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Explaining computer use among preservice teachers: Towards the development of a richer conceptual model incorporating experience, demographic, motivation, personality, and learning style clusters of variables.

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EXPLAINING COMPUTER USE AMONG PRESERVICE TEACHERS: TOWARDS THE DEVELOPMENT OF A RICHER CONCEPTUAL MODEL INCORPORATING EXPERIENCE, DEMOGRAPHIC, MOTIVATION, PERSONALITY, AND LEARNING STYLE CLUSTERS OF VARIABLES

by

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Abstract

Despite the professional training that North American teachers receive, many believe they are not well prepared to implement computer technology in their classrooms (Industry Canada, 2003; The CEO Forum, 2001). Educational computing research has failed to provide conceptually integrated frameworks and theories that can best predict or explain the factors that facilitate computer use, whether in a computer course or for general purposes.

The conceptual framework that emerged in this study incorporated specific determinants of computer use—demographics, experience, learning style, motivation, and personality—for new teachers that represent prominent themes in theories of human motivation and decision making. However, among the twenty-one variables that constituted these five clusters, experience, intrinsic motivation, program of study, gender, familiarity with computer terminology, and educational level were the only significant predictors of computer use. Interestingly, of the five clusters, the experiential variable cluster was the most significant predictor of computer use.

The qualitative phase revealed that the pedagogy adopted in computer courses is crucial: What preservice teachers are asking for in a computer technology training course is a pedagogy-based training that incorporates two main categories: (a) computer technology as "main content focus" and (b) computer technology as "part of teaching method." They stated they want to learn computer skills first, then how to incorporate these skills in the classroom. Preservice teachers also reported the need to dedicate more time to computer-training courses offered at the Faculty of Education.

The quantitative and qualitative findings indicate that experience should be at the core of a larger framework that explains computer use. A digital literacy framework may be the best candidate for such a broader framework. The importance of such a framework lies in the fact that it encompasses more than having experience and familiarity with basic computer skills: For example, the qualitative data showed that preservice teachers would like to acquire skills in critiquing various aspects of computer technology, such as the ability to evaluate certain software and its contribution to the educational process; few others stated a person should have interest and a belief in computer technology and its role in education.

dedicated to my parents,

Ibrahim and Anisseh,

for a lifetime of support

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Introduction

Today educators, educational researchers, and policy makers believe that computers and the Internet are becoming a necessity to the educational process: At the 14th Conference of Commonwealth Education Ministers, held in Halifax, Nova Scotia, 2000, priority programs and projects were identified that would constitute an action plan which would respond to change and renewal over the years. This action plan holds that the use of Information and Computing Technology (ICT) should be actively and systematically promoted through strategic initiatives that link countries, agencies, the private sector, and non government organizations in key projects to expand access to education. (Industry Canada, 2003).

The use of ICT in schools is viewed as essential to prepare students for a knowledge-based society in which information technology is central. Students with little or no exposure to information and computer technology may face difficulties in making a smooth transition to the labour market (Canadian Education Statistics Council, 2003).

The increasing interest in computer technology has paved the way for a vast number of research studies that investigated the potential influence of this technology on the teaching/learning process (e.g., Cradler & Cradler, 1999; Mann, Shakeshaft, Becker, & Kottkamp, 1999), as well as the factors that might impede a successful implementation in the classroom (e.g., Anderson & Reed, 1998; Jaber & Moore; 1999; VanFossen, 2001; Wiesenmayer & Koul, 1999; Yeun & Ma, 2002).

Access and professional development were the most dominant factors that influenced computer use for instructional purposes. However, today access seems to be no longer a major issue. The National Center for Education Statistics (2003) has reported that in fall 2002, 92% of public schools in the United States had access to the Internet. This is consistent with data reported by Kleiner and Farris (2002). Quite interestingly the same report showed that public schools have made consistent progress in expanding Internet access in instructional rooms, from 3% in 1994 to 77% in 2000 and 92% in 2002. In Canada, the Canadian Education Statistics Council (2003) indicated that majority of schools have access to the computers/Internet. On average, there were seven students per computer in a school, which was among the best ratios internationally. Other countries with favourable results were Australia (6:1) and the United Kingdom (8:1).

As professional development is required to integrate technology into the curriculum in the dynamic ways that increase student learning (Gibson & Oberg, 2004; Industry Canada, 2003; The CEO Forum, 2001), today, faculties of education all over Canada are providing microcomputer courses to prepare future teachers to meet the demands of the new technological innovations. However, despite the fact that most Canadian teachers (75%) have had in-service training on computer use for educational purposes, the majority of those teachers (83%) believe that they are not adequately prepared to integrate technology in their classes and lesson plans (Industry Canada, 2003). In the United States, in spite of the fact that 87% of teachers reported undertaking some degree of training on how to implement computer technology, the CEO Forum (2001) reported that only 53% of the whole teacher population revealed that they were somewhat prepared to use computer technology for instruction.

Last but not least, investigating the factors that influence preservice teachers' use of technology may have significant implications for educators, researchers, and curriculum designers, especially since faculties of education all over North America are providing microcomputer courses to preservice teachers to help them meet the demands of the 21 st century classrooms. However, such courses won't be beneficial unless there is an understanding of the learners and the factors that might impede an efficient use of the innovation.

Based on this evaluation of the status of educational computing, the goal of the present research study is to develop a model that can best explain preservice teachers' computer use in a computer course and for general purposes. This will be accomplished by examining influential variables representing prominent themes in theories of human motivation and decision making with respect to preservice teachers' computer use.

Literature Review

Pedagogy of Training in Computer Technology Courses

The implementation of computer technology in education is a complex process that involves more than just learning some basic skill. Computer technology is a rapidly developing field. For this reason, preparing teachers to meet the new developments can be quite difficult. Even though many teachers in Canada and the United States report that the training they had was not quite adequate to prepare them to use technology effectively in teaching and learning, there has always been efforts, in North America and around the world, to provide training on how to use technology as a tool for enhancing teaching and learning.

The various uses of computer technology in teacher training courses can be divided into two main categories: technical- versus pedagogy-based training (Diaz & Bontenbal, 2000). Traditional technical based training focuses on providing trainees with the basic skills of how a particular piece of hardware or software works. This type of training is hardware/software dependent and attempts to transfer specific technical skills to trainees. On the other hand, pedagogy-based training focuses on familiarizing trainees with the techniques and knowledge needed to implement technology in an instructional setting. This type of training is hardware/software independent and aims at educating the trainees on how to use the newly gained technical skills in the teaching/learning settings.

Combining new technologies with effective pedagogy has become a daunting task for both initial teacher training and in-service training institutions. Pedagogy-based training takes many forms due to the rapid development in information and communication technology, especially the Internet, which influences the structure and content of training and delivery methods (Jung, 2005).

Collis and Jung (2003) suggested four major approaches to ICT pedagogy integration in teacher training: (a) ICT as main content focus of teacher training, (b) ICT as part of teaching methods, (c) ICT as core technology for delivering teacher training, and (d) ICT used to facilitate professional development and networking.

ICT as main content focus is one of the earliest forms of teacher training that started in the 1990's. The primary purpose of this form was to provide preservice and inservice teachers with the basic skills of technology with some emphasis on pedagogical integration. Yet, teachers who undertook this kind of training reported the lack of enough experiential and instructional opportunities using the innovation. This form of training is common in the Asian Context, especially in countries such as Singapore (Jung, 2005).

The main focus of *ICT as part of teaching methods* is on the development of ICT-pedagogy integration skills. An example of this approach is providing teachers with examples of ICT pedagogy integration in their training process. This type of pedagogy is common in North America. Jung (2005) provides an example of this form in a Canadian and U.S context. In Canada, the School Administrator's Technology Integration Resource project focuses on the development of ICT pedagogy integration skills of educators by sharing successful cases and practical ideas. The main philosophy behind this approach is promoting teachers' ICT-pedagogy integration in the classroom by demonstrating examples and allowing discussions among teachers throughout the whole training process.

In the United States, the Captured Wisdom resource program uses CD-ROMs that contain video descriptions and demonstrations of how technology is used in teachers' classrooms.

The focus of ICT as core technology for delivering teacher training is the third approach to teacher training. An example of this approach is using the Internet as the main tool of providing the learning experience of teacher training. The focus is not on skills but rather on covering a variety of ICT applications.

ICT can also be used to support teachers' ongoing professional development; such a use is more common than using ICT as core technology for delivering teacher training. An example of this approach is developing a website or websites to provide online resources for teachers for the sake of facilitating teachers' professional development. Such websites would allow educators to communicate and interact with each other and with expert groups based on the belief that professional development should be an integral part of daily practice for all teachers (Jung 2005).

However, the literature has shown that teachers and educators are still resistant to the adoption of computers as a main instructional tool despite the fact that computers and training are available to the majority of teachers. This indicates that unless the deficiencies of traditional training programs are successfully addressed, many schools will find their teachers resistant to implementing instructional technologies.

In preparing teachers to use technology in their classrooms, a new approach to training is necessary. The new approach has to take into consideration the influence of aspects that are personal to teachers. Personal aspects might be very influential to an extent that affects knowledge adoption. Moreover, learning theory has to be employed in conjunction with the findings of this research.

Research in the Field

The growing body of literature associated with educational use of computers and the Internet has examined variables and interrelationships in order to gain a better understanding of computer technology beliefs and use. Most of the studies related to teachers' use of technology have investigated computer attitudes, prior experience, and level of use (Anderson & Reed, 1998; Jaber & Moore; 1999; Marcinkiewizc, 1993/1994; VanFossen, 2001; Wiesenmayer & Koul, 1999; Yeun & Ma, 2002). Among the group of preservice teachers, the focus was mainly on the effect of demographics, training and access on computer and Internet use (Farenga & Joyce, 1996; Milbrath & Kinzie 2000; Ruden & Mallery, 1996).

A closer look at the research in the field provides a better understanding of some of the factors that impede or enhance the implementation of computers in the classroom. Moreover, an analysis and synthesis of these findings will set the stage for launching a research study that investigates these factors and others in new configurations related to current motivational theorizing.

Demographics have been a principal interest of researchers. Age and gender have been explored in relation to teachers and preservice teachers' computer use and attitudes (Cates & McNaull, 1993; Kellenberger & Hendricks, 2003; Marcinkiewicz, 1993/1994; Woodrow, 1991). Findings from such studies provide evidence that the relationship between teacher age, gender, and computer-related beliefs or behaviours appears to be uncertain at best.

Age

In 1993, Cates and McNaull investigated the effect of inservice training and university coursework on special education teachers' attitudes and computer use. Inservice training focused on the day-to-day needs of special education teachers. Age was one of several independent variables that the researchers felt might possibly influence the amount and type of computer training teachers had completed. The study examined 107 seventh and eighth grade teachers of learning disabled students. Of the respondents, 7% were males and 93% were females. One-third of the participants were in their 30s, one-third in their 40s, and one-third was almost equally divided between those who identified themselves as being in their 20s and those who identified themselves as being 50 or older. The study found that there was no significant difference in reported usage for teachers within differing age brackets.

