceived Risk and technology type on users' acceptance of technologies	Im, I., Kim, Y. & Han, H. 2008.	HIGHER EDUCATION	Development of web-based applications. 3 treatment groups: 1)webboard 2) webboard and MSN 3)mobile devices	Objective: Refine UTAUT in order to investigate 4 moderating variables: 2 new - perceived risk (PR), technology type (TT), 2 old - user experience (UE) and gender. Found that model showed a very good fit

Article	Author/ Date	Discipline	Technology	Brief Summary
8. Merchants and Credit Cards: Determinants, perceptions and current practices – a case of Malaysia	Loke, Y.J. 2008	BUSINESS	Merchants' credit card payment systems	SI and PE play the most important role in a merchant's decision
9. User acceptance of Malaysian government multipurpose smartcard applications	Loo, W.H., Yeow, P & Chong, S.C. 2009	BUSINESS	Malaysian government multipurpose smartcard (MyKad)	Found there is a low intention to use MyKad NIC and DL applications. Reasons: lack of understanding of MyKad's benefits, lack of facilitating, and anxiety of damaging the card due to excessive use. Then there is a lack of social support
10. The perceptions towards mobile services: an empirical analysis of the role of use facilitators	Koivumaki, T., Ristola, A. & Kesti, M. 2008	BUSINESS	Mobile phones	Focused on the role of facilitating conditions – familiarization with technology, usage time and tech use related skills
11. Moving beyond adoption: exploring the determinants of student intention to use technology	Robinson Jr., L. 2006	HIGHER EDUCATION	Administrative & instructional technology tools used in undergrad marketing	Look at student intention to use technology. Found acceptable fit of data to the model. PE, EE and SI have direct impact on intention to use technology

Article	Author/ Date	Discipline	Technology	Brief Summary
12. Designing a multifaceted quality improvement intervention in primary care in a country where general practice is seeking recognition: the case of Cyprus	Samoutis GA, Soteriades ES, Stoffers HE, et al. 2008	HEALTH CARE	Electronic medical records	Results show significant impacts of SI on IT adoption (of colleagues in the same department on adopters and non-adopters, of the operating department on non-adopters, of the IT department on non-adopters, and of superiors on adopters)
13. An exploratory study of electronic marketplace adoption: a multiple perspective view	Wang, S., Archer, N.P. & Zheng, W. 2006	BUSINESS	Business to business electronic marketplaces (EMs)	Focuses on the factors that are important for acceptance and whether these change when viewed from multiple perspectives. Discovered that PE is most important, followed by II and FC. EE is least important. Does vary with different perspectives
14. Investigating the determinants and age and gender differences in the acceptance of mobile learning	Wang, Y.S., Wu, M. & Wang, H., 2009	BUSINESS	Mobile learning	Added 2 constructs: perceived playfulness and self-management of learning. Found that PE, EE, SI, perceived playfulness, and self-management of learning were all significant determinants of BI, age moderates the effects of EE and SI on BI, and gender moderates the effects of SI and self-management of learning on BI
15. Why do people use information kiosks? A validation of the UTAUT	Wang, Y. & Ying-Wei, S. 2009	BUSINESS	Information kiosks	The results partially support the use of the UTAUT in the context of information kiosks. PE, EE, and SI were found to have a significant positive influence on BI. BI and FC had a significant positive effect on use

tablet PCs, prepayment metering systems, clinical decision support systems, MSN/webboard, mobile phones, a Picture Archiving and Communication System (PACS) for radiology, business to business electronic marketplaces, mobile learning, Malaysian smartcard (MyKad), information kiosks, credit card payment systems, CV databases, and electronic medical records. The fifteenth study examined ICT in a more general sense, looking at the administrative & instructional technology tools used in undergraduate marketing.

Of the three studies that use the UTAUT model in an educational environment, two of these examine acceptance of a specific technology: tablet PCs and MSN/webboard. The other study looks at students' acceptance of all administrative and instructional technology used in an undergraduate marketing class. In the first study, Anderson, Schwager and Kerns (2006) examined faculty acceptance of Tablet PCs in the College of Business. They determined that the UTAUT model was largely validated in this setting and explained 44.6% of the variance in usage of Tablet PCs. They discovered that within the business faculty environment, PE and voluntariness were the most important factors in determining acceptance.

Im, Kim and Han (2008) used the UTAUT model with undergraduate students to investigate the addition of two new moderators, perceived risk (PR) and technology type (TT). They also included Venkatesh et al.'s moderators experience and gender. They determined that the UTAUT model showed a very good fit to the data. PR, TT and gender were found to be significant moderators.

Robinson (2006) used the UTAUT model to explore the factors that affect marketing students' intention to use technology. Robinson's study supported all four of

Venkatesh et al.'s hypotheses, but found that the moderator effect of gender was insignificant. Robinson also concluded that social influence was important and suggested that educators highlight what other students are doing with technology and give examples of their successes. These three studies are the only ones that have used the UTAUT model to focus on a population in an educational setting. No studies were located that use the UTAUT model with preservice teachers.

A common model in education

The previous studies that examined factors affecting preservice teachers' use of technology used different instruments and factors. Fifteen articles were located that examined preservice teachers' acceptance of ICT integration, and they used numerous technology acceptance models. Two of the studies used an existing model with no changes, and in both of these cases it was the Technology Acceptance Model (TAM) that was used. Three studies adapted or extended an existing model, two of which were the TAM, and one was the Decomposed Theory of Planned Behavior. Ten articles combined one or more existing surveys or created their own. Each study examined its own set of variables or factors, with only a small amount of overlap. None of the studies utilized the UTAUT model. If one instrument could be determined to take into account all of the relevant and influential factors, this could be an important step in learning about our preservice teachers' intentions to use ICT in their teaching. Yuen and Ma (2002) conclude that "the need for a well-defined framework is essential to predict and explain teacher's computer use and to provide necessary inputs to planning and implementing successful professional developments" (p. 367). In order to move forward in this line of research, a common technology acceptance model is needed.

Summary

The literature review indicates that research has been conducted on factors that influence preservice teachers' acceptance and use of ICT in the classroom, yet different variables are examined in each study and a consistent theoretical model is not employed. The need for a single model that includes all factors is evident. The UTAUT model, which takes elements across eight previous technology acceptance models and outperforms all eight models, has been utilized to examine user's intention to use technology, but mainly in a business setting. Three previous studies have used the UTAUT model to examine technology usage in an educational environment, but no previous work has been done that uses the model with preservice teachers. The purpose of this study is to use the UTAUT model to determine the factors that influence preservice teachers' acceptance of ICT integration in the classroom.

Chapter 3: Methodology

Introduction

Chapter 3 will discuss the general approach and research design of the current study. Specific procedures will be described for sampling, instrumentation, data collection, and data analysis.

General Approach

The study uses a mixed methods approach. A mixed methods approach was selected because “the combination of quantitative and qualitative approaches provides a better understanding of research problems than either approach alone” (Creswell & Plano Clark, 2007, p. 8). Mixed methods began in the 1950’s, but it was not until recently that it became popular as a design (Creswell & Plano Clark). Mixed methods is based on a pragmatic world view, in which the “focus is on the consequences of research, on the primary importance of the question asked rather than the methods and multiple methods of data collection” (Creswell & Plano Clark, p. 23).

An Embedded Triangulation design was used in order to “bring together the differing strengths and non-overlapping weaknesses of quantitative methods (large sample size, trends, generalization) with those of qualitative methods (small N, details, in depth)” (Creswell & Plano Clark, 2007, p.62). The study uses the qualitative data to illuminate answers given by participants on the survey and determine whether any issues outside of the UTAUT factors influence preservice teachers’ acceptance of ICT integration. This helps to verify the use of the UTAUT model in an educational setting.

The study begins with a quantitative phase. In social sciences, quantitative research is defined as “inquiry that is grounded in the assumption that features of the social environment constitute an objective reality that is relatively constant across time and settings; the dominant methodology for studying these features is to collect numerical data on the observable behavior of samples and subject them to statistical analysis” (Gall, Gall & Borg, 2005, p. 555). Quantitative research is used to study populations, or samples that represent populations, and study behavior in a natural setting (Gall et al.). Quantitative research “asks specific, narrow questions, collects numeric (numbered) data from participants, analyzes these numbers using statistics, and conducts the inquiry in an unbiased manner” (Creswell, 2005, p. 597). Quantitative data in this study was obtained using the survey of the four UTAUT constructs and intention, age, gender, and voluntariness (see Appendix D for a copy of the survey).

Following the administration of the quantitative survey, qualitative data was obtained through focus groups conducted with a sub sample of the participants. Qualitative research is defined as “a type of educational research in which the researcher relies on the views of participants, asks broad, general questions, collects data consisting largely of words (or text) from participants, describes and analyzes these words for themes, and conducts the inquiry in a subjective, biased manner” (Creswell, 2005, p. 41). Qualitative research is used to explore a central phenomenon, usually with a small sampling of individuals. In this study, preservice teachers’ acceptance of ICT integration in the classroom is investigated in the qualitative phase.

Research Design

The research design for the quantitative data collection is correlational. Gall, Gall and Borg define this research design as “a type of quantitative investigation that seeks to discover the direction and degree of the relationship among variables through the use of correlational statistics” (Gall et al., 2005, p. 546). Correlation coefficients are used as “precise mathematical expression[s] of the types of relationships between variables” (Gall et al., p. 219). The researcher’s aim is to study relationships; they do not control or manipulate any variables. A correlational design was chosen because the study seeks to determine relationships among the UTAUT factors and behavioral intention of ICT integration with preservice teachers. These results (the factors found to be influential in acceptance) can then be explored in further research, and experimental studies can be conducted to test specific interventions. The independent variables in this study are performance expectancy, effort expectancy, social influence, and facilitating conditions. The dependent variable is behavioral intention. The research design is not experimental, as variations in the independent variables occur without the researcher’s intervention.

Correlational research involves the following steps: identifying participants, deciding on measures for the variables under study, collecting data, analyzing the data to determine relationships between variables (strengths and directions) and interpreting the results to form conclusions (Creswell, 2005). Correlational studies are not used to show cause-and-effect between variables. The focus is relationships and degrees of association (Creswell, 2005).

Threats to internal validity must be considered. With correlational research, it must be acknowledged that there may be other independent variables that could affect the

dependent variable being measured. In this study, there may be other factors that affect intention to use ICT in preservice teachers, beyond those hypothesized by Venkatesh et al. Some moderators were tested: gender, age, and voluntariness. Any other independent variables outside of those mentioned are not included in this study, though they may surface through the focus group portion of the study.

In order to minimize generalizability concerns, a large sample was used for the study. Using a power of .80, alpha of .05, and a large effect size (with 19 interactions), a sample size of 76 was determined to be desirable (calculation done with G*Power, Faul, Erdfelder, Lang and Buchner). The final number of surveys used in analysis was 82, which satisfies this calculation. The sample was drawn from only one mid-sized Western Canadian university's teacher education program and therefore may not be generalizable to all preservice teachers. It must also be acknowledged that correlational research can not determine a cause and effect relationship. This is not the goal of this study, which examines the relationships between factors related to preservice teachers' ICT integration intentions.

For the qualitative phase of the study, two focus group interviews were conducted with a sub sample of individuals. These individuals were selected from those participants who indicated (on their survey) a willingness to be involved in the focus groups. Two separate groups were scheduled, according to the participants' schedules. Each session lasted approximately twenty five to thirty minutes (as recommended by Patton, 1990). Within each group, the individuals were relatively homogenous.

Sampling

The population of interest in this study is secondary level preservice teachers in all teaching areas. For the quantitative phase, participants were selected from the researcher's home university. All preservice teachers enrolled in a secondary teacher education program at this mid-sized Western Canadian university were asked for their participation in the quantitative phase of the study. The sample unit was the individual participant that completed the UTAUT survey, because each preservice teacher completed the survey individually.

Every year this mid-sized Western Canadian university admits approximately 120-140 secondary education students into the Post Degree Professional Program (PDPP) and 40-50 students into the Secondary Bachelor of Education (BEd) Program. This year's PDPP students began their program in July 2008 with coursework at the university, and continued this through the fall term. These students had the option of pursuing any of the following teaching areas: Art, Biology, Chemistry, Physics, General Science, English, French, Social Studies (with Geography or History Emphasis), Mathematics, Music, Theatre, German, Japanese, Mandarin, Russian, and Spanish. The Bachelor of Education students began their professional (fifth) year in September of 2008. Possible teaching areas include: Art Education, Physical Education, and Music Education. The Physical Education students must also select a second teachable subject. Both the PDPP and BEd students completed coursework at the university during the fall of 2008, and then began their 3-month practicum in January 2009. Neither the secondary PDPP nor BEd Program currently includes a technology course for the preservice teachers.

For the qualitative phase of the study, purposeful sampling was used to select participants for the interviews: “the logic and power of purposeful sampling lies in selecting *information rich cases* for study in depth. Information rich cases are those from which one can learn a great deal about issues of central importance to the purpose of the research” (Patton, 1990, p. 169). Specifically, intensity sampling was used, which is defined by Patton as selecting “information-rich cases that manifest the phenomenon of interest intensely (but not extremely)” (1990, p. 171). Responses to the quantitative surveys were examined and the researcher looked for interested individuals who indicated that they were either willing to accept technology integration (high intention), or reluctant to use technology in their teaching (low intention). The intention of the study was to form two separate focus groups from these individuals. In reality, those participants who volunteered to participate in a follow-up focus group session all indicated a relatively high intention to use technology on their survey. Therefore it was not possible to form a group of participants with a low intention to use technology, even though some low intention responses existed in the survey. All participants were given the opportunity to indicate on their survey whether they would be interested in participating in a follow-up focus group.

Patton (1990) argues that there is no established sample size that is suitable for all qualitative studies. Twenty participants indicated on the survey that they would be willing to take part in a follow-up focus group. These twenty students were contacted via e-mail, and eight responses were obtained. Due to the schedules of the focus group participants that were contacted, two separate sessions were arranged. The first focus

group consisted of three participants, and the second session was held with two. This gave a total of five individuals for the second phase of the study.