However, it is important to mention that the researchers did not provide detail on the various age groups. One wonders if both males and females were represented in these age groups. Moreover, there was no evidence about the degree of computer usage among the various age groups. The main focus of this study seems to be on the influence of inservice training on computer use and attitudes. Age was of secondary importance.

Similar results were found by Marcinkiewicz (1993/1994). The researcher conducted a study that examined factors that might possibly influence teachers' level of computer use. The list of independent variables included age, gender, computer experience, innovativeness and locus of control, self-competence, and perceived relevance of computers for teaching. The sample consisted of 170 elementary school teachers. The researcher indicated that the choice of elementary school teachers for this study was because they taught a variety of subjects and were less likely to be influenced by their specialization in a subject area that emphasizes computer use. The mean age of the elementary school teachers was 41. Regression analysis showed that age was not a significant predictor of the level of computer use. Moreover, age was not correlated with any of the independent variables except for computer experience ($r = 0.186$, $p < 0.05$). Significantly, computer experience itself did not predict computer use at any level.

With respect to preservice teachers, Woodrow (1991) examined the relationship between age, among other variables, and the computer achievement of 98 preservice teachers enrolled in an introductory computer literacy course for novices. Here, computer literacy was defined as an "understanding of computer characteristics, capabilities and applications, as well as an ability to implement this knowledge in the skilful productive use of computer applications suitable to individual roles in society" (p. 249). The final grade attained in the course was used to measure computer achievement. This grade was based upon an application project and two examinations. The age of the subjects ranged from 18 to 44 with 73% being less than 24 years old. The researcher found that prior programming experience, prior computer literacy, and perceived locus of control were correlated with the final course grade at the $p < .05$ ($r = .22$, .21, and -.25 respectively). The negative correlation between the final course grade and the locus of control confirms the researcher's hypothesis that an internal locus of control is a good predictor of performance in computer literacy courses.

Neither age nor word processing experience were significantly correlated with preservice teachers' final grade.

However, a closer look at this study shows the following: First, the predictor variables (locus of control, previous programming experience, and prior computer literacy) were all found to be weakly correlated to achievement in this computer literacy course. The combination of these variables predicted 14. 7% of the computer achievement variability. Second, this low prediction (14.7%) indicates that variables other than those included in the study seem to have influenced the results. Factors such as instructional procedures and learning tasks among many others may have accounted for a large measure of the computer literacy achievement. Third, although prior computer literacy and prior computer experience correlated with computer literacy achievement, they did so minimally (r = .21 and .22). This also supports the need to seek other determinants of computer achievement.

Most importantly, the order of entry of variables into the regression equation was based upon the assumption that "computer attitudes are personal qualities that result from computer experience" (p. 253). For the computer-inexperienced preservice teachers, age, gender, and locus of control were chosen as precursors of the entry levels of experience with word processing, experience with programming, and computer literacy. These factors were also assumed to be precursors of entry level computer attitudes. However, the authors themselves stated that other relationships among these variables could have existed and that "while causality cannot be determined on the basis of correlations, the stated theoretical position, if supported by empirical data, may indicate the relationships worthy of further investigation" (p. 253).

In sum, the above research findings suggest no linear relationship between age and computer use and attitudes. Yet, a closer look at these findings has shown that there might be some sort of interaction between age and the other variables. There is a need for further research to probe the issue of age and its influence on computer use. Most importantly, it would be significant to see if age correlates with variables such as motivation, learning style, and personality.

Gender

Like age, gender is one of the factors that were investigated in relation to preservice teachers' computer beliefs and behaviours, especially in the early nineties. While some researchers (e.g., Kay, 1989) found a significant difference between males and females' computer attitudes, literacy, and achievement, others (e.g., Woodrow 1991) found that gender did not predict computer achievement nor did it correlate with other variables.

Kay (1989) compared the attitudes, degree of computer literacy, locus of control, and commitment to computers between male and female student teachers. The sample consisted of 383 students (33% males, 67% female) enrolled in the Faculty of Education at the University of Toronto. The attitude scale was divided into two subscales that measured cognitive attitude (14 questions) and affective attitude (20 questions). Literacy was comprised of five subscales including computer experience, basic skills, application software ability, awareness and programming. Locus of control questions focused exclusively on the use of computers. Commitment to computers was measured using a self-report instrument asking about intentions to carry out computer related activities. The Cronbach alpha coefficients of internal consistency of the attitudes scale, literacy battery, locus of control, and commitment were .96, .94, .97, and .86 respectively. The author found that there were no significant differences between males and females in either cognitive or affective attitudes towards computers. However, males had significantly higher mean scores for all five areas of computer literacy, including computer experience. Moreover, males scored significantly higher on the computer locus of control scale, indicating a more internal locus of control with respect to computers. Also males showed more total commitment to computers than females. Though these findings suggest that female teachers might not favour the use of technology for educational purposes as strongly as males, the author mentioned that these differences do not appear "insurmountable." It was also suggested that females' positive attitude might help them enrol in activities that can help enhance their computer literacy level that would in turn have a positive influence on computer locus of control and commitment. These findings seem to contradict the findings of the Woodrow study (1991) that was mentioned earlier. Woodrow found no significant correlations between gender and either computer attitudes, locus of control, and literacy. Moreover, gender was not a significant predictor of success in the computer literacy course.

However, a closer look at these studies shows the following: The main purpose of the Kay study was to explore differences in computer attitudes, literacy, and locus of control between males and females. Kay only compared the mean scores for males and females on the various instruments. On the other hand, the focus of Woodrow study was on investigating factors that predict computer achievement. As such the author did not provide information about the mean scores difference between males and females on the various instruments. Whereas descriptive statistics was the main means of data analysis for the Kay study, the focus of the Woodrow study was on using inferential statistics (regression analysis).

In sum, there seems to be a great difficulty drawing a general conclusion about the influence of gender on computer attitudes and use. Most of the research that investigated gender was done in the eighties and early nineties. There is a need to investigate this issue today, especially since faculties of education across North America have placed great emphasis on providing computer courses to preservice teachers. With resources and training being available, it is valid to investigate any possible influence for gender on preservice teachers' computer use and whether gender correlated with factors such as motivation, learning style, and personality.

Computer Experience

A number of studies have examined the effect of formal computer instruction on attitudes and behaviours towards computer technology. Results appear to indicate that formal instruction can improve computer attitudes and use (Jaber & Moore, 1999; Vanvossen, 2001; Wiesenmayer & Koul, 1999).

Jaber and Moore (1999) conducted a study to examine whether access to computers and training influences teachers' use of computer-based technology. The population for this study was 1017 teachers (elementary 47%, middle school 22%, and high school 31%) from two county school systems, including general education and special education teachers. A sample of 339 teachers was randomly selected from the

1017 available teachers. The instrument that the researchers used was divided into five sections: computer-based technology use, computer-based technology access, computer-based technology training and support, computer inventory, and demographic data. The computer-based technology use section had questions with three response options: yes, no, or not available (e.g., "Are the computers that you use in your classroom?"). This section also had questions with six response options: daily, every other day, weekly, every other week, monthly, every other month or less, or never (e.g., "I use computer-based technology for problem solving."). The computer based technology access section had questions with five possible responses for computer and Internet access: classroom, computer lab, media center, home or none (e.g., "The computers I use for instruction are in the classroom"). The computer based technology training and support section, had questions with three possible responses: yes; no; no, but would if available, or don't know (e.g., "Do you receive workshops on integrating computers into the curriculum?"). The computer inventory section had multiple choice responses with the possibility of multiple responses (e.g., "Indicate the numbers of computers available to you for instructional activities: a. IBM compatible, b. MAC, c. other"). Cronbach's alpha was used to determine internal consistency. The reliability value was .84. Results obtained in this study indicated that access influenced computer use for instructional purposes. Generally, teachers surveyed preferred a continuous type of computer training. Continuous type training has been defined as training conducted on an ongoing basis throughout the year to provide the teachers with the necessary competencies and experience for employing computer-based technology in instruction.

This finding has significant implications for educators and researchers: There is a difference between the experience gained by using computers in general and the experience acquired by using computers for instructional purposes. However, both of these experiences seem essential to any successful implementation of computer technology.

Similarly, Vanfossen (2001) studied the degree of Internet use and barriers to use among secondary social studies teachers. More than 85% of the teachers were employing the Internet in some way for professional use such as planning and research. Results indicated that most of the Internet use was of the lower-order types in Blooms Taxonomy of the cognitive domain. Social studies teachers in this study were using the Internet only for gathering information. As to the barriers to Internet use, the most common factors included lack of training in how to apply the Internet to the classrooms (47.7%), lack of general computer experience (32.7%), concern over students accessing inappropriate materials via the Internet (30.1%) and lack of Internet access in the school building (22.2%). These findings show that a lack of experience with using computers for instructional purposes seems to be the major obstacle in the implementation of the innovation. Formal training and workshops provide teachers with the necessary skills and techniques to assist them in using computer technology for various educational and professional purposes. Moreover, data analysis revealed that a lack of general computer experience was the second main reason that impeded Internet use (32.7%). As such, experience using the Internet in general and for educational purposes, seems to be essential to a successful use of computer technology for instructional purposes.

Very similar results were found by Wiesenmayer and Koul (1999) who investigated "amount of experience" with the Internet as one of several independent variables that possibly may have influenced inservice teachers' level of Internet use. The sample consisted of 90 teachers who participated in a workshop that provided them with training on how to use the Internet in science teaching. Experience with Internet use with students as well as Internet use in general was based on the number of years of experience. For example, 30% of the teachers reported having no experience using the Internet with their students. Fifty percent had less than one year, 13.3% one to two years, and 6.7% more than two years. Correlation analysis revealed that Level of Use was highly correlated with number of years experience using the Internet with students, $r = .62, p < .01$. Availability of classroom connection initiated the second highest correlation, $r = .59, p < .01$. Total number of years of Internet experience was also correlated with Level of Use, $r = .41, p < .01$. Multiple regression analysis revealed that experience of using Internet with students was the best predictor of the Level of Internet Use. It was responsible for 38.8% of the variance in the level of Internet use. Availability of classroom connection was responsible for additional an 3.4% of the variance. The number of teachers using Internet at school has contributed only to an additional 3% of the variance in level of Use.

As such, one can easily notice that "experience of Internet usage with students" and not "total number of years of Internet experience" was the best predictor of the level of Internet use. The implications of such results can be seen in most of the faculties of education today, where microcomputer courses are becoming a main part of the curriculum. These courses provide students with professional development on how to use computers and the Internet and locate them within the context of teaching and learning.

Results from the above research have shown that experience is one of the main factors that influence computer and Internet use. However, it is important when measuring or investigating this issue to differentiate between experiences using computers in general and experiences using computers for instruction. Both experiences seem to be essential for a successful implementation of the innovation: Though regression analysis revealed that experience using computers in general did not contribute to any variance in the level of computer use, this factor was highly correlated with computer use. This indicates that general computer experience will be a significant predictor of computer use, provided that experience using computers for instructional purposes is excluded from the study. Moreover, among the group of novice preservice teachers, who have no teaching experience, it would be significant to focus on the role that experience with basic and general computer skills might have on this group's ability to use computers for their own development.