Participant Profile

160 students were invited to participate in the quantitative phase of this study. A total of 85 surveys were received from the education students enrolled in EDCI 352 in the 2008 fall semester, giving a participation rate of 53%. Creswell indicates that “many survey studies in leading educational journals report a response rate of 50% or better” (2005, p. 367), therefore 53% is appropriate. After examination of the surveys, one participant was removed from the study, as this individual had only answered one page (of two) of the survey. This omission left 11 of the 23 items for this participant with no response.

Two of the surveys had outlier responses – one participant answered 1.0 to behavioral intention, and the other 1.0 to social influence. These two participants were removed from the study as these outlier responses had a strong effect on the results for the group. The study is interested in the general response of the group, not on the answers of two individual education students.

Therefore, 82 surveys were used in the analysis of the quantitative data. Within these surveys, there were a total of 11 items that had been left unanswered. According to Tabachnick and Fidell (2001), since “5% or less are missing in a random pattern from a large data set, the problems are less serious and almost any procedure for handling missing values yields similar results” (p. 59). This missing data was handled through SPSS by list wise deletion based on all variables in each procedure.

One of the participants circled two numbers for three of the survey items. In these cases, the mean was used as the individual's response. For example, when both 5 and 6 were circled on the likert scale, a value of 5.5 was entered as the response for that item.

The participants of the survey ranged in age from 21 to 42 years, with a mean age of 25.49, and standard deviation of 3.507 (see Table 3). The majority, 89% of the participants, were under the age of 30.

Table 3
Age of the preservice teachers

Age	# of individuals	Percentage of sample
20-24 years	41	50.0
25-29 years	32	39.1
30-34 years	7	8.5
35-42 years	2	2.4
Total	82	100

Fifty (61%) of the preservice teachers that took part in the survey were female, with thirty-two (39%) being male.

Thirty-five of the 82 participants (42.7%) indicated a single teaching area; all others gave two or more high schools subjects that they specialized in. The subject indicated by the most preservice teachers was Social Studies, with Physics/Chemistry/Biology/Science as the second most common (see Table 4). Mathematics and Physical Education were the two least common teaching areas amongst this group of secondary preservice teachers. In Table 4, each teaching area was counted, so that most participants have two subjects included in the table.

Table 4
Teaching area of the preservice teachers

Teaching Area/Subject	# of individuals	Percentage of sample
Mathematics	9	11
Physics/Chemistry/Biology or Science	29	35.4
English	14	17.1
Social Studies	38	46.3
Languages	12	14.6
Drama, Art, or Music	14	17.1
Physical Education	11	13.4
Other (planning, Economics)	2	2.4

In the qualitative phase of the study, the focus group participants ranged in age from 22 to 34, with an average age of 27.6. Three females and two male preservice teachers participated in the focus group sessions. The teaching areas of the five individuals were English, Biology/Science, Social Studies (two participants), and Chemistry/Science. The focus group participants have been given pseudonyms that will be used consistently throughout this discussion.

Instrumentation

For the quantitative phase of the study, a survey including the UTAUT constructs and moderators was used (see Appendix D for the survey). As discussed in Chapter 1, the UTAUT model was developed by Venkatesh et al. in 2003. Venkatesh et al. combined elements across eight previous models of technology acceptance to create their model.

The UTAUT model has four direct determinants or constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) and three indirect determinants (self-efficacy, attitude towards technology, and computer anxiety). Table 5 gives a breakdown of the four UTAUT constructs and behavioral intention, and

Table 5
 UTAUT constructs - in Venkatesh et al. and this study

Item on Venkatesh et al.'s UTAUT survey	Reworded Item (for this study)	Construct being measured
I would find the system useful in my job	#18: I would find using technology for teaching in the K-12 classroom useful	Performance Expectancy
Using the system enables me to accomplish tasks more quickly	#2: Using technology for teaching in the K-12 classroom would enable me to accomplish tasks more quickly	
Using the system increases my productivity	#10: Using technology for teaching in the K-12 classroom would increase my productivity	
If I use the system, I will increase my chances of getting a raise	#12: If I use technology for teaching in the K-12 classroom, I will increase my employment opportunities	
My interaction with the system would be clear and understandable	#1: My interaction with technology for teaching in the K-12 classroom would be clear and understandable	Effort Expectancy
It would be easy for me to become skilful at using the system	#8: It would be easy for me to become skilful at using technology for teaching in the K-12 classroom	
I would find the system easy to use	#6: I would find using technology for teaching in the K-12 classroom easy to do	
Learning to operate the system is easy for me	#13: Learning to use technology for teaching in the K-12 classroom would be easy for me	

Item on Venkatesh et al.'s UTAUT survey	Reworded Item (for this study)	Construct being measured
People who influence my behaviour think that I should use the system	#19: People who influence my behaviour would think that I should use technology for teaching in the K-12 classroom	Social Influence
People who are important to me think that I should use the system	#14: People who are important to me would think that I should use technology for teaching in the K-12 classroom	
The senior management of this business has been helpful in the use of the system	#9: Senior K-12 school officials would be helpful in the use of technology for teaching in the K-12 classroom	
In general, the organization has supported the use of the system	#5: In general, senior K-12 school officials would support the use of technology for teaching in the K-12 classroom	
I have the resources necessary to use the system	#23: I have the resources necessary to use technology for teaching in the K-12 classroom	Facilitating Conditions
I have the knowledge necessary to use the system	#20: I have the knowledge necessary to use technology for teaching in the K-12 classroom	
The system is not compatible with the other systems I use	#16: Using technology for teaching in the K-12 classroom would not compatible with other teaching responsibilities that I have	
A specific person (or group) is available for assistance with system difficulties	#17: A specific person (or group) would be available for assistance with difficulties when using technology for teaching in the K-12 classroom	

Item on Venkatesh et al.'s UTAUT survey	Reworded Item (for this study)	Construct being measured
I intend to use the system in the next <n> months	#21: I intend to use technology for teaching in the K-12 classroom during my 3-month teaching practicum	Behavioral intention to use the system
I predict I would use the system in the next <n> months	#3: I am determined that I will use technology for teaching in the K-12 classroom during my 3-month teaching practicum	
I plan to use the system in the next <n> months	#7: I plan to use technology for teaching in the K-12 classroom during my 3-month teaching practicum	

Note: In the second column, the number indicates the item number on the survey (see Appendix D)

how the items were reworded for this study. Gender, age, experience, and voluntariness of use were also added to the model by Venkatesh et al. and were hypothesized to moderate the effect of the four direct determinants on user's intention. Self-efficacy, attitude towards technology, and computer anxiety are not believed by Venkatesh et al. to be direct determinants in the model, and therefore they were not included in this study.

The construct of performance expectancy is defined as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” (Venkatesh et al., 2003, p. 447). Venkatesh et al. use the term “the system” as a default placeholder that is to be modified for a given context (see Carlsson et al., 2006; Robinson, 2006). In this study, “using the system” was replaced with “using technology for teaching in the K-12 classroom.” Other studies have used a general term such as ‘technology’ (as opposed to a specific technology or software program) in place of Venkatesh et al.’s ‘the system’ (e.g., Robinson, 2006).

Effort expectancy is defined as “the degree of ease associated with the use of the system” (Venkatesh et al., p. 450). Social influence is defined as “the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al., p. 451). The fourth direct determinant, facilitating conditions, is defined as “the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” (Venkatesh et al., p. 453).

The three UTAUT items for behavioral intention were used by Venkatesh et al. to ask participants about their intended use of ‘the system’ in the next <n> months. In this study, the items were reworded to ask about intention during the participants’ three month teaching practicum (which began January 5, 2009). This is necessary as the

preservice teachers first spent a few months at the university, with a two-week observation time in the high schools where they did not have the opportunity to teach. The study is interested in the preservice teachers' intended use of technology during their own teaching time.

Venkatesh et al. discuss the administration of the UTAUT survey at three points in time: "post-training (T1), one month after implementation (T2), and three months after implementation (T3). Actual usage behavior was measured over the six month post-training period" (Venkatesh et al., 2003, p. 437). This study represents data collection for time T1, prior to implementation (and therefore with intention as the dependent variable, and no usage data). This thesis will be part of a larger study which will follow up with future data collection for T2 and T3 that will include self-reported usage behavior.

Venkatesh et al. (2003) ensured that "the tense of the verbs in the various scales reflected the timing of the measurement: future tense was employed at T1, present tense was employed at T2 and T3" (p. 438). In this study, the future tense was used throughout, providing consistency and ensuring that the participants were thinking ahead to their three month teaching practicum in the high schools when answering the survey questions.

The UTAUT survey items use a 7-point Likert scale, ranging from a rating of 1 indicating strongly disagree, to a rating of 7 indicating strongly agree (with a rating of 4 as neutral). The UTAUT survey includes four items which explore each of the above direct determinants, and three that explore behavioral intention. Behavioral intention is seen as a critical predictor of technology use (Venkatesh et al., 2003).

The survey also contains questions regarding the following moderators established by Venkatesh et al.: gender, age, and voluntariness of use (see Appendix D

for the survey). Gender was measured using “male” and “female.” Age was measured as a continuous variable. Experience was measured by Venkatesh et al. using a “dummy variable that [takes] ordinal values of 0, 1 or 2 to capture increasing levels of user experience” (Venkatesh et al., 2003, p. 439). In this study, the participants’ experience level is 0, corresponding to the T1 data collection. Experience was not included as a moderator in this thesis, which is focused on time 1 only.

Data on voluntariness of use was collected through the inclusion of four items on the survey (see Table 6). These items were developed by Moore and Benbasat (1991) and then used by Venkatesh et al. in the UTAUT model: “perceived voluntariness was measured as a manipulation check per the scale of Moore and Benbasat (1991), where 1 was nonvoluntary and 7 was completely voluntary” (Venkatesh et al., 2003, p. 438). Voluntariness of use is hypothesized by Venkatesh et al. (2003) to mediate the effect of the four direct determinants on intention to use and usage behavior.

Table 6

UTAUT items for voluntariness of use

Reworded Item (for this study)
#4: Although it might be helpful, using technology for teaching in the K-12 classroom would certainly not be compulsory in my job
#11: My boss (principal) would not require me to use technology for teaching in the K-12 classroom
#15: My superiors would not expect me to use technology for teaching in the K-12 classroom
#22: Using technology for teaching in the K-12 classroom would be voluntary (as opposed to required by superiors/job)

Note: The number indicates the question number on the survey.

The UTAUT survey has been shown by Venkatesh et al. to account for 70% of the variability in user’s intention to use technology. Venkatesh et al. tested the model with the original four organizations (used to compare the eight technology acceptance

models) and then cross-validated with two new organizations. Preliminary results were confirmed with this new testing. In cross-validation testing of the survey, the authors established internal consistency reliabilities ranging from .83 to .94 for the constructs.

The qualitative phase of the study, the focus groups, used a standardized open-ended interview approach: “interview questions are written out in advance *exactly* the way they are to be asked during the interview” (Patton, 1990, p. 285). The benefits to using a standardized interview technique are that questions can be made available for review before administering the focus groups, and the interviewee’s time is used efficiently as the questions are developed ahead of time (Patton, 1990). The following five focus group questions (also included in Appendix F) were asked:

1. Within your education program so far, how thorough has the coverage been on the use computer technology for your teaching in the K-12 classroom?
What would you recommend to the university?
2. Do you intend to use technology in your teaching? Why or why not? How?
3. What are your thoughts on the curriculum for educational technology in the high school setting, with respect to appropriateness, thoroughness, etc?
4. What would be the most important thing that would help you to feel prepared to use computer technology for teaching in the K-12 classroom?
5. What is your biggest concern with using computer technology for teaching in the K-12 classroom?

Each focus group began with the researcher explaining what would be covered in the interview, how the information will be used, and the purpose for conducting the focus group (as recommended by Patton, 1990).

Data Collection

The dependent variable measured in this study is behavioral intention. The study is interested in the intention of the preservice teachers to integrate ICT into their teaching. The independent variables of the study are performance expectancy, effort expectancy, social influence, and facilitating conditions. The following information was also obtained from participants: age, gender, voluntariness, and teaching subject area.

The Gantt chart (Table 7) shows the major steps involved in this study and the completion time for each. After the proposal was accepted by all committee members, the ethics process was completed through the university's Human Research Ethics Board.

At this time, contact with the university's teacher education program was initiated to approach instructors for distribution of the participation package, which contained the consent form and survey. A survey of Venkatesh et al.'s UTAUT constructs and questions regarding gender, age, voluntariness, and teaching areas was used to obtain data for the dependent and independent variables, demographic information, and moderators.

In order to collect the data, the researcher obtained permission from the individual class instructors and then visited the secondary teacher education classrooms on campus. A script was used to ensure that the same information was given to all potential participants. The researcher has no relationship to the education students.

Table 7
Gantt Chart Timeline

TASK	START	FINISH	Sept-	Oct. 2008
Proposal approval by committee members	Oct 1 2008	Oct 16 2008		
Proposal approval by Ethics Board	Oct 1 2008	Oct 30 2008		

TASK	START	FINISH	Nov-	Dec. 2008	Jan-Feb 2009	Mar- Apr 2009	May- June. 2009
Prepare for administration of survey	Nov 1 2008	Nov 15 2008					
Data collection	Nov 17 2008	Dec 17 2008					
Analysis of data and thesis writing time	Jan 1 2009	mid Apr 2009					
Thesis review (& revisions) by committee	mid Apr 2009	May 30 2009					
Thesis defense	June ? 2009						
Convocation	Nov ? 2009						

All secondary education students (in the PDPP and BEd programs) were required to take a literacy course (EDCI 352) in the fall 2008 term. There were five sections of this course and the researcher visited each section at the conclusion of the class. The script was read, telling participants about the study and asking for their voluntary participation. Students who were interested were asked to stay behind after the class ended to complete the short survey, or take the survey home with them and drop it off at a predetermined location (addressed envelopes provided). They could also choose to complete the survey online, using the URL provided on the survey. Compensation for the time taken to complete the survey was offered to participants. Each participant who completed a survey was entered into a draw for the winner's choice of: a 2GB ipod shuffle (\$75 value), a \$75 donation to Victoria General Hospital Children's Ward, or \$75 cash. If an individual voluntarily participated in a focus group, their name was entered twice (once for the survey and once for the interview time) and they received \$10 cash for their participation in the focus group. Participants were asked to include their name and contact information on the survey to allow the researcher to contact them for a follow-up focus group and/or the raffle prize. A random number generator was used to choose a winner for the raffle and the prize was awarded in early January 2009.