Language

The Language factor seems to be of such great significance that Mestre (2001) suggested that language is a major issue that might impede the learners' use of computer technology to help enhance their knowledge. The author even stated that educators and librarians had to use bilingual methods with limited-English-Proficient students. Yet, despite the possible influence for language on computer use, very rare was the empirical research that addressed this issue.

The purpose of Sankaran and Bui's (2000) study was to investigate differences in attitudes to Web versus lecture formats and how they affected learning outcomes. The participants were students enrolled in an undergraduate business course. At the beginning of the course the students had to choose either Web or lecture format. Among the 116 participants there were 65 ESL students. The results of this study showed no significant difference between the two groups of ESL and non-ESL speakers ($t = 0.89$; $p = .37$) regarding their attitudes towards the course format. However, this study revealed that the twenty-seven students (27) who chose the Web format had an average of four years residency in the United States of America. Those who chose the face-to-face format (38) had an average of seven years. The author suggests that this result could be because the newcomers to an English speaking country are hesitant to be in the interactive lecture environment due to language and cultural barriers.

Culture

The culture issue seems important to the field of teacher education. Today there is an influx of preservice teachers in faculties of education who were raised in cultures that are totally different from the North American culture. Often, these people bring new values and beliefs to their classrooms. Sometimes these values and beliefs dictate their way of behaviour and interaction in the classroom. Researchers suggest that individuals tend to fall into distinct categories with the manner in which they prefer to learn and to a large degree that these preferences are culturally identified (Anderson & Adams as mentioned in Mestre, 2001). This indicates that cultural norms influence the way students react and interact in the classroom environment. "If students are raised in a strict environment and learn not to challenge their parents or teachers, the atmosphere in mainstream classrooms may foster reliance, inhibit independence and the growth of inductive reasoning, and nurture inactivity and submission" (Mestre, 2001, p. 22).

Research that investigated the influence of cultural factors on computer use or attitudes was very sparse. This might be due to the fact that technology remains new to the field of education as compared to the other traditional tools. For example, a study conducted by Chisholm, Irwin, and Carey (1998) investigated the attitudes towards computer technology and perceptions of usefulness of this technology across cultures. The Asian sample consisted of 97 Chinese students who were attending Shandong University in Shandong province. The African sample consisted of 99 Ghanaian students attending Cape Coast University. The US sample consisted of 98 university students enrolled at Arizona State University. Students in the different samples were enrolled in a variety of majors.

The results showed that these cultures valued technology and that attitudes towards computer technology did not differ across cultures. Despite the fact that the results showed that only five Chinese students and six Ghanaians students had a computer at home, this group felt as positive towards computers as US students did. Significantly, the study showed that whereas the majority of Chinese and Ghanaian students preferred to share computers, only seven US students preferred to share computers with another. This fact indicates the Chinese and Ghanaian cultures value collaboration and sharing. Lack of personal resources could be another factor that had lead to such results among these groups of students.

There are a few questions to raise regarding this study: First, the authors did not provide details regarding the validity and reliability of the instruments used. Second, there was a lack of information regarding the statistical procedures used to analyse the data. Moreover, one wonders if holding positive attitudes does ensure a purposeful use of technology for professional or educational purposes, especially among the group of preservice teachers.

Learning style

Adult learners vary in how they acquire knowledge. Some individuals learn better by doing, while others would prefer formalized instructional methods. In this sense, adult learners represent a variety of learning styles. While some individuals find it very convenient to learn in quiet conditions, others would learn better with some background noise. Individuals also differ in the kind of light conditions, temperature conditions, bodily positions, amount of food consumed, and the company they keep for efficient learning. Bio-chronology is another factor. Some people are early-day learners and some are late-day or even evening/night learners. Some are impulsive learners and others are reflective. Some may find that traditional educational methods, such as lecture and discussion, are not the best ways to help them learn (Meighan, 1996).

Anderson and Reed (1998) investigated the influence of Internet instruction, prior computer experience, and learning styles on teachers' Internet attitude and knowledge. Participants in the study were 24 inservice teachers from West Virginia. These teachers participated in a two-week seminar that taught them how to use "the software that was available in the participants' schools" (p. 230). The software covered in the workshop included Chameleon, "a client/server program that runs within Windows and includes Gopher, FTP, and Telnet applications" (p. 230). It also included Netscape World-Wide Web browser that allows the users to navigate multimedia of networks in a graphically rich environment. Prior to starting the workshop, the authors administered the prior-computer experience, learning style, Stage of Concern, and prior Internet knowledge instruments. At the end of the workshop the subjects were administered the Stage of Concern and Internet knowledge instruments.

The computer experience scale was conducted on the first day of the workshop and addressed domains such as general computer experience, content-area software, programming languages, and hypermedia applications. The authors mentioned that this instrument was used twice in previous studies (see Wells & Anderson, 1997, and Reed, Ayersman, Giessler, & Ervin, 1995).

The Stage of Concern Questionnaire (SOC) instrument was used to collect data about the subjects' affective domain as they consider an innovation as it relates to their institution (Hall, George & Rutherford, 1977). This instrument has 35 questions on which the participants rate themselves using a 7-point Likert scale. There are seven stages of concern that are considered in relation to two dimensions: internal and external. Internal stages focus on how the Internet might influence the individual's (a) awareness (e.g., "I am not concerned about the Internet"), (b) informational (e.g., "I would like to know more about the Internet"), (c) personal (e.g., "I am concerned about how the Internet will affect me"), and (d) management (e.g., "I seem to be spending all my time getting instructional materials related to the Internet"). As to the three External concerns--consequence, collaboration, and refocusing--they are related to one's learning about the innovation and how that might influence others whom the learner might teach about the Internet. Examples of consequence, collaboration, and refocusing are: "I am concerned about how the Internet will affect my students"; "I would like to know more about what my colleagues are doing related to the Internet"; and "I would like to know how something other than the Internet would work better in my classroom."

The learning style inventory used in this study was the Group Embedded Figure Test (GEFT), a three-section instrument developed by Witkin, Oltman, Raskin and Karp (1971) used to test participants' perceptual and cognitive activities. This instrument would classify subjects' learning style as either field-independent or field-dependent. The Internet Knowledge Instrument has thirty questions that address Internet terms, applications, syntax, hardware and software issues, and curriculum integration themes. It included items such as: (a) What is Telnet? (b) List three ways that you might use the Internet in your classroom. The internal reliability of the instrument was estimated using the K-R 20 formula. This formula yielded a pre-treatment value of $r = .90$, and a post-treatment value of $r = .79$.

The researchers found no significant relationships between FI/D Learning Style and any of the Internal Stages of Concern before or after the workshop. However, they found significant relationship between the three external stages of concern and the learning style. There was a significant negative relationship between FI/D Learning Style and the Consequence post treatment concerns. The more Field-Independent the participants were, the more likely their Consequence concerns—how the innovation affects their students—were to be low. This is perhaps explained by Field-Independents affinity for minimum guidance and maximum discovery. The authors believed that this result is common due to the fact that Field-Independent teachers "were content to navigate the Internet on their own and confident that they could do so." That's why they perhaps felt "less concerned about specific learners' outcomes of their classes to which they would take the innovation." As to Collaboration—working with others who are involved in the innovation—it was found that more Field-Independent teachers tended to have lower collaboration concerns prior to the treatment. The study also found significant negative relationships between Field-Independence and Refocusing—individuals' ideas about alternatives to the innovation--before and after the workshop. The more Field-Independent the participants, the more likely their concerns for this stage were to be lower. This is logical, as one of the characteristics of the Field-Independent learner included generating his or her own structure in a learning environment: "Whereas the Field-Dependent learner would be appreciative of the improvements in the interface of recent Internet navigation software, the Field-Independent learner might effectively bypass the interface altogether and generate navigation structure and strategy internally" (p. 243). This internal structure of the Field-Independent learners might cause them to "be less concerned about improving the Innovations "look and feel" since he or she had effectively created an internal interface any way."

Yet two important issues are to be taken into consideration when analyzing the results of this study. First, the number of subjects in the sample was 24, which is somewhat less than the number required to conduct correlational research (Creswell, 2002). Also, this study examined only the FI/D learning style and how it could be related to the teachers' attitude towards the Internet. The authors themselves stated that "there are other learning styles that might make good research candidates for Internet-related research" (p. 244).

The purpose of Shih and Gamon's (2002) research study was to examine how students with different learning styles learned in Web-based courses and what factors influenced their learning. One of the objectives of this research was to identify how students' learning strategies, patterns of learning, and achievement varied as a function of their learning styles. Seventy-four students were surveyed using (a) the learning style test (Group-Embedded Figure Test-GEFT), which classified students as either field-dependent or field-independent and (b) the online questionnaire that consisted of two scales (learning strategy and learning pattern) with pilot-test reliabilities of .80 and .72 respectively. The thirteen learning strategies in the learning strategy scale were selected from the Motivation Strategies for Learning Questionnaire (MSLQ), mentioned earlier. As to the learning pattern scale, it consisted of 15 statements based on the techniques in the Web-based courses that students use to accomplish a task. Student achievement was measured by class grade. Analyses of data included frequencies, means, standard deviations, *t* tests, Pearson correlations, and regressions. The alpha level was established at the .05 level. The researchers found that field-dependent students scored almost the same on the learning strategy scale ($\bar{x}$ = 3.27) as the field-independent students did ($\bar{x}$ = 3.25). Among the selected variables, learning strategy was the only variable that correlated significantly with student achievement (r = .50). Regression analysis showed that learning strategy was responsible for 25%

of the variance in achievement. As such, the authors stated that "students scoring higher on general use of learning strategies tended to have higher final grades in the class. Learning styles was only responsible for an additional 1% of the variance in student achievement. Yet, it is essential to notice here that the independent variables predicted only 27% of the variance in achievement. One wonders about the other factors that might have influenced the students' achievement.

Contrarily, the purpose of Ross, Drysdale, and Schulz's (2001) study was to examine the relationship between academic performance and learning styles of 168 preservice teachers in a computer application course (Computer Applications in Education). The focus of the computer course was on familiarizing students to the computer and how to apply computer technology to the school curriculum. The Gregorc Style Delineator was used to collect learning style data. It is a self-scoring battery based on mediation ability theory which states that the human mind has channels through which it receives and expresses information most efficiently and effectively (Gregorc, 1982a). These channels focus on two abilities in adult individuals: *perception*, the way one grasps information, and *ordering*, the way one arranges, systemizes, and disposes of information. The two dimensions of perception are abstractness and concreteness. The two dimensions of ordering are sequential and random. This instrument classifies students on four channels of mind styles: Concrete Sequential (CS), Abstract Sequential (AS), Abstract Random (AR), and Concrete Random (CR). As mentioned in Gregorc (1982a), people who are dominant CS are usually practical, thorough, and well organized. They prefer quiet, structured environments. They enjoy being physically involved and active in lessons. AS dominant learners are evaluative, analytical, and logical individuals with a preference for mentally stimulating, orderly, and quiet environments. These learners thrive on teachers who are experts in their area of interest, learning well through lecture-style teaching. Dominant AR learners are non-linear, multidimensional, emotional, perceptive, and critical. They prefer active, free, and colourful environments. Dominant CR learners prefer competitive, unrestricted and stimulus-rich environments. Gregorc (1982a) reported reliability coefficients for the four learning style scales to range from 0.89 for the AS scale to 0.93 for the AR scale ($p = 0.01$). Analyses of data included frequencies, means, standard deviations, chi-square, and one way ANOVA.