After the researcher visited all five classes, the instructors of EDCI 352 were asked if they would be willing to send out an e-mail to their class list via FAST (the University of Victoria student information system). The e-mail text was written by the researcher, and invited students who may have not yet had a chance to complete the survey, to do so through an electronic version (web-based survey). This step, as

approved by Ethics, was implemented because the researcher wished to increase the response rate after the initial hard copy distribution of the survey.

The qualitative data collection was through personal interaction. This qualitative data was collected to help illuminate the results discovered through the quantitative UTAUT survey responses. Selected participants were involved in a focus group with the researcher and a small number of other individuals. The focus groups took place as soon as possible after all of the surveys have been administered (the sessions were held on December 11 and 17, 2008), to ensure that the participants' thoughts and opinions had not changed. Each focus group was recorded using a digital recording device and later transcribed by the researcher. Additional notes were also taken by hand during the focus groups.

The time required to complete the survey and/or focus group was a potential threat that the study may have posed to participants, especially as preservice teachers are enrolled in a program that involves intense course work and a teaching practicum. In order to minimize this threat, the surveys were administered during the first term of the education program (prior to the intense practicum period), and the focus groups conducted shortly after. By asking for participation from the preservice teachers before they began their teaching practicum, the researcher hoped to minimize the intrusion. This also gave the research a pre-practicum picture of the preservice teachers and their thoughts on ICT integration. Future research beyond this thesis will attempt to follow-up during the teaching practicum to collect data at additional points in time.

Patton (1990) notes that an interview can cause participants to reflect on their own thinking and values and can perhaps even cause individuals to change their opinions

about certain topics that were addressed. To accommodate this possibility, a handout providing an overview of resources and information about integrating technology into teaching high school was left with each participant of a focus group (see Appendix G).

Procedure for Data Analysis

Quantitative Phase.

This study used concurrent analysis when examining the quantitative and qualitative results in order to “merge the two datasets so that [...] a complete picture is developed from both datasets” (Creswell & Plano Clark, 2007, p. 136). SPSS (originally Statistical Package for the Social Sciences) 17.0 was used in the analysis of the quantitative data. Descriptive statistics were used to examine the demographic information provided by the participants. The mean, range, and standard deviation were calculated for age, voluntariness, and gender.

In order to determine the relationships between the independent variables (UTAUT constructs) and the dependent variable behavioral intention, correlation coefficients were calculated. Correlation coefficients were determined between each item on the UTAUT survey and behavioral intention, as well as each construct and behavioral intention.

Multiple regression (ordinary least squares method) was used to determine whether preservice teachers’ intention to use ICT in their K-12 teaching can be predicted by the following factors: performance expectancy, effort expectancy, social influence, and facilitating conditions. The data was then examined to determine whether the constructs are modified by gender, age, and voluntariness, as hypothesized by Venkatesh et al.

Qualitative Phase.

The data from the focus group interviews was transcribed by the researcher and then read through in its entirety. The qualitative data was examined through the use of content analysis, in order to “identify, cod[e] and categoriz[e] the primary patterns in the data” (Patton, 1990, p. 381). For this phase of the analysis, inductive analysis was used, meaning that “the patterns, themes and categories of analysis come from the data” (Patton, 1990, p. 390). When a new theme/node emerged from the data, the researcher reexamined the transcripts from the beginning, coding any mention of this new node.

Seven themes emerged from the data: K-12 ICT Curriculum Requirements, Leadership (K-12 schools, K-12 students, other preservice teachers, and university), Preparation (knowledge and teacher education program), Specific Uses of ICT, Student Engagement, Time required to learn or use, and Resources (accessibility and quality). These themes were taken directly from the transcripts of the participant’s answers to the focus group questions, and were not based on a pre-existing framework. After examining the themes, the researcher attempted to group the themes into categories. The study is interested in whether any factors exist outside of the UTAUT model that have an effect on preservice teachers’ intention to use ICT in their teaching. The seven themes that developed out of the transcribed focus groups were mapped onto the UTAUT factors, and it was discovered that the themes fit well into the four main constructs. The themes align themselves under the following constructs:

Performance Expectancy:

1. Specific uses of ICT
2. Student Engagement

3. K-12 Curriculum Requirements

Effort Expectancy:

1. Time required to learn or use
2. Preparation (Knowledge and Teacher Education Program)

Social Influence

1. Leadership (K-12 schools, K-12 students, other preservice teachers, and University)

Facilitating Conditions:

1. Accessibility of Resources
2. Quality of Resources

The researcher recognizes the limitations within the qualitative phase of the study.

Member checks, where the analysis is taken back to the participants for review, was not possible due to the time limitations within a masters program. Also, the participants began their practicum in January of 2009, making it difficult to reach them. It was also not possible to have a second researcher code the data and compare themes with the researcher. This is not within the funding available for this study.

Summary

Chapter 3 explained the methodology that was used in the study. An embedded triangulation design was used, which consisted of a quantitative survey followed by qualitative data collection. The qualitative phase, focus groups, was used to build on the initial findings. Data collection began with the survey in late November, and continued with focus groups in December. Through this mixed methods approach, the researcher hoped to determine the UTAUT factors that are important in preservice teachers'

acceptance of ICT integration as well as any other factors outside of these that may be influential.

Chapter 4: Results

Introduction

This chapter discusses the results obtained from both the quantitative and qualitative phases of the study. A profile of the respondents is given, and each of the UTAUT constructs are examined in terms of responses from the survey, and information obtained during the focus group sessions. The researcher then examines the regression analysis and results, and the effects of the moderators on the four main UTAUT constructs.

Performance of the UTAUT Measure

Item reliability.

Cronbach's Alpha was calculated to determine the reliability of the items for each of the UTAUT constructs. A minimum Cronbach's of .70 is typically used, although Leech, Barrett and Morgan (2004) indicate that it is "common to see journal articles where one or more scales have somewhat lower alphas (e.g., in the .60-.69 range), especially if there is only a handful of items in the scale" (p. 25).

Performance expectancy and effort expectancy both had acceptable Cronbach's alphas (.69 and .86 respectively) with the inclusion of all four items for each construct. Behavioral intention (3 items) and voluntariness of use (4 items) had Cronbach's alphas of .87 and .70, indicating that the items for these two constructs are reliable.

The Cronbach's Alpha for social influence was .52, indicating a reliability issue with the items. Removal of item nine ("Senior K-12 officials would be helpful in the use of technology for teaching in the K-12 classroom") raised the alpha slightly, but only to

.57. Omission of both item nine and also item five (“In general, senior K-12 officials would support the use of technology in the K-12 classroom”) gave a Cronbach’s of .63, indicating that the two remaining items worked together to provide a reliable measure of the social influence construct.

The Cronbach’s Alpha for facilitating conditions was .60 when all four items were included. When item sixteen (“Using technology for teaching in the K-12 classroom would not be compatible with other teaching responsibilities that I have”) was deleted, the alpha was increased to .72. When the correlations between this item and the other three items for facilitating conditions were run, it was seen that item sixteen is not correlated with the other three items.

Construct creation.

With item reliability established, the means were used to combine the items for each construct. Performance expectancy, effort expectancy, voluntariness of use, and behavioral intention retained all of their items from the survey. For facilitating conditions, item sixteen (“Using technology for teaching in the K-12 classroom would not be compatible with other teaching responsibilities that I have”) was omitted, and both item five (“In general, senior K-12 school officials would support the use of technology in the K-12 classroom”) and item nine (“Senior K-12 school officials would be helpful in the use of technology for teaching in the K-12 classroom”) were dropped from the social influence construct.

The kurtosis and skewness of each variable was then analyzed in order to check for normality. The kurtosis is a measurement of the peak of the curve, but does not usually have a large effect on the analyses (Leech, Barrett & Morgan, 2004). Skewness

examines the symmetry of a curve: “if one tail of a frequency distribution is longer than the other, and if the mean and median are different, the curve is skewed” (Leech, Barrett & Morgan, 2004). The skewness and kurtosis is within range for all six of the constructs (between -1 and +1 for skewness and a value close to zero for kurtosis), as shown in Figures 5-10.

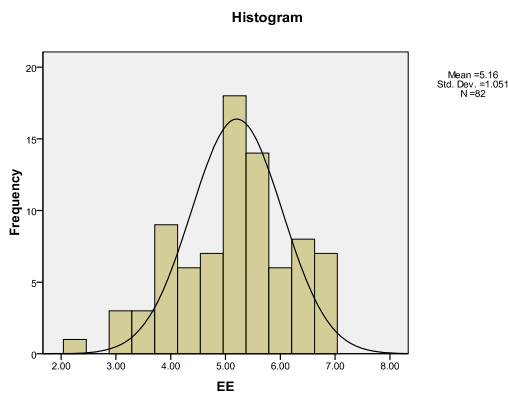


Figure 5. Effort Expectancy
Skewness = $-.31$, Kurtosis = $-.27$

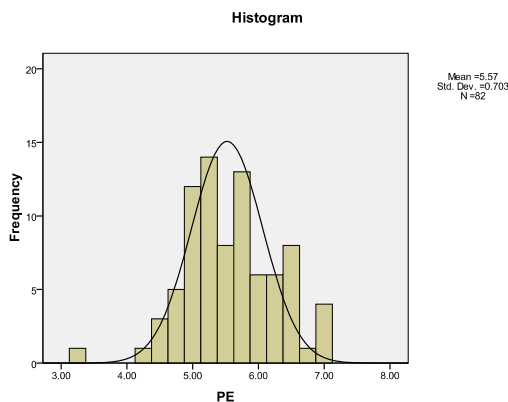


Figure 6. Performance Expectancy
Skewness = $-.08$, Kurtosis = $.46$

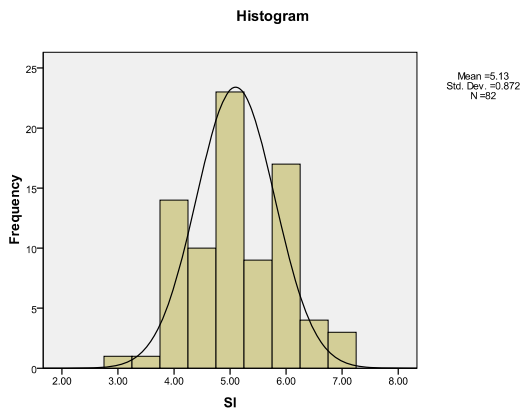


Figure 7. Social Influence
Skewness = .08, Kurtosis = -.52

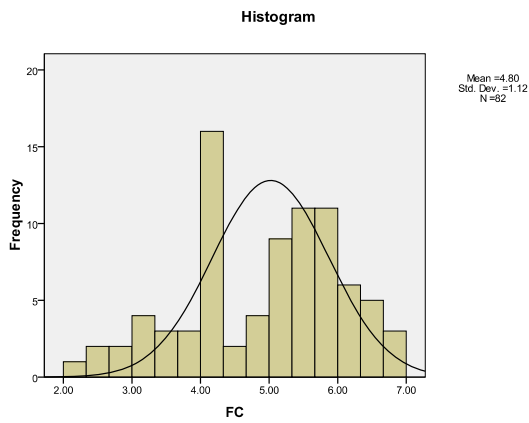


Figure 8. Facilitating Conditions
Skewness = -.50, Kurtosis = -.38

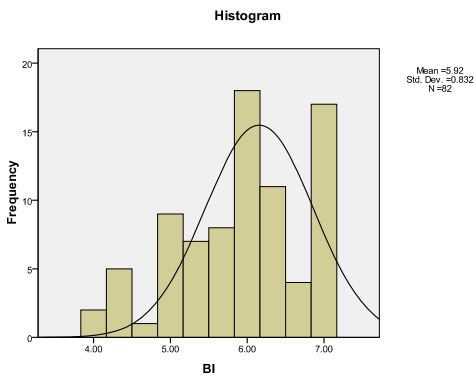


Figure 9. Behavioral Intention
Skewness = -.45, Kurtosis = -.53

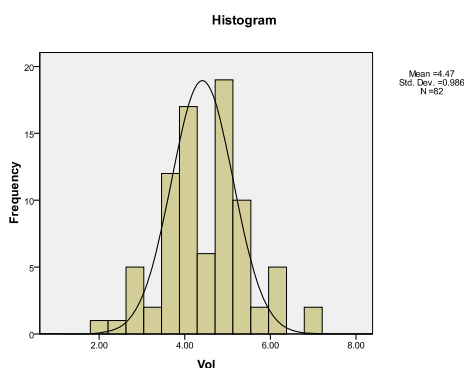


Figure 10. Voluntariness of Use
Skewness = .15, Kurtosis = .10

The 4 Main Constructs

Venkatesh et al. hypothesized that performance expectancy, effort expectancy, and social influence all have a significant direct effect on behavioral intention. They hypothesized that facilitating conditions would not have a significant effect on intention, but would affect usage behavior (in later time trials).

In the following sections, the survey and focus group responses are examined for each of the four direct determinants, voluntariness of use, and behavioral intention. The correlations are discussed for each construct with behavioral intention, and all correlations can be seen in Table 8. The correlations between each individual survey item and behavioral intention can be seen in Appendix H.

Table 8

Correlations between independent and dependent variables

Subscale	EE	PE	FC	SI	BI
EE	-	.366(**)	.680(**)	.155	.520(**)
PE		-	.197	.391(**)	.387 (**)
FC			-	.142	.371(**)
SI				-	.256(*)
BI					-

Note. * Correlation is significant at the 0.05 level (2-tailed).

** Correlation is significant at the 0.01 level (2-tailed).

EE=effort expectancy, PE=performance expectancy, FC=facilitating conditions, SI=social influence, BI=behavioral intention

Performance Expectancy

The construct of performance expectancy is defined as “the degree to which an individual believes that using the system will help him or her to attain gains in job performance” (Venkatesh et al., 2003, p. 447). In this study, performance expectancy had a mean response of 5.58, and standard deviation of .70. The construct was significantly correlated with behavioral intention at the .01 level (2-tailed), with a correlation coefficient of .39. Item number 18, “I would find using technology for teaching in the K12 classroom useful” had the highest correlation with behavioral intention (.611), which was much higher than the other three items. 76.9% of the participants responded “agree” or “strongly agree” to this statement (see Table 9 for a complete breakdown of the frequencies of responses to each item in this construct). It is interesting to note that just over half of the participants (51.2%) indicated that they believe that using technology for teaching in the K-12 classroom will enable them to increase their employment opportunities.

Through the focus group sessions, student engagement emerged as the main reason that the preservice teachers felt that they should use ICT in the classroom. Four of the five participants mentioned this as a strong motivating factor for using ICT in their future teaching at the high school level.

When asked whether they intend to use ICT in their teaching, Justin responded “I would, do intend to use it, because I think it’ll ... I have a *feeling* that it’ll help involve more students of this generation.” Similarly, Sally said:

Table 9
Performance expectancy frequency distributions

		1	2	3	4	5	5.5	6	7
		SD							SA
PERFORMANCE EXPECTANCY									
#18: I would find using technology for teaching in the K-12 classroom useful	#	0	0	0	1	17	1	39	24
	%	0	0	0	1.2	20.7	1.2	47.6	29.3
#2: Using technology for teaching in the K-12 classroom would enable me to accomplish tasks more quickly	#	0	0	1	10	33	0	25	13
	%	0	0	1.2	12.2	40.2	0	30.5	15.9
#10: Using technology for teaching in the K-12 classroom would increase my productivity	#	0	2	4	12	30	0	25	9
	%	0	2.4	4.9	14.6	36.6	0	30.5	11
#12: If I use technology for teaching in the K-12 classroom, I will increase my employment opportunities	#	0	0	0	15	25	0	23	19
	%	0	0	0	18.3	30.5	0	28	23.2

Note: SD=strongly disagree; SA= strongly agree

Yes, because I think there's a lot of good things you can do. Um, especially in the sciences, to like show videos and that sort of thing to make it a little more engaging than chalk and talk which will get pretty boring. (Sally)

Dennis agreed with the availability of engaging resources for students, and indicated the following:

Certainly in Social Studies, so many resources are available, videos, uh, historical videos, news reels, audio recordings ... I definitely want to include those in my classroom. With those you can engage the students much better and get their attention and make them think more about the material at hand. (Dennis)

Linda spoke about the fact that she had already seen that ICT can get students excited about learning and that this observation has motivated her to use ICT in her own future teaching:

You know, [technology is] the stuff that kids get *really* excited about. Even from my two-week practicum I could tell, like, when they were talking about film or making a film, they got really excited. So I think that's what I'm going to have to stick to. (Linda)

Dennis later acknowledged that using ICT in the classroom can sometimes encourage or assist students who benefit from a different way of learning new information:

I'm interested in using technology in schools. I think it's, uh, a great way to engage students and, you know, explore different topics ... It also engages students that see things differently, more students are visual, some students are visual, others who see the written word. (Dennis)

Student engagement was the most important reason for using ICT according to the preservice teachers that participated in the focus group sessions. Yet although they indicated an intention to use ICT in their own teaching, the participants did not seem to be aware of many opportunities or ways in which they could use ICT effectively.

Justin was unsure of what would work with his students, and when asked how he would incorporate ICT he responded:

I'm not sure. I think it would be more of a trial and error thing. Like, maybe set up a blog, if that, I don't know if that would work in my subject area or not. Or

maybe, yeah, like a homepage that they could check. Or a facebook thing, group, or... (Justin)

Linda also mentioned facebook and blogs as possible methods for integrating ICT: “doing a Social Studies project where they have to create a facebook or a blog based on a historic character. Or doing podcasts, or doing mini movies, or commercials.”

Bridget was a little more hesitant with her intended use of technology. She felt that her own lack of knowledge and skill with ICT tools would make it difficult for her to use these tools effectively in her teaching. She responded that she “plan[s] to use basic technology as well. Like PowerPoint, and presentations ... it would probably be mostly them using it through assignments as well I guess, and not so much incorporation.”

Dennis concluded the conversation in one of the focus group sessions with “but that said, I don’t think [technology is] a replacement for, you know, a well-planned lesson and a teacher who knows their subject and is interested in teaching.” He was willing, and even excited about using ICT as an additional tool in his teaching repertoire, but was determined that it would not be his only technique.

This group of preservice teachers believed in the usefulness of ICT for increasing student engagement during lessons, but did not seem to be aware of many techniques or ways in which they could effectively use ICT. When asked about the curriculum for educational technology in the K-12 classroom, it was also evident that the participants did not feel that ICT was a topic that they needed to worry about including in their classes.

Dennis’ response was typical of the participants:

What’s being taught in high school to students? Hmmm... I don’t know if I can answer that. I can guess, but I don’t know if I can answer that with, you know,

authority, because I don't know what is being taught in the curriculum. I know there's definitely computer science courses, I know the high school I'm going to has a class which offers web design and one of my professors, sorry, one of the teachers I'll be working with runs a class which does, uh, video editing as well. But, uh, yeah, I don't know what the curriculum is. (Dennis)

Bridget responded similarly, indicating that "Yeah, I don't think it's part of curriculum, or to my knowledge, I don't know if there's specific classes or anything for it." She did mention that "it's in the English IRPs a little bit in the form of watching, like media awareness, and watching film and video. That's minimally." Linda responded to this comment by saying that "there's nothing in grade 8 that requires [ICT]. Even within the Social Studies or English, there's nothing really. It doesn't say, go on a website and ... so ...". The only specific mandatory ICT tool mentioned by any of the focus group participants was B.C.'s student information system (BCSIS). Dennis was aware of the need for him to learn this software program, a requirement which was making him nervous without proper preparation with this tool from the university.

Although ICT is incorporated throughout the B.C. IRPs, the participants did not appear to be aware of this requirement. On the contrary, Justin indicated that "I guess my biggest concern would be ... whether or not it could fit into the structure of the prescribed learning outcomes." The participants had high ratings on the construct of performance expectancy, and the majority of the survey respondents indicated that they felt ICT would be useful in their teaching. Yet in the focus groups, the uses they saw for ICT were extremely limited, and they were not aware of any mention of ICT in the K-12 curriculum documents.

Effort Expectancy

Effort expectancy is defined as “the degree of ease associated with the use of the system” (Venkatesh et al., p. 450). The construct of effort expectancy had a mean response of 5.16, and a standard deviation of 1.05. Effort expectancy was significantly correlated with intention, with a coefficient of .52 (this was the highest correlation with intention of the four main constructs). All four of the items within this construct were significantly correlated with behavioral intention, but the strongest correlation was with item 13 (“Learning to use technology for teaching in the K-12 classroom would be easy for me”). This item had a correlation of .53 with intention.

Table 10 displays the frequency of responses for each of the four items within effort expectancy. For all four items, less than half of the participants responded “agree” or “strongly agree” to the statements – 48.8%, 37.8%, 37.8% and 46.3% respectively for items 1, 8, 6, and 13. These results indicate that the majority of the participants are not extremely confident in the ease of use associated with ICT in the K-12 classroom.

Participants in the focus group sessions also indicated a concern with the ease of use associated with ICT. They were particularly concerned with technical difficulties that could occur when attempting to utilize technology during a lesson: when asked what would be their biggest concern with using technology for teaching in the K-12 classroom, two participants indicated “technical difficulties.” Sally was concerned with what would happen if the technology “doesn’t work ... waste a lot of time trying to get it to work....” Dennis was concerned with technical difficulties and also “the time it takes perhaps to learn some software applications. And that said, also, um, some of the ministry

Table 10
Effort expectancy frequency distributions

		1	2	3	4	5	6	7
		SD						SA
EFFORT EXPECTANCY								
#1: My interaction with technology for teaching in the K-12 classroom would be clear and understandable	#	0	3	2	18	18	29	11
	%	0	3.7	2.4	22	22	35.4	13.4
#8: It would be easy for me to become skillful at using technology for teaching in the K-12 classroom	#	0	2	8	9	32	19	12
	%	0	2.4	9.8	11	39	23.2	14.6
#6: I would find using technology for teaching in the K-12 classroom easy to do	#	1	1	10	15	24	20	11
	%	1.2	1.2	12.2	18.3	29.3	24.4	13.4
#13: Learning to use technology for teaching in the K-12 classroom would be easy for me	#	0	2	7	9	26	28	10
	%	0	2.4	8.5	11	31.7	34.1	12.2

Note: SD=strongly disagree; SA= strongly agree

based software.” These two things were seen by the participants as barriers to their successful use of ICT in the classroom.

The focus group sessions also revealed a potential explanation for the concerns that the participants have with the ease of use of ICT. Preparation was a key theme that came out of the responses: both knowledge of ICT, and preparation obtained through the teacher education program. Although some of the participants felt secure in their own basic technology skills, they did not feel prepared to use these skills effectively in teaching. In particular, they felt that their university courses had not given them many examples of possible uses of ICT, or opportunities to experiment with ideas and tools.

As Justin says:

I mean, personally I'm fairly comfortable with what, you know, high school students are using, like how they're using it. But in terms of how I can actually incorporate that or integrate that into a way to teach them, I have no idea. And I've never been given any kind of suggestion, or anything like that, here. (Justin)

When asked specifically how thoroughly the university program had covered the use of ICT, the participants indicated concern with the lack of examples they'd been given for successful uses of ICT in the classroom. With respect to the coverage of ICT in the teacher education program, Bridget responded: "I'd say not very... thorough. I don't find it mentioned very much except that it *can* be an option but there's not really too much instruction on how to go about doing it." Linda agreed with this comment, stating that "we've had nothing about computers or any other technology ... I've had one professor in one classroom we did a, *one* digital lesson project, and that's for a website, and that was during the summer. But other than that there's been nothing else." Justin echoed these responses, saying that "I'd have to agree with these guys. We have had very little, if anything, in terms of technology, or how to integrate it any way into the classroom."

Bridget especially felt that her ICT knowledge was insufficient, as evident in the following comment: "I'm not very comfortable with a lot of technology ... [My biggest concern is] not having the knowledge base, so feeling almost useless when it came to teaching anything with technology, besides maybe media awareness." Linda seemed to disagree with Bridget, saying that her fellow education students are all "pretty comfortable" with technology. Yet she then continues, saying:

Not everyone's comfortable with building a website or doing that ... I mean, we had, we did a blog in one class, and not everyone knew how to work a blog. And maybe doing a wiki or even another digital, uh, digital project or that required for a classroom. (Linda)

This comment indicates that her classmates are not, in fact, comfortable with technology such as website development, blogs, or wikis. She mentions the possibility of a course during the teacher education program that could help students with "integrating it" (Linda).

Bridget, Justin, and Dennis all supported the idea of an ICT course in the teacher education program. Bridget highlights the need for a course with her statement:

Well, yeah, some instruction [is needed], but maybe also just a lot of ideas or examples of how it *has* been used in a class, and how we could go about it. One teacher mentioned a blog once. I think that was the only suggestion we ever got. (Bridget)

Justin made the following comment:

Yeah, I would even go so far as to say a course would be helpful. It wouldn't have to be. ... I mean, it could be that seminar class because we didn't do anything in that anyway. Cause they're already trying to push some form of it on us that way, with the e-portfolio. So it could be just more focused on, just all focused on [technology]. That's where we wrote the blogs and that's where we got the e-portfolios. In terms of just integrating, yeah, the technology into the classroom as strategies to help the kids learn. And even using a projector. Like, I've never

even used one of those. Or one of, whatever this is [points to a PowerPoint projector]. I don't know how to use it. (Justin)

When later asked about the most important thing that would help him to feel comfortable integrating technology into his teaching, Justin replied with “a course on how to integrate that [technology] into the class. Like, with actual examples of strategies and how it's been done. You know, things to work on ... or work off of.”

Dennis referred to a course at a nearby university, and the need for a similar course in his university:

I think it would be a good idea to perhaps just have a basic course on, um, perhaps web design, or HTML would be good. I know that [nearby university] for example, in their creation of, they have to do a similar e-portfolio as us, but they have to do it individually, e-portfolio, and design their own webpage. So they actually take a course in learning HTML. I thought that would be useful. It would certainly be more time consuming for a student, but the long term benefits would be better. (Dennis)

Only Linda disagreed with the idea of a technology course, saying “I don't know so much if a class would be useful. I feel pretty comfortable with technology.” The others indicated a lack of coverage in their current program, indicating that the use of technology was optional but never required, and examples for incorporation were rarely included. A typical inclusion of technology in the program is shown by this example given by Dennis: “in presentations we have been asked if we want to use PowerPoint or some other means to present. But again, it's not required.” Sally mentioned a workshop

that introduces ICT tools such as webpages, wikis, and blogs, but this seminar was held in the summer time, and attendance was optional for the preservice teachers.

Social Influence

Social influence is defined as “the degree to which an individual perceives that important others believe he or she should use the new system” (Venkatesh et al., p. 451).

Social influence had a mean of 5.13 and standard deviation of .87. This construct was significantly correlated with intention, with a coefficient of .26. Table 11 gives a breakdown of the responses for this construct.