ANOVA results revealed significant differences between the GPA scores achieved by each learning style group, $F\ (3{,}165) = 2.84$, $p < .05$. Post-hoc Scheffe analysis has shown that the AS group mean was significantly different from the AR group's recorded GPA ($\bar{x} = 3.72$, $SD = .36$; and $\bar{x} = 3.42$, $SD = .69$ respectively). Dominant AS learners achieved the highest score. However, students in the CS group were the in the same mark range of an A- ($\bar{x} = 3.67$; $SD = .39$). Dominant AR learners score was the lowest of all learning-style groups and less than the course average (3.58). The CR group mean was 3.56 ($SD = .57$).

The chi-square analysis was not significant ($X^2 = 30.92(3)$, $p < .05$). Forty six percent of the students in the CS dimension and 48% of students in the AS dimension received A grades. Less than 38% of dominant CR students and only 18% of dominant AR students achieved the same mark in the course. Nine percent of dominant AR and

8% of dominant CR students received a mark of C or lower compared with 0% of dominant CS and 1% of dominant AS students.

The ANOVA and chi-square results indicate that learning style played a significant role in determining student performance in the computer course. According to Gregorc (1982b) students showing dominance in the sequential dimension (CS and AS) tend to prefer working with computers because the computer is seen as an extension of the sequential person's mind. The authors indicated that dominant CS and CR students are well suited to computer tasks such as programming because such activities require linear processing and logical reasoning skills. Dominant AR individuals are inherently social and enjoy working and learning with others (Butler, 1987). They may find using the computer frustrating and boring.

Aragon, Johnson and Shaik (2000) investigated the relationship between learning style preferences and learner success of students in an online graduate level of instructional design course with an equivalent face-to-face course. Curry's (1990) Model of Learning style served as the theoretical framework for the study. This framework posits that motivation maintenance, task engagement and cognitive controls must be considered together when dealing with learning styles: Learners can maintain their motivational levels once they are able to set the preferred environmental and social conditions for learning. Task engagement level is revealed in the amount of attention that is dedicated to features in the instructional situation, persistence of the learner, the degree of participation, the enthusiasm, and degree of concentration the learner sustains throughout and beyond the instructional situation. Cognitive controls refer to the information processing habits or control systems that learners bring to learning situations. As such, comparisons included the environmental factors that maintain student motivation in the classroom, task engagement strategies, and cognitive processing habits. Subjects in the study were 38 students who were divided equally among the online and face to face course. The Grasha and Reichman Student Learning Style scale (SLSS) was used to measure "motivation maintenance." It describes learners among the bipolar scale dimensions of independent vs. dependent, avoidant vs. participant, and collaborative vs. competitive. "Task engagement" was assessed by the Weinstein, Palmer, and Schulte (1987) Learning and Study Strategies Inventory. This inventory focuses on ten variables: anxiety, attitude, concentration, information processing, motivation, selecting the main idea, self-testing, study aids, and test strategies. Finally "cognitive control functions" were assessed through the Kolb Learning Style Inventory. Subjects' responses on this scale were classified on two bipolar concepts: concrete experience vs. reflective observation, and abstract conceptualization vs. active experimentation.

Data analyses included frequencies, means, independent *t* tests, and bivariate correlation analysis. Results of the independent *t* test revealed no significant difference in the social and environmental preferences (motivation maintenance) between the students of the two delivery formats. The results also showed no difference in the learning and study strategies with the exception of study aids, $t\ (34) = 4.10, p < .05$. This result revealed that face-to-face students reported greater use of support techniques and materials than the other group ($\bar{x} = 30.17$, $SD = 4.76$; $\bar{x} = 23.78$, $SD = 4.58$ respectively). However, *t* test results showed significant differences on the three subscales of the cognitive processing habits (reflective observation, abstract conceptualization, and active experimentation) of the two student groups at the .05 level, $t(35) = 2.18$; $t(35) = 2.11$; and $t(35) = - 2.54$ respectively. Face-to-face students scored higher than the other group on the reflective observation subscale ($\bar{x} = 30.53$, $SD = 5.67$: $\bar{x} = 25.22$, $SD = 5.88$ respectively). Moreover, face-to-face learners reported a higher degree of learning by thinking (abstract conceptualization) in comparison to the online learners ($\bar{x} = 34.74$, $SD = 5.67$; $\bar{x} = 30.44$, $SD = 6.67$ respectively). As to active experimentation, online learners reported greater use of this mode of learning than the other group ($\bar{x} = 36.11$, $SD = 8.46$; $\bar{x} = 29.16$, $SD = 8.15$).

Bivariate correlation analysis revealed no significant relationship between learning style and computer achievement among the group of online learners. However, quite interestingly, significant correlations were found among learning style and computer achievement of face-to-face learners at the 5% level: For the maintenance motivation construct, the findings were significant: As the level of avoidance of classroom activities decreased, the course performance increased ($r = -0.58$) that as participation in classroom activities increased, the course performance increased. For the task engagement construct, positive correlations were found between attitudes and course performance as well as time management and course performance ($r = 0.51$ and 0.45 respectively). As to the cognitive control construct, active experimentation was negatively correlated with performance ($r = -0.56$). The authors indicated that this "surprisingly" negative correlation might be due to the fact that the class was an application, hands-on course where success is highly dependent upon participation.

Significantly, despite the difference among the two groups of learners in terms of cognitive control functions, this factor seemed to have no impact on course performance.

The above studies have shown that learning style has significant relationships with the learners' attitudes towards computer technology as well as computer use and achievement. It is also apparent that the influence of this factor varies as a result of the nature of delivery formats. Research studies that compared performance of students in a face-to-face environment with an equivalent online course revealed that learning style had only influenced students' performance in face-to-face. These differences were also found among the studies that investigated each environment separately. As such, learning style seems to have more influence on computer use especially among students who are involved in a face-to-face course.

Motivation

Educational literature usually defines motivation as an internal state that arouses, directs, and maintains behaviour (Woolfolk, Winne, & Perry, 2003). It is frequently seen as a force within the individual that moves him or her to act in a certain way. Motivation in education is the compulsion that keeps a person within a learning setting and encourages them to learn.

Motivation influences how and why people learn as well as how they perform (Pintrich & Schunk, 2002). Chalupa, Chen, and Charles (2001) investigated the motivational variables and learning strategies that university students bring to a software application classroom. Seventy-four students, in three sections of the Computer Applications Course, participated in the study. The computer course focused on teaching applicants how to use commercial software packages including systems, spreadsheets, database, and word processing.

The Motivated Strategies and Learning Questionnaire (MSLQ) was used to collect data about students' motivational orientations and their use of different learning strategies. The motivation section of this instrument has 31 items that assess students' intrinsic goal orientation, extrinsic goal orientation, task value, control beliefs, self-efficacy for learning and performance, and test anxiety. The learning strategies section has 31 items that address students' use of different cognitive and metacognitive strategies such as rehearsal, elaboration, critical thinking, and effort regulation. This section also has 19 items that address management of different learning resources.

The researchers ran reliability statistics for each of the subscales of the instrument. The Cronbach alphas for all the subscales were within the range of .73 and .92, with the exception of External Goal Orientation and Control Beliefs about learning, with coefficient alphas of .54 and .62 respectively. The course grade was used as the measurement of achievement. For the motivation subscales, both intrinsic goal orientation and self-efficacy were correlated with the course grade at the $p < .05$ level. However, the strength and value of these correlations were not stated clearly. Students who were either more intrinsically motivated or had higher self-efficacy tended to have higher course grades. For the learning strategies subscales, both critical thinking and organization had inverse relationship with course grade at the $p < .01$ level. The authors concluded that such unexpected results were due to the fact that the MSLQ Organization and Critical Thinking items do not seem to relate to computer courses. For instance, the Organization subscale relates to "clustering, outlining, and selecting the main idea in reading passages" (Pintrich, Smith, Garcia, & McKeachie, 1991). In the computer course the focus was on learning specific software features with hands-on activities which makes statements as " when I study for this course, I go through the readings and my class notes and try to find the most important ideas" are not applicable and appropriate to ask about learning strategies used for a computer course. Results of regression analysis showed that intrinsic goal orientation predicted the final grade (achievement) of students with an $r^2 = .35$. Critical thinking had a negative value with a regression coefficient of -.34. Yet, some questions could be raised regarding these results. One wonders how consistent the grading of the various students was and to what extent the three sections were treated as one homogeneous group, though teachers who taught the three sections used the same textbook, teaching methods, and followed the same hands-on activities.

In 2003, Chen and Chapula conducted a very similar study where the focus this time was on a cluster of motivation characteristics and a set of learning strategies. The authors in this study hypothesized that a relationship exists between performance and a cluster of motivation characteristics. Cluster analysis is a process that is directed at finding similar groups in data. These groups are formed in such a way that objects in the same group are similar to each other whereas objects in different groups are as dissimilar as possible. Students were clustered based on their scores on the six motivation scales of the MSLQ. Statistical analysis indicated that a three-cluster solution was the most interpretable and stable between the pre-test and the post-test. Students were characterized as: (a) intrinsically motivated, (b) extrinsically motivated, and (c) those with low level of motivation. As to the learning strategies clusters, students were categorized as high studiers and light studiers. High studiers tended to use numerous learning strategies and light studiers tended to use very few learning strategies. The nine learning strategies that the MSLQ include are: rehearsal, elaboration, organization, critical thinking, self-regulation, time and study environment management, effort regulation, peer learning and help seeking. Students were administered the MSLQ during the third or fourth week of the semester and once again during the week before final examinations. Of the 65 subjects who took the computer application course, 26 (40%) indicated the computer applications course was required while 39 said it was not required for their major.

Chi-square tests indicated that the motivation characteristics early and late in the semester were not independent of each other. Fifteen (75%) of the students who were intrinsically motivated remained the same, one shifted to become unmotivated, and four students shifted to become extrinsically motivated at the end of the course. One of the fifteen unmotivated students shifted to become intrinsically motivated, and 4 shifted to become extrinsically motivated, and 10 (67%) remained the same. For those who were initially extrinsically motivated, 23 (77%) remained the same, two shifted to become intrinsically motivated, and 5 shifted to become unmotivated. Seventy-two percent of the two groups of high and light studiers remained the same.

A one way analysis of variance (ANOVA) was used to investigate the difference in students' final grades in relation to the motivation and the use of learning strategies characterization as measured early and late in the semester. ANOVA results showed that there was a significant difference in final grade at the .05 level among various motivation clusters early and late in the semester (*F* = 4.998, *df* = 2 and *F* = 3.9, *df* = 2 respectively). The researchers found that students who were identified early and late as intrinsically motivated earned higher final grades ($\bar{x}$ = 3.38 and 3.28: *SD* = .71 and .83 respectively) than those identified as extrinsically motivated ($\bar{x}$ = 2.73 and 2.90; *SD* = .88 and .84 respectively). The unmotivated group of students had the lowest final grade ($\bar{x}$=2.58 and 2.46; *SD* = .91 and .91 respectively).

Interestingly, ANOVA results showed that there was a significant difference among students in the study intensity clusters early in the semester (*F* = 11.01, *df* = 1). Contrary to general beliefs, however, students who reported to be heavy studiers in the beginning of the course tended to have lower grades than those students who reported to be light studiers ($\bar{x}$ = 2.52 and 3.20 respectively). A possible explanation would be that the nature of the MSLQ learning strategies scale does not fit a computer application course. A computer application course requires hands-on learning, not text book learning or the use of rehearsal, elaboration, or organizing learning strategies (Chen and Chapula, 2003). Though this research yielded significant findings regarding the influence of motivation on computer achievement, such findings cannot be generalized unless further investigation takes place. This is due to the fact that the number of participants in the three motivation groups was not enough to conduct correlational research (Creswell 2002). Creswell states that a researcher needs approximately 30 participants for a correlational study.

The purpose of Shih and Gamon's (2001) research study was to examine how students with different learning styles learned in Web-based courses and what factors influenced their learning. One of the objectives of this research was to identify how students' motivation, attitudes, and achievement differed as a function of their learning styles. Ninety-nine students were surveyed using (a) the learning style test (Group-Embedded Figure Test-GEFT), and (b) an online questionnaire that consisted of two scales (motivation and attitudes) with pilot-test reliabilities of .71 and .91 respectively. Student achievement was measured by class grade. Data were analyzed using the statistical Package for Social Science, Personal Computer Version (SPSSx/PC). Analyses of data included frequencies, means, standard deviations, *t* tests, Pearson correlations, and regressions. Pearson correlations showed that the relationship between student achievement and overall motivation scores yielded a significant value ($r=.53$). No significant relations were found between students' achievement and the other variables. Regression analysis revealed that motivation was the only significant predictor that explained the variance in achievement scores ($r = .28$). No significant difference was found on student overall achievement score by learning styles.

Achievement Motivation

Weiner (1972) outlined an attribution theory that incorporated achievement motivation. The intent of this theory was to develop a theory that was better than others to explain (account for, predict) behaviour in achievement related contexts and to provide a theory that more readily extended to other motivational domains than other conceptions of achievement strivings (Weiner, 1986). Weiner felt that this cognitive approach towards explaining achievement motivation satisfied these objectives.

Attribution theories, in general, investigate the explanations individuals offer for the occurrence of an event, and how these causal attributions presumably influence future expectations and behaviour. Heider was considered to be the founder of attribution theory (Weiner, 1972). Heider (1958) postulated that outcomes at achievement-related activities are a function of both internal and external factors. Examples of internal factors are ability and effort. Examples of external factors are ease or difficulty of the task and grading policies. Of course, fatigue, illness, and drugs are also among the causes that might be unique to a specific situation. But within the confines of academic accomplishment, ability and effort are believed to be the dominant causes of success and failure (Weiner, 1986). Effort and ability are perceived to be personal factors whereas difficulty and luck are factors of the environment. Heider (1958) concluded that behaviour (B) was a function of the person (P) and the environment (E): B = f (P, E)). However, Weiner and Kukla (1970) deserve credit for recognizing the importance of causal attributions for the explanation of achievement behaviour.

Weiners' model incorporated and expanded Heider's work in an attempt to establish the reasons that caused an individual to succeed or fail. In 1970, Weiner and Kukla found that failure-motivated and success-motivated individuals use distinctively different attributions. Thus, a link between achievement motivation and attributions was established.

Weiner (1972) wrote that ability, effort, task difficulty, and luck were the four perceived causes of success and failure for achievement tasks and he postulated that these four elements could be classified within two causal dimensions: locus of control and stability. The locus of control dimension classified the variable according to whether or not control was an internal or external variable. As to the stability dimension, it could indicate whether or not the variable in question changes for a person.

An example of the use of this model may be seen in predicting a student's future behaviour based on the student's attributions for success or failure in a former task. If this student perceived the likelihood of success in a task at hand as dependent upon his/her ability versus the amount of luck involved, and the student had succeeded in a similar past activity, the student would then approach this task with a great hope and expectation of success. On the contrary, if this same student perceived that the chance of succeeding in a task at hand as dependent on the amount of luck involved versus the individual ability, the student may not try his hand at this task or may compensate in some different approach that would bring him/her success. This student might, for example, think the timetable of this task should be changed and thus try to approach it another time where success could be within the reach.

Personality

One prominent model that describes human personality is the Five-Factor Model (FFM) of personality. "The FFM is a hierarchical model of trait structure, in which relatively narrow and specific traits are organized in terms of five broad factors: Neuroticism, Extraversion, Openness to Experience, Agreeableness, and Conscientiousness" (McCrae, & Allik, 2002, p. 1). Extraversion, is defined as" a trait characterized by a keen interest in other people and external events, and venturing forth with confidence into the unknown" (1989, p.198). Neuroticism is "a dimension of personality defined by stability and low anxiety at one end as opposed to instability and high anxiety at the other end" (Pervin, 1989, p. G-7). Openness refers to people's willingness to make adjustments in notions and activities in accordance with new ideas and situations (Popkins, 2004). Popkins describes Agreeableness as people's ability to get along with others. Conscientiousness refers to will and general choice, the ability to consider others when making decisions.

Fiske (1949) was the first to recognize this set of factors when he described them as five "recurrent factors." Fiske's research was influenced by the systematic work of Catell (1943) who applied empirical procedures to the task of constructing a personality taxonomy based on a perusal of English personality descriptive terms. Catell developed a set of 35 bipolar clusters out of the 171 scales that the empirical analyses revealed. Rating scales based on these clusters were then tested in various studies, the result of which was identifying at least a dozen oblique factors. However, when Catell's variables were analyzed by orthogonal rational methods, only five factors proved to be replicable (Fiske, 1949; Norman, 1963; Tupes & Crystal, 1961).Though the naming was different, these researchers agreed on the presence of five stable factors. Goldberg (1981) noted the robustness of the model, stating that "it should be possible to argue the case that any model for structuring individual differences will have to encompass—at some level—something like these 'big five' dimensions" (p. 159).

Kentle (1994) stated that the increased interest in the Five-Factor Model requires a closer examination of these factors. To obtain precision, the author decided to investigate the same item repeatedly in several samples. This would "lead to better approximation of the factor loadings than would loadings derived from a single sample" (p. 739). This close examination has yielded significant findings about the nature of the five factors. Three factors, Openness, Conscientiousness, and Agreeableness, were found to have essential characteristics. Items with the highest loadings in the Openness factor had "novelty or originality" in common. Adjectives in the Conscientiousness factor were found to refer to "general organization." In Agreeableness, adjectives had "concern for others" or "sympathy" in common. Introversion and Neuroticism were found to be composed of more specific elements. "Shyness" was dominant among the introversion adjectives. "Nervousness" was common to the Neuroticism adjectives. Based on such results, Kentle developed an inventory--the SONSO Personality Inventory. Shyness, organization, nervousness, sympathy, and originality represent the five subscales in this inventory. The SONSO consists of 50 adjectives, ten per each factor. Participants are usually asked to rate themselves on these adjectives on a five point Likert scale that ranges from "strongly describes me" to "strongly does not describe me."

While there is an abundance of research related to using personality traits inventories or scales in counselling, career guidance, and education, there is considerably much less research that investigated the relationship between either (a) personality traits and Likelihood to use computers (Chambers, Hardy, Smith & Sienty 2003; Jones, 1994; Smith, Munday & Windham 1995), (b) personality traits and performance in an introductory programming course (Bishop-Clark & Wheeler 1994), or (c) personality traits and satisfaction with course delivered online versus those delivered in the classroom (Daughenbaugh, Ensminger, Fredrick & Daniel, 2002).

Jones (1994) investigated the relationship between personality traits, attitudes towards computers, and computer use. Participants in the study were 140 undergraduate and graduate students enrolled in educational psychology, a graduate educational psychology course in human learning and development, and two sections of an undergraduate course in tests and measurement. The undergraduate courses were required in all teacher education licensure programs at the university where the study was conducted and were taught by the investigator himself. Data were collected using three instruments that measured: (a) personality traits (the Myers-Briggs Type Indicator), (b) likelihood to use computers, and (c) computer attitudes. The computer use instrument included items such as: using a computer on a regular basis, using a computer word processor, and working with computer graphics. The participants' attitudes were assessed with a scale adopted from Kay (1989) which required the participants to choose, between bipolar adjectives, the word that seemed more closely associated with computer use. Examples of the adjectives used were uncomfortable-comfortable, empty-full, and natural-artificial. Cronbach's alpha coefficient for the adapted scale was .89, suggesting satisfactory reliability. Results revealed that the participants over all had highly positive attitudes towards computer use: Results revealed that there was no relationship with the MBTI E-I (Extroversion-Introversion) and J-P (Judging-Perceiving) dimensions and any of the computer use variables. Significant results were found on the T-F (Thinking-Feeling) dimension. Participants with strong preference for logical, analytical problem solving (thinking) revealed more likelihood to experiment with software packages. On the S-N (Sensing-Intuition) dimension, participants with more intuitive perceptions reported being more likely to purchase or borrow hardware or software and more likely to complete major tasks with a computer. Generally, the overall results suggest that the MBTI S-N and T-F dimensions are related to the likelihood of computer use. There were no significant correlations between personality traits and the participants' attitudes. Though results from this study revealed that certain personality traits are correlated with computer use, there are a number of features to be taken into consideration before making any generalizations. It is important to mention that most of the subjects in this study were females (102 females and 38 males). Second, the instruments used to assess probability of computer use were based on self-report. It could be more effective to investigate correlations between MBTI dimension and actual computer use.

Similar findings were found by Smith, Munday, and Windham (1995). The authors' purpose was to investigate the impact of personality types on intermediate/secondary teachers' willingness to use technology. Participants were 138 teachers from three school districts in the Northeast Texas area. Two instruments were used to collect data. The Myers-Briggs Type Indicator (MBTI G-form) was used to collect personality preferences. The G-form generates eight basic personality traits, yet for this study the authors used only four: Sensory-Feeling, Sensory-Thinking, Intuitive-Feeling, and Intuitive-Thinking. Interestingly, the authors did not state why they intended to use four models only. The instrument that measured likelihood to use technology consisted of twenty statements which "were obtained form background literature and from similar studies." However nothing was mentioned about the reliability of this instrument. Analysis of variance was the major statistical procedure used in this study. The resulting F ratio of 37.46 ($p < .01$) was significant. A Tukey's-B procedure was used to determine the precise location of the significance among the four personality groups mentioned above. Teachers who fall under the Intuitive-

Thinking category were more receptive to the use of technology than the Sensory-Feeling types ($\bar{x}$ = 80.87 and 46.13 respectively). The Sensory-Feeling types were found to be the least comfortable with technology.