Table 11
Social influence frequency distribution

		1	2	3	4	5	6	7
		SD						SA
SOCIAL INFLUENCE								
#19: People who influence my behavior would think that I should use technology for teaching in the K-12 classroom	#	0	1	1	17	32	22	8
	%	0	1.2	1.2	20.7	39	26.8	9.8
#14: People who are important to me would think that I should use technology for teaching in the K-12 classroom	#	0	1	2	24	24	26	5
	%	0	1.2	2.4	29.3	29.3	31.7	6.1
#9: Senior K-12 officials would be helpful in the use of technology for teaching in the K-12 classroom	#	0	0	11	28	26	14	1
	%	0	0	13.4	34.1	31.7	17.1	1.2
#5: In general, senior K-12 officials would support the use of technology in the K-12 classroom	#	0	0	0	2	14	51	13
	%	0	0	0	2.4	17.1	62.2	15.9

Note: SD=strongly disagree; SA= strongly agree

Item five (“In general, senior K-12 officials would support the use of technology in the K-12 classroom”) had an overwhelmingly positive response from the participants compared to the other three items, with 78.1% of the participants responding with “agree” or “strongly agree.” Compare this with item nine, where only 18.3% of participants responded “agree” or “strongly agree,” indicating that the preservice teachers feel that senior K-12 officials would support the use of ICT, but would not be helpful in implementation. These two items (five and nine) were dropped from the construct as they did not work with the other items to provide a reliable measure.

The two remaining items, numbers 19 and 14, had a much smaller percentage of positive responses: 36.6% and 37.8% of the individuals indicated that they “agree” or “strongly agree” with these statements. It appears that the preservice teachers do not believe that the people who influence them or are important to them would think that they should use ICT in their teaching. From the surveys, it is unclear who the participants are imagining when answering these items – their friends, family, colleagues, high school students, etc. The focus group sessions give us the opportunity to examine these possibilities. Four groups of individuals emerged from the focus groups as having an influence on the preservice teachers’ intentions to use ICT: the K-12 schools, K-12 students, other preservice teachers, and the university.

One participant mentioned the influence of the K-12 practicum school when responding to a question about his biggest concern with integrating ICT: “I guess my biggest concern would be the [pause...lack of] acceptance on the part of the rest of the school, or the administration or something” (Justin). Another participant in that session (Linda) asked Justin whether his school had many older teachers, to which he responded

“there’s a mix.” Linda said “I’d be worried about that too, but I think I have younger teachers, so I think they’d be more accepting [pause] I never thought of it that way.”

Lack of acceptance of the K-12 schools (administration or teachers) did not emerge in the other focus group session as a concern.

The influence of K-12 students emerged as the biggest factor in determining whether or not the preservice teachers will integrate ICT into their teaching. Two of the participants (Bridget and Linda) indicated that they, as teachers, are likely to be “way behind most of the high school students that I’m teaching, in terms of that knowledge” (Bridget). When Justin commented on the fact that he didn’t know how to use the PowerPoint projector, Linda said “Now we’re going to look like a fool. I don’t know how to turn it on!” There was a real concern from the preservice teachers about looking foolish in front of their students, who were likely to be more proficient with the latest technologies. Bridget went so far as to admit that she “feel[s] [that she’d] be kind of laughed at in a high school for [her] current [ICT] knowledge.”

When asked what would make her feel the most prepared to use technology in her teaching, Linda made the following comment:

I think though, that I would feel more comfortable if I had more time with my practicum students, and ask *them* about the technology that they use, and what kind of things do they want to see in the program. Because you know, I know about blogs, I know about wikis, I know about, you know, video games and that, but maybe there’s something beyond that I haven’t gotten to yet. I don’t know what level my kids are at, right. So ... we’ll see! (Linda)

Although she feels confident about her basic ICT skills, Linda is very aware of the fact that her young students may be far more advanced in terms of technology. Linda later talked about her biggest concern with using ICT in her teaching at the high school level:

Having the kids know, just *so* beyond my [level...] you know, just, I mean, I'm not that, that savvy about ... you know, I'm not a computer programmer. But I know that some of my kids could be. I mean, I just have to identify, I guess I'm going to have to identify those kids and make them kind of a leader. You know, make them feel like they can teach, and they *should* be teaching other kids how to do this ... so that's the only thing I'm worried about really. (Linda)

Linda was the only focus group participant to mention the idea of using her students' advanced knowledge of ICT as a positive force within the classroom.

Only one participant mentioned the influence of the university or teacher education program. Linda commented about the lack of encouragement from faculty members with respect to the use of ICT: "I've actually had several professors tell me don't bother with PowerPoint, you know, it's going to take up too much of your time and don't bother with, you know, this or this." The influence of fellow preservice teachers was also mentioned by Linda, who indicated that it was other students, and not faculty members, who encouraged the use of ICT: "But the only other way I got anything, any technology based activities, is through my peers. Just through discussion, right? So, I'd say just all around, we need more peer sharing."

Facilitating Conditions

Facilitating conditions is defined as “the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system” (Venkatesh et al., p. 453). This construct had a mean of 4.80 and standard deviation of 1.12. Facilitating conditions was significantly correlated with behavioral intention, with a coefficient of .37.

In order to align the four items for this construct, item number 16 was reversed during the analysis, so that a response of 1 became a 7, a 2 became a 6, and so on. This effectively alters the meaning of the item to become a positive statement about facilitating conditions: “Using technology for teaching in the K-12 classroom *would* be compatible with other teaching responsibilities that I have.”

Item 17 stands out as the item with the fewest preservice teachers responding with “agree” or “strongly agree.” Only 22% of the participants indicated that they believe there is a specific person/group that would be available to help them with difficulties they may encounter with the use of ICT. The responses to the other items were also relatively low – 35.4% responded “agree” or “strongly agree” to item 23, 46.4% to item 20, and 56.1% to item 16. These responses indicate that many preservice teachers do not feel that they have the knowledge, resources, and help that they require to use ICT successfully in their teaching practicum. Table 12 gives the frequencies of responses for the four items within the construct of facilitating conditions.

Although facilitating conditions did not have a substantially large correlation with behavioral intention, this factor was mentioned as a concern by the participants in the focus group sessions. When asked about the most important thing that would help them

Table 12
Facilitating conditions frequency distribution

		1	1.5	2	3	4	5	6	7
		SD							SA
FACILITATING CONDITIONS									
#23: I have the resources necessary to use technology for teaching in the K-12 classroom	#	2	0	5	5	18	22	19	10
	%	2.4	0	6.1	6.1	22	26.8	23.2	12.2
#20: I have the knowledge necessary to use technology for teaching in the K-12 classroom	#	0	0	5	9	7	23	25	13
	%	0	0	6.1	11	8.5	28	30.5	15.9
#16: Using technology for teaching in the K-12 classroom would not be compatible with other teaching responsibilities that I have	#	2	1	2	3	9	19	35	11
	%	2.4	1.2	2.4	3.7	11	23.2	42.7	13.4
#17: A specific person (or group) would be available for assistance with difficulties when using technology for teaching in the K-12 classroom	#	1	0	5	15	19	21	15	3
	%	1.2	0	6.1	18.3	23.2	25.6	18.3	3.7

Note: SD=strongly disagree; SA= strongly agree

to feel prepared to use technology in their teaching, Sally responded with: “Other than knowing what is offered, what resources are offered in my school? If I know what’s there for me to use, that would probably make a lot more ... prepared [laughs]!” Dennis agreed with this concern, and addressed the large variety of resources (and often lack of resources) that exist across K-12 schools, even within the same district:

Yeah, I think the same thing ... schools vary so much as to what they do and what sort of technological resources they have. I know some schools don’t have digital

projectors, for example, whereas the school I'm going to seems to - every classroom seems to have one. (Dennis)

In contrast to the resources available in Dennis' practicum school, Linda's school "doesn't have a lot in terms of technology - there's no projectors, there's no, there's nothing like that available." Bridget was also concerned about the accessibility of resources at her practicum school and indicated that "she would probably avoid making a lot of it mandatory just cause it might not all be equally accessible."

Even when the technology was available to them, the focus group participants wondered about the quality of the resources. As Linda pointed out, "we have a really small computer lab and they're pretty old computers." Even Dennis' practicum school, which has a PowerPoint projector in every classroom, has its concerns: "But, that said, the computers that run them are antiques, and most people who use them bring in their own laptops. So [the teachers] have to have those resources available - the school doesn't have any spare laptops."

Voluntariness of Use

Voluntariness of use was measured using four items within the UTAUT survey. The mean response for this construct was 4.47. The frequency table below (Table 13) shows the mixed responses for this construct. At the extreme, only 7.3% of participants indicated "agree" or "strongly agree" to item 15 - "My superiors would not expect me to use technology for teaching in the K-12 classroom." The mean response for this item was 3.7, indicating that most participants somewhat disagree, and feel that their superiors would expect them to use ICT. When asked directly whether the use of ICT would be voluntary in their K-12 teaching (item 22), 47.6% of the individuals responded "agree" or

Table 13
Voluntariness of use frequency distributions

		1	2	3	4	5	6	7
		SD						SA
Voluntariness of Use								
#4: Although it might be helpful, using technology for teaching in the K-12 classroom would certainly not be compulsory in my job	#	1	8	14	20	19	15	5
	%	1.2	9.8	17.1	24.4	23.2	18.3	6.1
#11: My boss (principal) would not require me to use technology for teaching in the K-12 classroom	#	2	5	13	21	14	21	5
	%	2.4	6.1	15.9	25.6	17.1	25.6	6.1
#15: My superiors would not expect me to use technology for teaching in the K-12 classroom	#	5	7	24	17	22	4	2
	%	6.1	8.5	29.3	20.7	26.8	4.9	2.4
#22: Using technology for teaching in the K-12 classroom would be voluntary (as opposed to required by superiors/job	#	0	0	8	16	19	29	10
	%	0	0	9.8	19.5	23.2	35.4	12.2

Note: SD=strongly disagree; SA= strongly agree

“strongly agree” and the mean response was 5.2. Not a single participant indicated that they “disagree,” or “strongly disagree” with this statement, and only 9.8% indicated “somewhat disagree.” This indicates that a very small proportion of the participants believe that the use of ICT in their teaching is mandatory, and the majority of participants “somewhat agree” with the statement that ICT use would be voluntary.

As previously discussed in the section on performance expectancy, the focus group comments indicated that the participants in the focus groups were unaware of any mention of ICT in the K-12 curriculum and did not feel that it was their responsibility to cover technology in their teaching.

Behavioral Intention

The three UTAUT items for behavioral intention were used by Venkatesh et al. to ask participants about their intended use of ‘the system’ in the next <n> months. In this study, the items were reworded to ask the preservice teachers about their intention to use ICT during their upcoming three-month teaching practicum (which began January 5, 2009).

The majority of the participants indicated an intention to use ICT in their teaching practicum. A large number of individuals responded “agree” or “strongly agree” for each of the three items: 65.9% for item 21 (I intend), 70.7% for item 3 (I am determined), and 78% for item 7 (I plan). Table 14 gives the frequency distributions for these items.

Table 14
Behavioral intention frequency distributions

		1	2	3	4	5	6	7
		SD						SA
BEHAVIORAL INTENTION								
#21: I intend to use technology for teaching in the K-12 classroom during my 3-month teaching practicum	#	0	0	1	6	21	36	18
	%	0	0	1.2	7.3	25.6	43.9	22
#3: I am determined that I will use technology for teaching in the K-12 classroom during my 3-month teaching practicum	#	0	1	0	6	17	32	26
	%	0	1.2	0	7.3	20.7	39	31.7
#7: I plan to use technology for teaching in the K-12 classroom during my 3-month teaching practicum	#	0	0	0	5	13	36	28
	%	0	0	0	6.1	15.9	43.9	34.1

Note: SD=strongly disagree; SA= strongly agree

Additional Influences

The focus group sessions did not reveal any additional factors or issues outside of the UTAUT constructs that are influential in preservice teachers' acceptance of ICT integration. The interview transcripts were coded using inductive analysis, meaning that "the patterns, themes and categories of analysis come from the data" (Patton, 1990, p. 390). Seven themes emerged from the data: K-12 ICT Curriculum Requirements, Leadership (K-12 schools, K-12 students, other preservice teachers, and university), Preparation (knowledge and teacher education program), Specific Uses of ICT, Student Engagement, Time required to learn or use, and Resources (accessibility and quality). These themes were taken directly from the transcripts of the participant's answers to the focus group questions, and were not based on a pre-existing framework. After examining the themes, the researcher attempted to group the themes into categories. The study is interested in whether any factors exist outside of the UTAUT model that have an effect on preservice teachers' intention to use ICT in their teaching. The seven themes that developed out of the transcribed focus groups were mapped onto the UTAUT factors, and it was discovered that the themes fit well into the four main constructs. No other influential factors were discovered.

The Regression

Multiple regression was used to determine whether the UTAUT constructs (performance expectancy, effort expectancy, social influence, and facilitating conditions) are significant predictors of secondary preservice teachers' intention to use ICT in their teaching practicum. In the initial analysis, a standard multiple regression was performed with all four UTAUT constructs input as independent variables, and behavioral intention

as the dependent variable. SPSS Regression was used for the analysis. The F-test was significant, meaning that the hypothesis of $R^2 = 0$ can be rejected. An R^2 of .33 was obtained, and only effort expectancy was shown to be a significant predictor of behavioral intention. With this knowledge, the regression was carried out a second time, with effort expectancy as the independent variable, and intention as the dependent variable. In this follow up, the F-test was significant, and an R^2 of .27 was obtained, indicating that 27% of the variance in intention is accounted for by the model. This is not a significant decrease from the R^2 initially obtained with all four predictor variables included in the model.

The standardized regression equation obtained through this analysis was Behavioral Intention = 3.80 + .52 (Effort Expectancy). This beta weight has error in the way it is estimated, but we can say with 95% confidence that the beta is within the range of 0.26 to 0.56. These results indicate that effort expectancy is the only significant predictor of intention, and as effort expectancy increases by one standard deviation, behavioral intention increases by .52 standard deviations. According to the model, performance expectancy, social influence, and facilitating conditions are not significant predictors of preservice teachers' intention to use ICT. Venkatesh et al. hypothesized that facilitating conditions would not have an influence on intention (but would later have an effect on usage). The first part of this hypothesis was proven correct in this study, and the follow-up phases of this study will examine usage. Table 15 gives the results from this second multiple regression.

Table 15
Multiple Regression

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	3.797	.398		9.538	.000
EE	.412	.076	.520	5.439	.000

Effects of the Moderators

Venkatesh et al. hypothesized that gender, age, experience, and voluntariness of use would moderate the effect of the four direct determinants on intention and usage.