Daughenbaugh, Ensminger, Fredrick, and Daniel (2002) conducted a study to investigate if different personality types relate to students' satisfaction with courses delivered online versus those delivered in the classroom. Subjects were 146 college students taking online and in-class courses in the College of Education at the University of South Alabama. One hundred fourteen (78.1%) of the subjects were female while 31 (21.1%) were male. Twenty-seven of the students were enrolled in online courses while 119 were enrolled in an in-class course. The Keirsey Temperament Sorter (KTS) was used to investigate personality variables. Participants were measured on four variables: (a) Extroversion or Introversion, (b) Intuition or sensing, (c) Thinking or Feeling, and (d) Judging or Perception. Course satisfaction instrument measured students' satisfaction with aspects of the course such as interaction with the instructor, interaction with other students, amount of information presented in the course, and assessment procedures. Data analyses included a variety of descriptive and inferential statistics: frequencies, bar graphs, means, modes, medians, correlations and analysis of variance. The results showed that the Extroverts expressed stronger preference for online courses than did Introverts. This finding is interesting and counter intuitive. As the authors suggest, more research is needed to determine if this finding was unique to this study. The most significant finding of this study was that there were statistically significant differences in the responses to certain course satisfaction variables among those in the various personality groups. For example, there were significant differences between the Extroverts and Introverts' satisfaction in the way they were evaluated by the instructors. The Judging and the Perception groups also differed on satisfaction factors such as interaction with other students. The Perception group expressed stronger preferences for the amount of student interaction than the judging group. There was also difference between the preferences of the Intuition group and those in the Sensing group regarding the type of information presented in the course. The Intuition group expressed stronger preferences in the type of information presented than the Sensing group. This indicates that students with various personality traits favour different learning/teaching styles.

Summary

Despite the fact that there is a prominent focus today on implementing technology into the curriculum, there are still obstacles that interfere with its use. This literature review has attempted to engage with and reflect upon the research studies that investigated this issue. As expected, internal factors, such as teachers' personal characteristics, prior computer experience, motivations, and learning styles were found to be very influential.

Age was among the factors that were extensively investigated in the literature. However findings from the literature yielded controversial results. One has to keep in mind the following when approaching the age issue: First, the authors who investigated this factor (e.g., Woodrow, 1991) indicated that even if age was not found to be a significant factor, there might be some sort of interaction that relates this factor to other variables. Moreover, it is evident that most of the research that investigated age was conducted in the eighties and early nineties. There is a need for further research to probe this issue and its influence on computer use in the 21st century, especially since the use of computers is becoming an essential tool that aids instruction and learning. Preservice teachers need to be familiar with how to use computers for their own needs as well as for their own classrooms. Preservice teachers also need to be prepared to meet the demands of the technology age. This fact puts more pressure on the various age groups of users especially since preservice teachers come from various backgrounds.

Like age, gender was one of the contradicting issues in the literature. Whereas some researchers found that there were significant differences among males and females' computer attitudes, computer literacy, and locus of control (Kay, 1989), others (Woodrow, 1991) found that gender did not predict computer achievement. However, Woodrow stated that gender might have had interactions with the other factors that influenced computer attitudes and achievement. Moreover, studies that investigated gender were carried out in the eighties and early nineties. Today computers are becoming an essential educational tool in schools, universities and especially in faculties of education. These faculties are even providing general computer courses that provide guidance and training on how to use computers for educational and instructional purposes. It makes sense for educational research to include a sex variable since there is a gender imbalance in education with females representing the dominant group especially at the elementary level.

Language is one of the factors that were rarely investigated in the literature. The few studies that tackled this factor have sought its influence only on computer attitudes. One wonders if the results of such studies have implications for computer use. Moreover, when investigating language, researchers have to keep in mind that what makes the issue of language of major importance is "not only that of English versus Spanish, but also of the terminology used to explain how to move around in a computer, database and the Internet" (Mestre, 2001, p. 24). As such it seems essential for any research study that addresses the issue of language to differentiate between mastery of the English language in general and computer terminology in particular.

Like language the literature that investigated culture was very sparse. Yet, the influence of culture on computer use and knowledge is an issue that is worth more investigation and probing especially since computer knowledgeable personnel are becoming a necessity not only for the marketplace but also for educational institutions as well. Most importantly, immigrants in North America constitute an increasing percentage of the population, not only in the market place but also in universities and faculties of education. As these people bring with them their own values and beliefs, it would be essential to investigate any possible influence for culture on computer use.

Computer experience was one of the factors that highly correlated with computer use. However, research has distinguished between two types of experiences: experiences using computers in general and experiences using computers for instruction. Among the group of novice preservice teachers, who have no teaching experience, it would be reasonable to focus on the role that experience with basic and general computer skills might have on this group's ability to use computers for their own development.

As to motivation and its influence on computer use and achievement, there is a body of educational research showing that motivation is one of the key factors for a successful involvement in the learning process (e.g., Shih & Gamon, 2001). Motivation was found to correlate highly with and predict achievement in computer courses. Intrinsically motivated students achieved higher grades than the extrinsically motivated ones.

It is also important to mention that motivation not only influences peoples' performance but also how and why people learn (Pintrich & Schunck, 2002). Because the learning process is complex, there are many factors that interfere within this process and influence its outcome. However, most of the literature that investigated motivation has isolated this variable. The influence of motivation was rarely investigated in the presence of the other interesting factors that were found to be influential in the literature.

Learning styles are believed to play a potentially important role for students' success in the various learning environments, and to a greater extent in face-to-face classrooms. A review of the literature has shown that learning style had significant relationships with the learners' attitudes towards computer technology as well as achievement in computer courses. For example, the Ross, Drysdayle, and Schulz (2001) study showed that dominant Abstract Sequential (AS) learners achieved the highest score and dominant Abstract Random learners the lowest. However, research studies that compared performance of students in a face-to-face environment with an equivalent online course revealed that learning style had only influenced students' performance in face-to-face classrooms. These differences were also found among the studies that investigated each environment separately.

The literature has also shown that personality factors correlate with computer use and achievement. Learners of different personality types reacted differently to computer courses. Whereas persons with certain personality types felt more comfortable about taking or being enrolled in a computer course (for example, the Intuitive/thinking category on the Myers-Briggs Type Indicator), others (for example, the Sensory/Feeling types) were more conservative about the value of computers and its role in attaining knowledge.

The literature review has also shown that there were statistically significant differences in the responses to certain course satisfaction variables among learners in the various personality groups. For example, learners who fall under the perception category expressed stronger preferences for the amount of student interaction than the judging group. The intuition group expressed stronger preferences in the type of information presented than the Sensing group. This suggests that students with various personality traits favour different learning/teaching styles.

In conclusion, it is evident that factors such as motivation, learning style, and personality influence preservice teachers' computer attitudes as well as their use of computers and achievement in computer courses. However, it is essential to mention that most of the researchers have studied these variables in isolation. No researcher has adopted a model or a framework that investigated the potential influence of all these factors on computer use: For example, Chapula, Chen and Charles's (2001) research study investigated the influence of motivation and learning strategies on achievement. Others (e.g., Shih and Gamon, 2001) investigated the influence of motivation and learning style on achievement. Significantly, studies that investigated the influence of personality on computer use have neglected or excluded factors such as motivation and learning style (e.g. Smith, Munday, & Windham, 1995). Second, it is noticed that when the influence of factors such as personality, motivation, and learning style was investigated, these variables predicted only a low or moderate percentage of the variance in achievement or computer use.

These observations indicate that there are weaknesses in the theoretical models adopted in the literature. There is a need to design a strong theoretical model that reinvestigates this issue (computer use) on broader terms. For any research study to yield valid and reliable results there is a need to adopt a theoretical model that provides solid grounds for conducting such research. The new model should allow for equal representation of all the factors that might be influential. Such a theoretical model will inform not only theory but also practice.

To conclude, five variable-clusters have emerged that might potentially have an impact on preservice teachers' computer use for personal and educational purposes. They are the following:

1. Demographic
2. Experiential
3. Learning Style
4. Motivational
5. Personality

Research Questions

Results from the literature have revealed that there is no clear theory or model that best explains computer use among teachers, both preservice and inservice.

Moreover, the researchers who tried to investigate the influence of certain variables on computer use (for example motivation) have failed to provide a framework that takes into consideration other factors that were found to be influential in the empirical literature. As such, this research study adopts a framework that is made up of a set of variable clusters that employ factors that were found to be significant in the literature. The significance of the new framework lies in the fact that it sets no expectation for one cluster over another. The main purpose is to see which of the variable clusters or variables that constitute them might explain computer use among novice teachers. To accomplish this purpose, the following research hypotheses are posed:

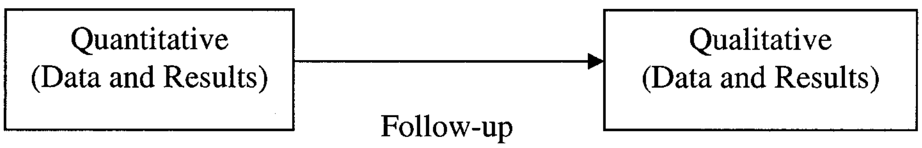
1. Certain variable clusters (demographic, experiential, motivational, learning style, and personality) will have a prominent relationship with computer use in a computer course, as well as for general purposes.
2. There will also be significant Intra-cluster predictions: Certain variables (age, gender, marital status (single/other), program of study, children, educational level, residence, racial/ethnic status, country of birth, age moved to Canada, aged learned to speak English, language spoken at home, familiarity with computer terminology, active LS, sensing LS, visual LS, sequential LS, motivation (intrinsic), motivation (extrinsic), motivation (task value), motivation (control of learning beliefs), motivation (success), motivation (self-efficacy), personality (shyness), personality (organization), personality (nervousness), personality (Sympathy), and personality (Originality) will have prominent relationship with computer use in a computer course, as well as for general purposes.

Research Design and Methodology

The Rationale

Explanatory mixed-method design (also called a two-phase model) (see the figure below) is adopted in this research study to carefully examine variables or cluster of variables that influence preservice teachers' computer use in microcomputer courses, as well as computer use for general purposes.

Figure 1: Explanatory Mixed Method Design



Creswell (2002) suggests that the mixed method researcher places a priority on quantitative data collection and analysis. This is done by introducing it first in the study and having it represent a major aspect of data collection. A small qualitative component follows in the second phase of the research. The rationale for this approach is that "the quantitative data and results provide a general picture of the research problem; more analysis, specifically through qualitative data collection is needed to refine, extend, or explain the general picture" (p.566).

Correlational research methodology was used for the quantitative phase of this study. This methodology is chosen since the purpose of the study was to determine whether, or to what degree, a relationship might exist between the independent variables (preservice teachers' motivations, learning styles, demographics, prior experiences, personality) and preservice teachers' computer use for personal and educational purposes.

Subjects

Subjects in this study are preservice teachers enrolled in the one-year consecutive Primary/Junior (P/J), Junior/Intermediate (J/I), and Intermediate/Senior (I/S) preservice program at the Faculty of Education, University of Windsor, during the 2005/2006 academic year. The program provides teachers in the P/J and J/I groups with training in all subject areas (Language arts, Math, etc.). I/S teachers receive training in their field of speciality (teachable). Females dominate the preservice teacher population. For example, among the 698 preservice teachers enrolled in the 2004/2005 program at the Faculty of Education University of Windsor, 492 (70.4%) students were female and 206 (29.6%) were male.

Upon completion of the program, successful candidates receive a Bachelor of Education degree and apply for membership in the Ontario College of Teachers. As part of their program, preservice teachers are required to receive computer training that focuses on providing them with hands-on computer experience. Such experience would allow preservice teachers to apply computers within all subject areas.