The following hypotheses examined the effects of the moderators:

H1: The influence of performance expectancy on behavioral intention is moderated by gender and age, such that the effect is stronger for men and particularly for younger men.

H2: The influence of effort expectancy on behavioral intention is moderated by gender and age, such that the effect is stronger for women, particularly younger women.

H3: The influence of social influence on behavioral intention is moderated by gender, age, and voluntariness such that the effect is stronger for women, particularly older women, particularly in mandatory settings.

In order to test the effects of the moderators, a three block multiple regression was performed. The first block consisted of the mean-centered variables EE, PE, SI, and FC. The second block contained the mean-centered moderators, gender, age, and voluntariness of use. In this study, the participants' experience level is 0 (as measured by Venkatesh et al.) and this variable is therefore not included as a moderator in this T1 administration of the survey. The third and final block of the regression contained the

twelve interaction terms – this block was performed step-wise so that each interaction term was only entered into the equation if it was statistically significant. This was done in an attempt to minimize the effects of multicollinearity.

The F tests indicated that the main effect (Model 1) and the independent main effect (Model 2) were both significant. None of the interaction effects were significant, and therefore they were never entered into the equation during the regression. In Model 1, the mean-centered variable for Effort Expectancy was shown to be the only independent correlate. In Model 2, only one main effect emerged. Age was shown to be an independent main effect, with a Beta coefficient of $-.26$. This indicates that as age increases, behavioral intention decreases. Age was the only significant effect – gender and voluntariness of use were insignificant. Table 16 gives the results for this 3-block regression analysis. Thus, the only hypothesis that was proven to be true in this study was the effect of age as a moderator on behavioral intention.

Table 16
Moderator Effects

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
1					
(Constant)	5.919	.077		76.541	.000
MCEE	.320	.107	.405	3.001	.004
MCPE	.219	.128	.185	1.709	.092
MCSI	.110	.097	.115	1.126	.264
MCFC	.032	.095	.043	.337	.737
2					
(Constant)	5.919	.074		80.320	.000
MCAge	-.061	.023	-.256	-2.644	.010
MCGender	-.242	.159	-.143	-1.523	.132
MCVol	-.101	.077	-.119	-1.300	.198

Summary

Chapter 4 discussed the results obtained through both the quantitative and qualitative portions of the study. This section summarized the important findings and showed connections between the survey responses and the focus group comments to determine whether the quantitative results were supported by the qualitative findings. Chapter 5 will discuss the final conclusions, and how the qualitative findings support the quantitative results. This chapter will also comment on implications for teaching and learning, and suggestions for further research.

Chapter 5: Discussion

Introduction

The purpose of this study was to examine the UTAUT variables that influence preservice teachers' acceptance of ICT integration, and determine whether there are any important factors outside of these. The study used a mixed methods approach to focus on the quantitative findings and use the qualitative data to help explain the results. In this way, the researcher hoped to provide a clearer picture of the intentions of the preservice teachers, through triangulation of the results. Creswell describes triangulation as “the act of bringing more than one source of data to bear on a single point [...] Data from different sources can be used to corroborate, elaborate, or illuminate the research in question” (2007, p. 146). The quantitative phase consisted of 82 UTAUT surveys, and 5 individuals participated in the follow-up focus group sessions. This chapter will summarize the significant results, draw conclusions, and suggest implications and ideas for future research.

The UTAUT Model

The UTAUT Model was developed by Venkatesh et al. in 2003. Since then the model has been used to examine the acceptance of specific technologies within the business environment, but seldom used within education. Only three studies were located that used the UTAUT Model in education: one examined faculty acceptance of tablet PCs in the College of Business (Anderson, Schwager and Kerns, 2006), one looked at undergraduate students' use of MSN/webboard (Im, Kim and Han, 2008), and the third

study examined undergraduate students' acceptance of all administrative and instructional technology used in a marketing class (Robinson Jr., 2006).

The current study found that the UTAUT model explained 27% of the variance in preservice teachers' intention to use ICT in their teaching. The only significant predictor was effort expectancy, and the only significant moderator was age. These results are partially supported by the literature: Smarkola (2007) used the TAM and found that perceived ease of use and perceived usefulness together accounted for 48% of the variance in preservice teachers' intentions to use ICT. In contrast, Smarkola discovered that perceived usefulness was most influential of the two factors. Similarly, Yuen and Ma (2002) used the TAM and found perceived usefulness to be the significant predictor of intention and usage of ICT (with perceived ease of use having an effect on perceived usefulness, but not directly on intention). Ma, Andersson and Streith (2005) used the modified TAM (with the addition of subjective norm) to examine preservice teachers' acceptance of technology, and also found perceived usefulness and perceived ease of use to be the significant predictors of behavioral intention.

Some previous studies have discovered various other constructs to be the most influential factor in predicting preservice teachers' intention to use ICT. Kadijevich, Happasalo and Hvorecky (2005) created their own survey and found that preservice teachers' interest in attaining ISTE standards is influenced by computer attitude; Kadijevich (2005) then later discovered that professional support has an influence on attitude. Anderson and Maninger (2007) also developed their own survey and discovered that self-efficacy, value beliefs, and gender account for 32% of the variance in user intentions, with self-efficacy having the greatest effect.

In order to allow for comparisons between studies, it is important to discover a consistent model that can be used throughout education and the study of preservice teachers' intentions to use ICT. This study suggests that the UTAUT model should be considered as a possible model. Perhaps future research could test the success of the main technology acceptance models in the field of education, as done by Venkatesh et al. in the business environment, through a "super survey" that includes items from the top eight acceptance models and the UTAUT. It would then be possible to objectively examine the results from each model and compare the regression equations and resulting values of R^2 to determine the best model for use with preservice teachers.

Performance Expectancy

Performance expectancy was significantly correlated with behavioral intention, with a value of .39. The mean response from the UTAUT surveys was 5.57. Item 18 ("I would find using technology for teaching in the K-12 classroom useful") had the highest correlation with intention. 76.9% of the participants answered "agree" or "strongly agree" to this statement. This construct also played an important role in the focus group sessions, with the theme of 'student engagement' emerging as a significant motivator for the preservice teachers' to utilize ICT in their classrooms.

Venkatesh et al. hypothesized that PE would have a significant effect on intention, and that the construct would be moderated by gender and age. These hypotheses were not supported by the current study, yet it was discovered that the participants believed that using ICT would be helpful to them in their teaching. They are interested in using ICT, but are not aware of many opportunities or ways in which they could successfully incorporate it into their lessons. Perhaps this is part of the reason why the performance

expectancy construct was not proven to be a significant predictor of behavioral intention. Without an awareness of how ICT can be used successfully, the participants may therefore feel that it will not be useful to them.

Effort Expectancy

Effort expectancy had the highest correlation with behavioral intention (.52) and was the only construct proven to be a significant predictor of behavioral intention.

Venkatesh et al. hypothesized that effort expectancy would have a significant influence on behavioral intention, with gender and age as moderators.

For all four EE items, less than half of the participants responded “agree” or “strongly agree” (37.8% - 48.8%), indicating that the majority of the individuals were not confident in the ease of use associated with the use of ICT in the K-12 classroom. Effort Expectancy emerged in the focus groups within the theme of ‘preparation’. The biggest concern for the preservice teachers was the fear of technical difficulties when using ICT in their teaching. Preparation emerged as an explanation for the concerns with effort expectancy: four out of five of the participants indicated that a technology course would be important to include in the teacher education program, in order to prepare preservice teachers for the effective use of ICT in their future teaching.

Since EE was proven to be the only significant predictor in preservice teachers’ intention to use ICT, it is important that future research focuses on this construct. The mean response for EE on the UTAUT surveys was 5.16 (out of 7), indicating that there is room for improvement within this construct. Future research should seek to discover the factors that predict effort expectancy. Effort expectancy may even be influenced by other constructs from within the UTAUT model. It is possible that social influence may affect

effort expectancy: preservice teachers' effort expectancy could be affected by the opinions that others express about the ease of use of ICT. The participants could be influenced by other preservice teachers, university faculty, K-12 supervisors, teachers, or students. Perhaps facilitating conditions feeds into effort expectancy and the preservice teachers feel that they are unable to use ICT because they do not have the necessary resources. These questions all need to be addressed in future research within this area.

Social Influence

The social influence construct had the lowest correlation with behavioral intention (.26). Venkatesh et al. hypothesized that social influence would have a significant influence on behavioral intention, and would be moderated by gender, age and voluntariness of use. Social influence did not have a significant effect in this study.

The mean response for the social influence construct was 5.13 on the UTAUT surveys. Social influence also emerged from the focus groups, as participants spoke of four groups that influenced their intention to use ICT: the K-12 schools, K-12 students, other preservice teachers, and the university. The participants felt very supported by senior K-12 school officials in the use of ICT (78.1% responded "agree" or "strongly agree"), but the preservice teachers felt that the school officials would not be helpful in implementation (18.3% responded "agree" or "strongly agree").

In order to ensure item reliability, items five ("In general, senior K-12 school officials would support the use of technology in the K-12 classroom") and nine ("Senior K-12 school officials would be helpful in the use of technology for teaching in the K-12 classroom") were removed from the construct of social influence. This left only items fourteen ("People who are important to me would think that I should use technology for

teaching in the K-12 classroom”) and nineteen (“People who influence my behavior would think that I should use technology for teaching in the K-12 classroom”). In future uses of the UTAUT survey in the field of education, researchers might consider rewording these two items. The statement “people who influence my behavior” may have been too vague to elicit appropriate responses from the participants. It may be necessary to specify the people to consider when answering these questions. Since social influence emerged as an important factor in the focus groups, but not in the surveys, perhaps the unclear wording was a problem for the participants.

Facilitating Conditions

Facilitating conditions correlated significantly with behavioural intention, with a coefficient of .37. This construct had a mean response of 4.80, indicating that many preservice teachers feel that they do not have the knowledge, skills, and support to use ICT successfully. Venkatesh et al. hypothesized that facilitating conditions would not have a significant influence on behavioral intention, and this statement held true in the current study. In order to ensure item reliability, item sixteen (“Using technology for teaching in the K-12 classroom would not be compatible with other teaching responsibilities that I have”) was dropped from the construct. Preservice teachers may have had difficulties responding to this statement since they had not yet begun their practicum teaching, and likely were not completely aware of their teaching responsibilities and how technology could be incorporated into their lessons.

Voluntariness of Use

The mean response for voluntariness of use was 4.47. Voluntariness of use was not a significant moderator in this study. As discussed in the previous chapter, the majority of the preservice teachers believed that the use of ICT would be voluntary. This is a difficult area because although the curriculum documents indicate that ICT skills should be integrated throughout the K-12 curriculum, teachers are not held accountable for this inclusion. It is up to the individual teacher whether they include ICT in their lessons, and this is not typically monitored by an outside individual or organization. This makes voluntariness of use a difficult construct to measure.

Behavioral Intention

The mean response for the behavioural intention construct was 5.92, indicating a high intention of the participants to use ICT during their practicum teaching. The only significant moderator was age: intention to use ICT decreases as the participant age increases. The multiple regression model explained 27% of the variance in intention, and found that effort expectancy is the only significant predictor of preservice teachers' intention to use ICT.

Venkatesh et al. found that the UTAUT model explained 70% of the variance in user intention when applied within the business environment. There are a few possible explanations for the lower R^2 that was calculated in the current study. First, the sample size used here was only 82 UTAUT surveys. There is also the possibility of response bias: those with low intention to use ICT may have chosen not to complete the survey. This leads to a sample population with a very high overall intention to use ICT, meaning that there is less variance to explain. One final consideration is that perhaps intention is

not an appropriate variable for this population. Intention is extremely difficult to measure, as it is a constantly changing variable. After spending a few weeks in their practicum school, the preservice teachers' intention to use ICT could change completely. This will hopefully be addressed in the long term version of this study, where the participants will be contacted again, and asked for both intention and usage data.

Implications for Teaching and Learning

The findings from this study have important implications for teaching and learning. Since effort expectancy was found to be the only significant predictor of preservice teachers' intentions, this should be our focus in teacher education. Preservice teachers need to be shown that it is possible for them to use ICT and integrate it into their lessons without too much difficulty. They need to learn the basics of the technologies that will be most useful to them and their students, and be shown ways to effectively and easily integrate these into their future classrooms.

The next step is to determine what interventions would help to increase the effort expectancy of preservice teachers. Based on the comments from the focus group sessions, a university course on ICT is needed: "a course on how to integrate [technology] into the class. Like, with actual examples of strategies and how it's been done. You know, things to work on ... or work off of" (Justin). A program change has been made at the university, whereby the core ICT course that currently exists in the elementary and middle school teacher education programs, will now be introduced as a core course for some secondary education cohorts in September 2009 and all cohorts by September 2010.

Implications for Future Research

This study has shown that effort expectancy is a significant predictor of preservice teachers' intentions to use ICT in their practicum teaching. Future research must now determine the specific interventions that will help to increase effort expectancy. It is likely that the primary measure of effort expectancy is the technology skill level of the preservice teachers. It would be beneficial to researchers to measure this, but due to the subjectivity of this variable it would be difficult. Individuals who are proficient at simple ICT tools (e-mail, word, etc.) may rate themselves at a high skill level, whereas those students that are more advanced in their ICT knowledge will be aware of the tools out there that they aren't comfortable with yet, and may rate themselves lower. In reality, these individuals should be rated with a high technology skill level. In order to avoid this issue, each individual should be given a performance/skill test, but this may be difficult to organize and administer in reality.

The researcher also recommends that future studies consider the use of a specific technology when asking preservice teachers to reflect on their intention to use ICT. Although previous studies have used the general term 'technology' (ex. Robinson, 2006), it may be beneficial to identify a specific technology. The use of the general term 'technology' also causes difficulty with the experience measure. In the business context, employees are introduced to a new system, and the UTAUT model is used to examine their acceptance. All employees begin with no experience with the technology. In education, if ICT is used as a general term, it is difficult to measure the participants' initial experience as each teacher's experience level will range from no experience to many years. Alternatively, researchers do not have the funding or means to deploy

enough technology in an experimental manner to teachers so as to start all participants at the same level of experience.

Future research should also examine any other factors that may have been omitted from this investigation that may account for some of the variance in user's intentions. Perhaps some of the other UTAUT constructs (such as facilitating conditions and social influence) may contribute to the effect of effort expectancy on intention, as discussed earlier.

Future research must also consider whether behavioral intention is the appropriate dependent variable for examining this problem. Intention is a dynamic variable that constantly changes. Perhaps usage should be examined instead, or inservice teachers should be used as a sample population. Teachers who have completed their first year of teaching at a high school would have a better understanding of the demands on them, their student's needs, and the technology and resources available to them. Their responses for the intention variable may be more accurate than preservice teachers who have not yet left the university setting.

From this research alone, it is not possible to conclude that the UTAUT is a fully functioning model to be used within the field of education. This pilot study discovered that some of the items may need to be rewritten and tested with new populations: the two social influence items "people who are important to me [influence my behavior] would think that I should use technology for teaching in the K-12 classroom" may be too vague and need to be reworded to specify the "people who are important to me/influence my behavior." As seen in the focus groups, K-12 students emerged as a strong influence on the preservice teachers' intention to use technology, and perhaps changing this item to

“K-12 students think...” might affect the results for this construct. Also, the facilitating conditions item “using technology for teaching in the K-12 classroom would not be compatible with other teaching responsibilities that I have” did not correlate with the other three items for this construct, and it may not be possible for the preservice teachers to answer this question at the T1 survey phase, as they have not yet had any experience teaching in the classroom. It may be beneficial to conduct a factor analysis to determine which construct each of the items loads onto, as it may be that the items load differently in the education field than within business. The UTAUT model has been very successful in the business sector, and it should be explored further as a possibility in education, with the provision that in future research the model is revised as per the suggestions above, and then tested along-side other prominent technology acceptance models to determine whether the UTAUT can work in the education field, and how it stands compared to other models.

Conclusion

The results from this research indicate that effort expectancy is the only significant predictor of preservice teachers’ intention to use ICT in their practicum teaching. The regression model explains 27% of the variance in user’s intentions, and age is the only significant moderator. Future research must now determine specific interventions to increase effort expectancy, and teacher education programs should focus on this construct with education students.

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Appendix A. Data Collection Protocol (Script)

PROTOCOL

ADMINISTRATION PROCEDURE:

- Survey will be administered at the END of the class period.
- Students will be given the option to complete the survey at that time and submit their survey to the researcher **OR** to walk away with the survey for completion and submission at a later time. Instructions on how to submit outside of class time are included at the end of the survey.

INTRODUCTION STATEMENT:

My name is Amanda Birch and this is Dr. Valerie Irvine. We are here today to distribute some materials to you. This is a collaborative project that we are working on together. This pre-practicum invitation involves participation in a survey and optional focus group, which are both part of my thesis research project. I am a graduate student in the Department of Curriculum and Instruction and my thesis has been funded by the Government of Canada's Social Sciences and Humanities Research Council. Dr. Irvine will follow-up with three additional invitations for participation between now and the end of your practicum experience. The timeline can be seen on the [overhead/handout].

The project has the following objective, as described in the materials presented to you:

- (1) Examine the factors that affect preservice teachers' acceptance of integrating Information and Communication Technology (ICT) into their teaching

Please review the consent form to determine whether you wish to participate in this study. Your participation must be voluntary and please note that you can withdraw at any point in the study. If you choose to participate, we will compensate you for your time as per the transparency/overhead. For each survey, your name will be entered in a draw for a prize. The compensation prize for today's survey participation will be a choice between a 2GB ipod shuffle (\$75 value), a \$75 donation to the Victoria General Hospital Children's Ward, or \$75 cash. There will be a \$25 increase in value for each round that you continue to participate in the survey to recognize the added convenience for additional participation. If you also voluntarily participate in the focus groups, your name will be entered a second time in the draw, and you will receive \$10 cash for your participation time. There are three ways to participate in today's survey:

- 1) You can complete the 2-minute survey right now and drop it off to us at the front of the room OR
- 2) You can take the survey with you, complete it, and return it to the location specified on the last page of the survey. Self-addressed campus mail envelopes are available at the front of the room. OR
- 3) You can complete the survey online. You will find the URL at the top of the consent form and survey.

To participate, you must:

- 1) Enter your name, demographic, and contact information on the identification sheet. We will use the contact information provided to invite you to the remaining surveys and focus group rounds.
- 2) Complete the consent form, keeping one copy for yourself, and complete survey
- 3) Submit the identification sheet, one copy of the consent form, and the survey

All surveys from today should be received by November 30, 2008.

Thank you.

*Appendix B. Cover Sheet***IDENTIFICATION SHEET**

Preservice teachers' acceptance of
information and communication technology integration in the classroom:
Applying the Unified Theory of Acceptance and Use of Technology
(UTAUT) Model

SURNAME: _____

FIRST & MIDDLE NAMES: _____

TEACHING AREA(S): _____

E-MAIL: _____

PHONE NUMBER: _____

JAN/09 PRACTICUM SCHOOL: _____

CITY: _____

PROVINCE: _____

COUNTRY: _____

MAILING ADDRESS:

Signature: _____ Date: _____

Study URL: <http://www.educ.uvic.ca/tie/utaut>

Appendix C. Consent Form for Quantitative Phase



Participant Consent Form

**Preservice teachers' acceptance of information and communication technology integration in the classroom:
Applying the Unified Theory of Acceptance and Use of Technology (UTAUT) Model**

Study URL: <http://www.educ.uvic.ca/tie/utaut/>

You are being invited to participate in a study entitled "Preservice teachers' acceptance of information and communication technology integration in the classroom: Applying the Unified Theory of Acceptance and Use of Technology (UTAUT) Model," that is being conducted by Dr. Valerie Irvine and Amanda Birch.

This is a collaborative project that we are working on together. This pre-practicum invitation involves participation in a survey and optional focus group, which are both a part of Amanda's thesis research project. She is a graduate student in the Department of Curriculum and Instruction and her thesis has been funded by the Government of Canada's Social Sciences and Humanities Research Council. Dr. Irvine will follow-up with three additional invitations for participation between now and the end of your practicum experience.

Purpose and Objectives

The purpose of this research project is to:

- (1) Examine the factors that affect preservice teachers' acceptance of integrating Information and Communication Technology (ICT) into their teaching

Importance of this Research

- (a) If our educational system values the integration of ICT into our K-12 classrooms, then we need to learn more about the determinants that affect our preservice teacher's intentions and usage of ICT in the K-12 classroom
- (b) The results could help to determine what teacher education programs and faculty can do to improve their programs to prepare preservice teachers in this area

Participant Selection

You are being asked to participate in this study because you are a secondary level preservice teacher in the Post Degree Professional Program (PDPP) at the University of Victoria. The study is approaching all secondary level PDPP students for the 2008-2009 year to ask for their participation.

What is Involved

If you agree to voluntarily participate in this research, your participation will include the completion of a 2-minute survey at four different times between now and after your practicum ends. In addition, selected participants will be invited to participate in small focus group or

interview sessions to be held once at the end of this term and once after your practicum is over. Each focus group will consist of six to eight participants and will last 30-40 minutes. Five questions will be asked. Follow-up contact will be made using the contact information provided on the Identification Sheet.

To participate in today's survey, you can stay behind in this classroom to complete this consent form, ID sheet, and survey and return it to the researchers, or you may take these materials with you to complete later for submission via campus mail or online.

Risks and Benefits

There are no known or anticipated risks to you for participating in this research. As a participant, you may benefit from this research through the opportunity to express your experiences and opinions on the topic of technology integration, so that it might be heard by the Faculty of Education and, beyond, through dissemination to educational researchers and other stakeholders. The potential benefits of your participation in this research also include improvements to Faculty of Education programs, which could be made based on your responses. Furthermore, the results will add to the state of knowledge on technology and teacher education by providing a better theoretical understanding of the reasons why preservice teachers may or may not accept or use technology in their K-12 teaching. Lastly, society may benefit from the indirect effect that these results may be used to improve technology and teacher education initiatives.

Compensation

Your agreement to participate must be voluntary. At each invitation to participate in a survey or focus group, you will be offered compensation for your time spent. The survey compensation will increase to recognize the added inconvenience of additional participation. An overview of the study components, time spent, and compensation is provided in the table below. Today's participation involves the underlined component.

all voluntary withdraw anytime	Amanda's thesis		Dr. Irvine's Follow-up			
	Nov- Dec/08		Feb/09	March/09	April/09	
Component	<u>Survey</u>	Focus groups	Survey	Survey	Survey	Focus groups
Time Spent	<u>2 min</u>	30-40 min	2 min	2 min	2 min	30-40 min
Compensation	<u>\$75 value draw*</u>	\$10 cash 2 nd entry into draw	\$100 value draw*	\$125 value draw*	\$150 value draw*	\$10 cash 2 nd entry into draw

* Draw prize value comes in your choice of the following:
mp3 player OR donation to Victoria General Hospital's children's ward OR cash

If you agree to participate in this study, this form of compensation to you must not be coercive. It is unethical to provide undue compensation or inducements to research participants. If you would not participate if the compensation was not offered, then you should decline.

Voluntary Participation

Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. Your survey results would be destroyed and withdrawn from the study. Your focus group data would be used in summarized form, with no identifying information. Should you withdraw from the study, your compensation will remain the same.

Anonymity

In terms of protecting your anonymity, no disclosure of personal identity will be made in any presentation or publication of the results. For those who choose to participate in the focus groups, no names will be used in publication of the results. Pseudonyms will be used for all participants wherever direct quotes are included in the discussion of results.

Confidentiality

Your confidentiality and the confidentiality of the data will be ensured through the following methods:

The researchers will work on a private computer behind a firewall and they will be the only researchers with access to the data. Paper data will be stored in a locked filing cabinet in the TIE Research Lab. Electronic data will be stored in a password protected database. If you volunteer to participate in a focus group, confidentiality will be limited in that the interview will take place with six to eight participants in one session. All data will be kept in a secure location.

Dissemination of Results

It is anticipated that the results of this study will be shared with others in the following ways: 1) directly to participants if they request it, 2) presentation at a conference, 3) publication in a peer-reviewed journal or 4) publication in Amanda Birch's Master's thesis for the University of Victoria. Other planned uses of this data include reanalysis for future research questions that may arise. These research questions will be limited to topics associated with education and access to data will be limited to research affiliates (ie. graduate students and faculty members) who sign a statement of confidentiality. For example, the participant data collected in 2008/2009 could be compared with responses from participants collected in 2009/2010. Furthermore, it could be compared with participants responses received from another education group.

Disposal of Data

Data from this study will be disposed of by shredding the original surveys and deleting all electronic data, within five years of data collection.

Contacts

Individuals that may be contacted regarding this study include: Dr. Valerie Irvine, Assistant Professor: 250-721-7778 or virvine@uvic.ca and Amanda Birch, Graduate Student: 250-472-4745 or abirch@uvic.ca. In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

Please place a checkmark next to each component of the study you wish to participate in.

Survey

and/or

Focus Group session (to be scheduled)

Name of Participant

Signature

Date

Keep one copy of this consent form and submit one copy to the researcher.

Consent form, ID sheet, and survey can be:

- 1) Completed now and returned to the researchers at the front of the room,
- 2) Completed later/returned to Dr. Irvine's mailbox, Curriculum & Instruction Dept Office, A430 MacLaurin, or
- 3) Completed later online at <http://www.educ.uvic.ca/tie/utaut/>

Appendix D. The UTAUT Survey

Preservice teachers' acceptance of
information and communication technology integration in the classroom:
Applying the Unified Theory of Acceptance and Use of Technology (UTAUT) Model

The UTAUT Survey

Study URL: <http://www.educ.uvic.ca/tie/utaut/>

Important: When completing the survey, please keep in mind that we are using a definition of technology which encompasses computer hardware (e.g. scanners, cameras, videoconferencing tools), software applications (e.g. word processing, excel, internet, PowerPoint, webpage construction) and any technology specific to your teaching area. Please circle the number that best describes your agreement or disagreement with each statement.

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree

	1	2	3	4	5	6	7
My interaction with technology for teaching in the K-12 classroom would be clear and understandable	1	2	3	4	5	6	7
Using technology for teaching in the K-12 classroom would enable me to accomplish tasks more quickly	1	2	3	4	5	6	7
I am determined that I will use technology for teaching in the K-12 classroom during my 3-month teaching practicum	1	2	3	4	5	6	7
Although it might be helpful, using technology for teaching in the K-12 classroom would certainly not be compulsory in my job	1	2	3	4	5	6	7
In general, senior K-12 school officials would support the use of technology in the K-12 classroom	1	2	3	4	5	6	7
I would find using technology for teaching in the K-12 classroom easy to do	1	2	3	4	5	6	7
I plan to use technology for teaching in the K-12 classroom during my 3-month teaching practicum	1	2	3	4	5	6	7
It would be easy for me to become skilful at using technology for teaching in the K-12 classroom	1	2	3	4	5	6	7
Senior K-12 school officials would be helpful in the use of technology for teaching in the K-12 classroom	1	2	3	4	5	6	7
Using technology for teaching in the K-12 classroom would increase my productivity	1	2	3	4	5	6	7
My boss (principal) would not require me to use technology for teaching in the K-12 classroom	1	2	3	4	5	6	7
If I use technology for teaching in the K-12 classroom, I will increase my employment opportunities	1	2	3	4	5	6	7

1	2	3	4	5	6	7
Strongly Disagree	Disagree	Somewhat Disagree	Neutral	Somewhat Agree	Agree	Strongly Agree

	1	2	3	4	5	6	7
Learning to use technology for teaching in the K-12 classroom would be easy for me	1	2	3	4	5	6	7
People who are important to me would think that I should use technology for teaching in the K-12 classroom	1	2	3	4	5	6	7
My superiors would not expect me to use technology for teaching in the K-12 classroom	1	2	3	4	5	6	7
Using technology for teaching in the K-12 classroom would not be compatible with other teaching responsibilities that I have	1	2	3	4	5	6	7
A specific person (or group) would be available for assistance with difficulties when using technology for teaching in the K-12 classroom	1	2	3	4	5	6	7
I would find using technology for teaching in the K-12 classroom useful	1	2	3	4	5	6	7
People who influence my behaviour would think that I should use technology for teaching in the K-12 classroom	1	2	3	4	5	6	7
I have the knowledge necessary to use technology for teaching in the K-12 classroom	1	2	3	4	5	6	7
I intend to use technology for teaching in the K-12 classroom during my 3-month teaching practicum	1	2	3	4	5	6	7
Using technology for teaching in the K-12 classroom would be voluntary (as opposed to required by superiors/job)	1	2	3	4	5	6	7
I have the resources necessary to use technology for teaching in the K-12 classroom	1	2	3	4	5	6	7

Gender: _____ Male _____ Female

Age: _____ years

Thank you for your participation and time.