Instrumentation

Six instruments were used for this study (see Appendix A). The first instrument solicits demographic information about the participants such as gender, age, marital status, and native language (see Appendix A1). The second instrument collects information about preservice teachers' experience with computer technology software or programs: for example, e-mail, Internet, and Word processing skills (see Appendix A2). Two professors who have experience with designing surveys have helped determining the face validity of the demographic and experience instruments.

Face validity is just a first step in establishing validity. More important aspects of validity (content validity, concurrent validity, and predictive validity) await future considerations and development. The purpose of instrument III is to collect information about students' preferred learning styles (see Appendix A3). Instrument IV requires students to answer questions on a 5-point Likert scale that best represents their response to a number of statements pertaining to their motivations to learn (see Appendix A4). Instrument V intends to elicit information pertaining to preservice teachers' personality (see Appendix A5). The last instrument collects data related to computer use for personal and educational purposes (see Appendix A6). A 5-point Likert scale was used throughout this study in order to maintain consistency. An answer of 5 on this scale would indicate strong agreement and an answer of 1 strong disagreement.

The study will utilize the following instruments: the Index of Learning Styles (Felder & Soloman, 1991), the Motivated Strategies for Learning Questionnaire (MSLQ) (Pintrich, Smith, Garcia, & McKeachie, 1991), and the SONSO Personality Inventory (Kentle, 1994). Information pertaining to each of these instruments is provided below.

Index of Learning Styles

The *Index of Learning Styles* (Felder & Soloman, 1991) is an instrument used to assess preferences on four dimensions (active/reflective, sensing/intuitive, visual/verbal, and sequential/global) of a learning style model formulated by Richard Felder and Linda Silverman. The instrument was developed by Barbara Soloman and Richard Felder of North Carolina State University. The results provide an indication of an individual's learning preferences. A student's learning style profile provides an indication of probable strengths and possible tendencies or habits that might lead to difficulty in academic settings. The profile does not reflect a student's suitability or unsuitability for a particular subject, discipline, or profession. The ILS is designed to help students discern what kind of learner they are. The results are categorized into four different areas: active/reflective, sensing/intuitive, visual/verbal, and sequential/global.

Questions 1, 5, 9, 13, and 17 reflect Active/Reflective preferences, questions 2, 6, 10, 14, and 18 reflect Sensing/Intuitive preferences, questions 3, 7, 11, 15, and 19 reflect Visual/Verbal preferences, and finally, questions 4, 8, 12, 16, and 20 reflect Sequential/Global learning styles preferences. For each of the questions, students were asked to select either "a" (active, sensing, visual, sequential preferences) or "b" (reflective, intuitive, verbal, global preferences) to indicate their answer. The total number of the "a" and "b" answers was calculated for each scale separately. The higher number indicates the higher preference for a certain learning style.

The ILS instrument was chosen for a variety of reasons. The ILS has been developed specifically during the past ten years to examine college students' learning style profile and suggest probable strengths and possible tendencies or habits that might lead to difficulty in academic settings. The ILS instrument was also found to be reliable and valid: Litzinger, Lee, Wise, and Felder (2005) found that the reliability estimate of the scores for the four scales of the ILS based on Cronbach alphas ranged from 0.56 to 0.77. Factor analysis also revealed that the factors that constitute each subscale are "appropriately matched to the intent of the scales, providing evidence of construct validity for the instrument." Similar results were found by Fedler & Spurlin (2005) who found that the instrument had construct validity. These finding were also corroborated by the findings of the literature (e.g., Zwyno, 2003) which showed that the ILS has moderate internal consistency and test retest reliability coefficient.

Zwyno (2003) collected ILS responses for several hundred students (N=557) and assessed test-retest reliability, internal consistency reliability, and several qualities related to the independence and construct validity of the four instrument scales. The research in which ILS questionnaires were collected took place at Ryerson University, Toronto, Canada, during three consecutive offerings (2000-2002) of a course in control systems in the undergraduate Electrical and Computer Engineering program. The research dealt with efficacy of hypermedia-assisted instruction and the relationship of learning styles, hypermedia and achievement (Zwyno, 2003). In order to validate the ILS, a test-retest and Cronbach's alpha/factor analyses were conducted.

In estimating test-retest reliability, the same test was administered to the same sample twice. The time lapse between the tests was eight months. The results showed a moderate to strong correlation between the test and the retest scores.

Table 1: *Pearson's Correlation of Test-Retest Scores for the ILS*

Active Scores	0.683**	N=124
Sensing Scores	0.678**	N=124
Visual Scores	0.511**	N=124
Sequential Scores	0.507**	N`=124

**Statistically significant at the 0.01 level, 2-tailed.

The internal consistency of single-dimensional additive scales such as in the Felder Model can be tested using Cronbach's alpha, a coefficient assessing how well a set of items on the scale measures a single "underlying construct" (Trochim, 1999). The higher the score, the more reliable the generated scale is. However, lower thresholds are sometimes used in the literature. For example, Tuckman (1999) stated that alpha test reliability should be above 0.75 for achievement tests but only above 0.5 for attitude tests.

Zwyno (2003) also performed an analysis of internal reliability of scales on the items for all 557 valid ILS questionnaires (Table 2). Cases with missing items were excluded from the analysis, and thus the number of cases shown varies. The internal reliability of the scales was found to range from 0.53 to 0.70. The resulting coefficients met acceptable limits as suggested by Tuckman (1999).

Table 2: *Internal Consistency Reliability for the ILS — Cronbach's Alpha*

	Cases	Items	Scale Mean	Scale Variance	Scale STD	Avg. IIC*	Avg. ITC**	Stand. A
Active/Reflective	540	11	5.7889	5.6177	2.3702	0.1179	0.264	0.595
Sensing/Intuitive	539	11	6.2430	7.0245	2.6504	0.1730	0.349	0.697
Visual/Verbal	544	11	8.1801	4.4537	2.1104	0.1354	0.289	0.633
Sequential/Global	532	11	5.7726	4.7900	2.1886	0.0927	0.217	0.530

*IIC: Inter-Item Correlations, **ITC: Item-Total Correlations

Zwyno (2003) concluded that test-retest analysis of the ILS scores suggested a moderate reliability of all scales. The internal reliability of the scales ranged from 0.53 to 0.70. Cronbach alpha coefficients met acceptable limits (Tuckman, 1999) and correlational and factor analyses suggested that the model scales assess separate qualities, as theoretically predicted. Zwyno also argued that while longer questionnaires such as MBTI and Kolb's LSI typically yield higher Cronbach's alpha measures for collected data, their usefulness in a classroom setting might be limited.

The author observed that any voluntary survey that took longer than 10 minutes was much less likely to be completed and returned by students and faculty alike. As well, when the Kolb's LSI I was administered, on a trial basis, together with the Felder-Soloman LSI to students in the 2000 and 2001 studies (Zwyno, 2002), many kept asking questions regarding the meaning of the words they were supposed to rank. Moreover, many, instead of ranking words, simply chose one, despite repeated explanations of instructions. This suggested that the students were having trouble understanding the wording used in the questionnaire, making any subsequent results questionable. This might be specific to the demographic sample of students in the study. However, should such observations be typical of other students, the clarity of the ILS might help explain in part its popularity.

The Motivated Strategies for Learning Questionnaire (MSLQ)

One of the main reasons the MSLQ was chosen for this study was because this instrument is reported to have high internal consistency and test retest reliability coefficients. According to the developers of the instrument, (Pintrich, Smith, Garcia, & McKeachie, 1993), the internal reliability for all the subscales is reasonable, with most of the coefficient alphas above .70. In addition, numerous research studies have demonstrated its reliability. For example the Chapula, Chen and Charles (2001) study, explained earlier in the literature review, revealed that the Cronbach alphas for all subscales were within the acceptable range of .73 to .84.

The MSLQ is a standardized 81-item Likert-type self-report instrument designed to measure students' motivational orientations for learning and learning strategy use. Students rate these items using a 7-point Likert scale (ranging from "not true of me" to "very true of me") indicating how well the item described the respondent. For this particular study, a 5-point Likert scale will be used throughout all the parts of the questionnaire in order to maintain measuring consistency. Other researchers (Shih & Gamon, 1999) have reported making the same adjustments to this instrument without jeopardizing its validity. In Shih and Gamon's (1999) research study, content and face validity for the questionnaire were established by a panel of three faculty associated with their project and three graduate students in Agricultural Education. The 5-point scales were pilot-tested for reliability with 38 students taking a different undergraduate Web-based Biology 201 course. Cronbach's alpha coefficients were .71 and .80 for the motivation, and learning strategy scales respectively.

The MSLQ consists of two sections –Motivation and Learning. The Motivation section is made up of three scales namely, expectancy, value, and affective components. The Learning Strategies section is also made up of three scales namely, cognitive, metacognitive, and resource management. The scales are designed to be modular and thus, can be used together or singly, to fit specific needs (Pintrich et al., 1993). Expectancy components refer to students' beliefs that they can accomplish a task. Two expectance-related subscales were constructed to assess students' (a) perceptions of self-efficacy and (b) control beliefs for learning. Value components focus on the reasons why students engage in an academic task. Three subscales are included in the MSLQ to measure value beliefs: (a) intrinsic goal orientation (a focus on learning and mastery), (b) extrinsic goal orientation (a focus on grades and approval from others), and (c) task value beliefs (judgments of how interesting, useful, and important the course content is to the student). As to the third general motivation construct, affect, it is operationalized in terms of responses to the test anxiety scale, which taps into students' worry and concern over taking exams.

For this study, the number of questions comprising each motivational scale was reduced from 5 to 3 questions in order to reduce the overall length of the questionnaire and to increase response rate. Redundant questions were eliminated. Qureshi (2003) adopted the reduced form in her research study that investigated factors affecting students' satisfaction with online course components. Qureshi reported reliability rates that ranged from .74 on the Intrinsic Goal Orientation scale to .87 on the Expectancy for Success scale.

SONSO Personality Inventory (Kentle, 1994)

The SONSO Personality Inventory (SPI) (Kentle, 1994) was derived from factor analyses of the "Big Five" model of personality which include Conscientiousness, Agreeableness, Openness (Culture), Introversion, and Neuroticism. It was determined that Openness, Conscientiousness, and Agreeableness contained essential characteristics based on the common meaning of the adjectives of highest loading for each of the three. Introversion and Neuroticism were comprised of specific elements that appeared to have differed from their essential definitions. In revising the original five factors, the SPI measures five personality factors based on similar factor loadings as original "Big Five" factors. These factors are Shyness, Organization, Nervousness, Sympathy, and Originality. Each factor is made up of ten items. The Shyness subscale is represented through items 3, 7, 12, 16, 24, 29, 37, 33, 41, and 46. The Organization subscale is represented through items 4, 8, 14, 19, 23, 28, 35, 39, 45, and 49. The Nervousness subscale is represented through items 2, 9, 13, 18, 22, 27, 32, 38, 42, and 48. The Sympathy subscale is represented through items 5, 11, 15, 20, 25, 30, 34, 40, 44, and 50. The Originality subscale is represented through items 1, 6, 10, 17, 21, 26, 31, 36, 43, and 47. Subjects rate themselves on a self-report 5-point Likert scale. Answers vary from "strongly describes me (5) to "doesn't describe me at all" (1).