Please:

- 1) Submit the survey to the researcher at the front of the room, OR
- 2) Take the survey home with you and return it to Dr. Valerie Irvine's mailbox, Curriculum and Instruction Department Office, A430 MacLaurin OR
- 3) Complete the survey online at <http://www.educ.uvic.ca/tie/utaut/>

BY November 30, 2008

Appendix E. Consent Form for Qualitative Phase



Participant Consent Form Focus Groups/Interview

Preservice teachers' acceptance of information and communication technology integration in the classroom: Applying the Unified Theory of Acceptance and Use of Technology (UTAUT) Model

You are being invited to participate in the focus group segment of a study entitled “Preservice teachers’ acceptance of information and communication technology integration in the classroom: Applying the Unified Theory of Acceptance and Use of Technology (UTAUT) Model”, that is being conducted by Dr. Valerie Irvine and Amanda Birch.

Purpose and Objectives

The purpose of this research project is to

- (1) Examine the factors that affect preservice teachers’ acceptance of integrating Information and Communication Technology (ICT) into their teaching

Importance of this Research

- (1) If our educational system values the integration of ICT into our K-12 classrooms, it is then important to discover how to make our preservice teachers comfortable with integrating technology
- (2) The results could help to determine what teacher education programs and faculty can do to improve their programs to prepare preservice teachers in this area

Participant Selection

You are being asked to participate in this study because you are a secondary level preservice teacher in the Post Degree Professional Program (PDPP) at the University of Victoria and you indicated on the initial consent form that you were interested in participating in a follow-up focus group interview session.

What is Involved

If you agree to voluntarily participate in this research, you will participate in a focus group interview session with the researcher and five to seven other participants. The focus group session is estimated to take approximately 30-40 minutes. Five questions will be asked of all participants. The researcher will take notes during the focus group, as well as using a digital recorder to capture the audio conversations. This is to ensure that the researcher does not miss any of the answers given by the participants.

Risks and Benefits

There are no known or anticipated risks to you for participating in this research. As a participant, you may benefit from this research through the opportunity to express your experiences and opinions on the topic of technology integration, so that it might be heard by the Faculty of Education and, beyond, through dissemination to educational researchers and other stakeholders. The potential benefits of your participation in this research also include improvements to Faculty of Education programs, which could be made based on your responses. Furthermore, the results will add to the state of knowledge on technology and teacher education by providing a better theoretical understanding of the reasons why preservice teachers may or may not accept or use technology in their K-12 teaching. Lastly, society may benefit from the indirect effect that these results may be used to improve technology and teacher education initiatives.

Compensation

Your agreement to participate must be voluntary. To compensate you for your time, your name will be entered a second time into the draw for the winner's choice of: a 2GB ipod shuffle (\$75 value), a \$75 donation to the Victoria General Hospital Children's Ward, or \$75 cash. You will also receive \$10 cash for your participation time. If you agree to participate in this study, this form of compensation to you must not be coercive. It is unethical to provide undue compensation or inducements to research participants. If you would not participate if the compensation was not offered, then you should decline.

Voluntary Participation

Your participation in this research must be completely voluntary. If you do decide to participate, you may withdraw at any time without any consequences or any explanation. Students wishing to withdraw from the study at any time will be asked to speak to the researchers. If you withdraw from the survey portion of the study, your survey will be destroyed and results withdrawn from the study. If you withdraw from the focus groups, your data will be used in summarized form, with no identifying information. Should you withdraw from the study, your compensation will remain the same.

Anonymity

In terms of protecting your anonymity, no disclosure of personal identity will be made in any presentation or publication of the results. Pseudonyms will be used for all participants wherever direct quotes are included in the discussion of results.

Confidentiality

Your confidentiality and the confidentiality of the data will be ensured through the following methods:

The researchers will work on a private computer behind a firewall and they will be the only researchers with access to the data. Paper data will be stored in a locked filing cabinet in the TIE Research Lab. Electronic data will be stored in a password protected database. Confidentiality will be limited in that the focus groups will take place with six to eight participants in one session. All data will be kept in a secure location.

Dissemination of Results

It is anticipated that the results of this study will be shared with others in the following ways: 1) directly to participants if they request it, 2) presentation at a conference, 3) publication in a peer-reviewed journal or 4) publication in Amanda Birch's Masters thesis for the University of Victoria.

Other planned uses of this data include reanalysis for future research questions that may arise. These research questions will be limited to topics associated with education and access to data will be limited to research affiliates (ie. graduate students and faculty members) who sign a statement of confidentiality. For example, the participant data collected in 2008/2009 could be compared with responses from participants collected in 2009/2010. Furthermore, it could be compared with participants responses received from another education group.

Disposal of Data

Data from this study will be disposed of by shredding the original surveys and deleting all electronic data, within five years of data collection.

Contacts

Individuals that may be contacted regarding this study include:

Dr. Valerie Irvine, Assistant Professor, phone: 250-721-7778, e-mail: virvine@uvic.ca

Amanda Birch, Graduate Student, phone: 250-472-4745, e-mail: abirch@uvic.ca

In addition, you may verify the ethical approval of this study, or raise any concerns you might have, by contacting the Human Research Ethics Office at the University of Victoria (250-472-4545 or ethics@uvic.ca).

Your signature below indicates that you understand the above conditions of participation in this study and that you have had the opportunity to have your questions answered by the researchers.

I agree to allow the focus group session to be recorded using a digital recorder

Name of Participant

Signature

Date

Keep one copy of this consent form and submit one copy to the researcher.

*Appendix F. Focus Group Interview Questions***Focus Group Interview Questions**

1. Within your education program so far, how thorough has the coverage been on the use computer technology for your teaching in the K-12 classroom? What would you recommend to the university?
2. Do you intend to use technology in your teaching? Why or why not? How?
3. What are your thoughts on the curriculum for educational technology in the high school setting, with respect to appropriateness, thoroughness, etc?
4. What would be the most important thing that would help you to feel prepared to use computer technology for teaching in the K-12 classroom?
5. What is your biggest concern with using computer technology for teaching in the K-12 classroom?

Appendix G. ICT Resource Handout for study participants

Thank you for participating in the focus group interviews for this study. We appreciate your involvement in the project.

You may find that you are interested in learning more about integrating ICT into your teaching. If so, I have created this handout of resources to help you get started on your search.

B.C Ministry of Education Resources

<http://www.bced.gov.bc.ca/technology/6-9.htm>

- Getting Started with Integrating ICT: A Guide for Teachers (PDF)
- Working with Colleagues: A Guide for Mentors (PDF)
- Ethics of Information Use (PDF)
- Information Technology: 8-10 and 11 and 12 IRPs (PDF)

Other Ministry of Education Resources:

- K-12 overview of ICT curriculum:
http://www.bced.gov.bc.ca/irp/program_delivery/ictk12_overviewchart.pdf
- E-Learning Research Sites:
http://www.bced.gov.bc.ca/technology/e_learning.htm
- Sample units that integrate ICT:
<http://www.bced.gov.bc.ca/technology/sampunits/samples.htm>
- ICTI Performance Standards, Grades 5-10:
http://www.bced.gov.bc.ca/perf_stands/icti/
- British Columbia's Premier's Technology Council:
http://www.gov.bc.ca/premier/technology_council/

UVic's Learning and Teaching Centre:

- Teaching with Technology at UVic:
<http://www.ltc.uvic.ca/servicesprograms/teachtech.php>

Technology Software that you might be interested in learning more about:

- Skype: free computer-to-computer calls and video
<http://www.skype.com>
- Dreamweaver: the industry standard in website creation
<https://www.adobe.com/cfusion/tdrc/index.cfm?promoid=BONQP&product=dreamweaver>
- Open Office: open source software for word processing, spreadsheets, presentations, graphics, databases and more
<http://download.openoffice.org/index.html>
- Audacity: free , open source software for recording and editing sounds (podcasts and more)
<http://audacity.sourceforge.net/download/>

Appendix. H. Item Frequencies and Correlations with Behavioral Intention

Note: * = correlation significant at the .01 level (2-tailed)

** = correlation significant at the .05 level (2-tailed)

Constructs and Variables	1	2	3	4	5	6	7	Correlation with Behavioral Intention
	# %	# %	# %	# %	# %	# %	# %	
BEHAVIORAL INTENTION								
#21: I intend to use technology for teaching in the K-12 classroom during my 3-month teaching practicum	0 0	0 0	1 1.2	6 7.3	21 25.6	36 43.9	18 22	.904**
#3: I am determined that I will use technology for teaching in the K-12 classroom during my 3-month teaching practicum	0 0	1 1.2	0 0	6 7.3	17 20.7	32 39	26 31.7	.879**
#7: I plan to use technology for teaching in the K-12 classroom during my 3-month teaching practicum	0 0	0 0	0 0	5 6.1	13 15.9	36 43.9	28 34.1	.904**
PERFORMANCE EXPECTANCY								.387**
#18: I would find using technology for teaching in the K-12 classroom useful	0 0	0 0	0 0	1 1.2	17 20.7	5.5- 1/1.2 39 47.6	24 29.3	.611**
#2: Using technology for teaching in the K-12 classroom would enable me to accomplish tasks more quickly	0 0	0 0	1 1.2	10 12.2	33 40.2	25 30.5	13 15.9	.222*
#10: Using technology for teaching in the K-12 classroom would increase my productivity”	0 0	2 2.4	4 4.9	12 14.6	30 36.6	25 30.5	9 11	.250*
#12: If I use technology for teaching in the K-12 classroom, I will increase my employment opportunities	0 0	0 0	0 0	15 18.3	25 30.5	23 28	19 23.2	.134

Constructs and Variables	1	2	3	4	5	6	7	Correlation with Behavioral Intention
	# %	# %	# %	# %	# %	# %	# %	
EFFORT EXPECTANCY								.520**
#1: My interaction with technology for teaching in the K-12 classroom would be clear and understandable	0 0	3 3.7	2 2.4	18 22	18 22	29 35.4	11 13.4	.383**
#8: It would be easy for me to become skillful at using technology for teaching in the K-12 classroom	0 0	2 2.4	8 9.8	9 11	32 39	19 23.2	12 14.6	.431**
#6: I would find using technology for teaching in the K-12 classroom easy to do	1 1.2	1 1.2	10 12.2	15 18.3	24 29.3	20 24.4	11 13.4	.438**
#13: Learning to use technology for teaching in the K-12 classroom would be easy for me	0 0	2 2.4	7 8.5	9 11	26 31.7	28 34.1	10 12.2	.497**
SOCIAL INFLUENCE								.256*
#19: People who influence my behavior would think that I should use technology for teaching in the K-12 classroom	0 0	1 1.2	1 1.2	17 20.7	32 39	22 26.8	8 9.8	.186
#14: People who are important to me would think that I should use technology for teaching in the K-12 classroom	0 0	1 1.2	2 2.4	24 29.3	24 29.3	26 31.7	5 6.1	.259*
#9: Senior K-12 officials would be helpful in the use of technology for teaching in the K-12 classroom	0 0	0 0	11 13.4	28 34.1	26 31.7	14 17.1	1 1.2	.177
#5: In general, senior K-12 officials would support the use of technology in the K-12 classroom	0 0	0 0	0 0	2 2.4	14 17.1	51 62.2	13 15.9	.267*

Constructs and Variables	1	2	3	4	5	6	7	Correlation with Behavioral Intention
	#	#	#	#	#	#	#	
	%	%	%	%	%	%	%	
FACILITATING CONDITIONS								.371**
#23: I have the resources necessary to use technology for teaching in the K-12 classroom”	2 2.4	5 6.1	5 6.1	18 22	22 26.8	19 23.2	10 12.2	.346**
#20: I have the knowledge necessary to use technology for teaching in the K-12 classroom	0 0	5 6.1	9 11	7 8.5	23 28	25 30.5	13 15.9	.403**
#16: Using technology for teaching in the K-12 classroom would not be compatible with other teaching responsibilities that I have	2 2.4	1.5- 1/1.2 2 2.4	3 3.7	9 11	19 23.2	35 42.7	11 13.4	.207
#17: A specific person (or group) would be available for assistance with difficulties when using technology for teaching in the K-12 classroom	1 1.2	5 6.1	15 18.3	19 23.2	21 25.6	15 18.3	3 3.7	.129
Voluntariness of Use								-.119
#4: Although it might be helpful, using technology for teaching in the K-12 classroom would certainly not be compulsory in my job	1 1.2	8 9.8	14 17.1	20 24.4	19 23.2	15 18.3	5 6.1	-.105
#11: My boss (principal) would not require me to use technology for teaching in the K-12 classroom	2 2.4	5 6.1	13 15.9	21 25.6	14 17.1	21 25.6	5 6.1	-.187
#15: My superiors would not expect me to use technology for teaching in the K-12 classroom	5 6.1	7 8.5	24 29.3	17 20.7	22 26.8	4 4.9	2 2.4	-.036
#22: Using technology for teaching in the K-12 classroom would be voluntary (as opposed to required by superiors/job	0 0	0 0	8 9.8	16 19.5	19 23.2	29 35.4	10 12.2	.009