Procedures

After obtaining clearance from the Research Ethics Board (REB, University of Windsor), preservice teachers from the Faculty of Education, University of Windsor, were recruited from the various psychology classes. These classes were comprised of preservice teachers from primary, junior, intermediate, and senior levels. The choice of psychology classes was because they have large student population, which makes it more convenient to contact all preservice teachers. Before commencing with data collection, the researcher contacted the professors who teach these classes to set a time that is most suitable for both professors and preservice teachers. Although this was a convenience sample, it was appropriate because of the relevance and importance of learning about preservice teachers and factors that influenced their use of computers. On the specific dates, the researcher walked into the classrooms and introduced the topic by using a Power Point presentation. Preservice teachers were told about the purpose of the study, as well as its value and probable contribution to the field of teacher education. Students had to complete the instruments that were described in the previous section. Furthermore, they were assured that their participation was voluntary, and that they could withdraw consent at any time throughout the data collection process. Confidentiality was also guaranteed. Before commencing with answering the questionnaire, participants had to sign a consent form (see Appendix B7) that informed them of the procedures to be followed to participate in this study. Preservice teachers were asked to answer the questions truthfully reflecting their own personal feelings. Once the questionnaires were received from the participants, the accompanying consent form was the only document that included the participant's name. The researcher separated the consent form from the questionnaire. The data were kept in locked files that were only accessible by the researcher.

Statistical analyses were performed on a personal computer using SPSS. A significance level of 0.05 will be used throughout the study. Moreover, unless otherwise indicated, significance level of 0.01 will be also indicated.

Multiple Regression Analyses (MRA) served as the primary statistical procedure for this study. A standard multiple regression analysis was run for each of the five clusters of variables as an independent variable and computer use in a computer course and for general purposes as the dependent variables. Multiple R, R^2, and F values were reported for each cluster of variables. However, before commencing with the MRA, Pearson product moment correlations were computed for computer use (in a computer course and for general purposes) and each of the five clusters of variables (Demographic, Experiential, Learning Style, Motivational, and Personality).

Results

The purpose of this study was to develop a framework that addresses the relative importance of specific determinants of computer use—demographics, experience, learning style, motivation, and personality—for preservice teachers. These determinants represent prominent themes in theories of human motivation and decision making and are expected to relate to preservice teachers' computer use in one way or another. More specifically this study aims to (a) explore the predictive potential of several preliminary clusters of variables, (b) help lay the grounds for future researchers to design effective models that can explain computer use, and (c) enrich instructional design and curriculum planning.

The data collection instrument was a 135-item self administered questionnaire. Data were analyzed using the SPSS 11.0 statistical program for personal computers. A total of 563 questionnaire response forms (out of 769) were completed by subjects and returned. This corresponds to 73.2% response rate. The data from the forms were read into a computer data file for later analysis. Statistical tests were applied to answer specific research questions and hypotheses. When appropriate, for descriptive purposes, arithmetic means and standard deviations were reported. A significance level of .05 was selected. Also a significance level of .01 was reported.

Demographic Information

Almost 50% of the participants (281) were between 18 and 25 years of age, 24% were between 25 and 30, and almost 13% were between 31 and 35. Only one person did not answer the age question. As to gender, female participants represented 70.9% of the sample. This large number of female participants (N = 401 out of 563) as compared to that of males (N=162) reflects the typical imbalance between both groups in Faculties of Education. The majority of preservice teachers (63%) were single (N = 354). The rest of the group (almost 34%) self-identified as being married or living with a partner (N = 190). With respect to the program of study, 59.3% of the preservice teachers were enrolled in the Primary/Junior (P/J) program (N=334), 27% were enrolled in the Junior/Intermediate (J/I) program (N=152), and almost 13.7% were enrolled in the Intermediate/Senior (I/S) program (N=77). As to educational level, the majority of the participants (90%) reported having a bachelor's degree, 8.3% a master's degree, and 1.3% a Doctoral degree. The majority of the participants (almost 90%) live in urban areas (N=506). Most of the participants (almost 80 %) were white Canadians (445). With respect to familiarity with computer terminology, almost 96% of preservice teachers were familiar with computer terminology. With respect to prior experience (familiarity with using computer software), 37% of the participants indicated that they "strongly disagree" or "disagree" with the notion that they have prior computer experience. It appears that a large of portion of the preservice teachers sample lacks experience with computers: About 60% believed that they had experience. Descriptive statistics (see Table 3 below) showed that preservice teachers had experience using e-mail, word processing, search engines, and printing software more than the other computer software components. With respect to computer use, Table 4 provides details about the various computer use items, both in a computer course and for general purposes. Results of paired samples *t* tests were also reported to reveal any significant difference between computer use in a computer course and that for general purposes.

Table 3: *Means and Standard Deviations of the Various Computer Experience Items.*

Experience Items	Mean	*SD*
Statistical packages	1.85	1.02
Web boards	2.36	1.30
Web Based Database	2.52	1.26
Library Database	2.57	1.29
Text/Hypertext	2.80	1.42
Blogs	2.83	1.48
Movies	2.89	1.53
Spread Sheet Software	3.00	1.44
E books and Online Newspapers	3.01	1.48
Graphics	3.06	1.47
Games	3.22	1.51
Software Database	3.28	1.49
Scanning Software	3.28	1.54
Chat	3.59	1.59
Printing Software	4.09	1.38
Search Engines	4.17	1.32
Word processing Software	4.54	1.06
E mail	4.73	.84
Over all Experience	3.12	.77

Table 4: *Paired t Tests, Means, and Standard Deviations for Variables in the Computer Use in a Computer Course and for General Purposes*

Computer Use	Computer Course		General Use		*t* test (p).
	Mean	*SD*	Mean	*SD*	
Statistical packages	1.21	.60	1.23	.530	
Movies	1.43	.94	2.14	1.26	-12.4(.000)
Games	1.49	.96	2.43	1.36	-14.6(.000)
Web board	1.58	.97	1.83	1.13	-4.62(.000)
Spread Sheet	1.73	.94	2.21	1.09	-9.80(.000)
Web based Database	1.74	1.06	2.10	1.13	-6.87(.000)
Scanning software	1.76	1.09	2.43	1.24	-12(.000)
Chat	1.77	1.24	3.07	1.71	-15.7(.000)
Library Database	1.78	.957	2.04	.950	-4.98(.000)
Text/Hypertext	2.13	1.24	2.52	1.40	-6.46(.000)
Graphics	2.17	1.15	2.56	1.27	-6.89(.000)
Blogs	2.19	1.20	2.01	1.25	4.08(.000)
Software Database	2.63	1.53	3.25	1.58	-9.19(.000)
Printing software	2.69	1.41	3.30	1.46	-8.08(.000)
Word Processing	2.87	1.34	3.67	1.45	-9.35(.000)
Search engine	2.97	1.48	2.21	1.09	-12.7(.000)
E mail use	3.17	1.56	4.62	.99	-17.7(.000)
E books	1.83	1.05	2.52	1.38	-11.1(.000)

The above table shows that e-mail was the most commonly used in a computer course (M = 3.17). Search engines and Word processing software were the next highest (M = 2.97 & 2.87 respectively). Statistical packages and movies were the least commonly used (M = 1.21 & 1.43 respectively). As to general use, descriptive statistics revealed that e-mail was also the most commonly used (M = 4.62), word processing and printing software were the next highest (M = 3.67, and 3.25 respectively). Statistical packages and movie editing software were the least commonly used (M = 1.23 & 1.26 respectively).

Paired-samples t tests revealed significant differences between the two computer uses (in a computer course and for general purposes) on 17 out of the 18 items (only statistical packages were the exception). Generally, preservice teachers reported more use of the various computer software items for general purposes than in computer courses.

Since some of the variables and models adopted in this study were not examined in the literature, there was a case for conducting preliminary analyses to help determine which variables to include in the final analyses. As such, Pearson product moment correlations were computed. Initially, 29 variables were used to build a profile (see table 5 below). Of these, the Pearson product moment correlations were computed for computer use and each of the five clusters of variables: demographic, experiential, learning style (LS), motivational, and personality (tables 6-10).

Table 5: *Summary of the Initial 29 Variables*

Demographic Cluster of variables	
	Gender
	Age
	Marital Status
	Program of Study
	Children
	Educational Level
	Residence
	Racial/Ethnic Status
	Country of Birth
	Age Moved to Canada
	Age Learned to Speak English
	Language Spoken at Home
Experiential Cluster of variables	
	Prior Online/Computer Experience
	Familiarity with Computer Terminology
Learning Style Cluster of variables	
	Active/Reflective
	Visual/Verbal
	Sequential/Global
	Sensing/Intuitive
Motivational Cluster of variables	
	Intrinsic
	Extrinsic
	Task Value
	Control of Learning Beliefs
	Success
	Self-Efficacy
Personality Cluster of variables	
	Shyness
	Organization
	Nervousness
	Sympathy
	Originality

Table 6: *Pearson Product Moment Correlations between Computer Use and the Demographic Cluster of Variables*

	Using Computers in a Computer Course	Using Computers for General Purposes
Gender	-.095* (N=475)	-.123** (N=554)
Age	.025 (N=474)	-.155** (N=553)
Marital Status	.016 (N=475)	-.128** (N=554)
Program of Study	.168** (N=475)	.123** (N=554)
Children	.005 (N=475)	-.181** (N=554)
Education Level	.004 (N=475)	-.092* (N=554)
Residence	.039 (N=475)	-.087* (N=554)
Racial/ethnic Status	-.084 (N=475)	-.071 (N=554)
Age Learned to Speak English	.080 (N=475)	-.019 (N=554)
Age Moved to Canada	.087 (N=475)	-.009 (N=554)
Country of Birth	.056 (N=475)	.023 (N=553)
Language Spoken at Home	.112* (N=475)	.025 (N=554)

P < .05. ** P< .01.

The above table shows significant correlations between gender, program of study, language spoken at home and computer use in a computer course. The negative correlation between gender and computer use (-.123) indicates that female preservice teachers were less likely to use computers than males. The positive correlation between program of study and computer use shows that primary-junior preservice teachers use computers less than junior- intermediate and intermediate-senior colleagues. It was also found that preservice teachers who did not speak English at home used computers more than the other group.

As to computer use for general purposes, it correlated with gender, age, marital status, program of study, children, educational level, and residence. The negative correlation between age and computer use (-.155) reveals that the older participants reported less use of computers. As to marital status, the negative correlation (-.128) shows that single participants reported more use of computers than others. The negative correlation between educational level and computer use (-.092) shows that preservice teachers with higher degrees reported less use of computers than those with lower degrees. It was also found that preservice teachers who lived in rural areas were also less frequent users of computers (-.087). The table also shows that preservice teachers who had more children used computers less than those who had fewer children.

Table 7 shows that prior experience was highly correlated with computer use for general purposes (.651). This variable was less strongly correlated with computer use in a computer course (.270). Those who were not familiar with computer terminology were less likely to use computers for general purposes (-.252) than in a computer course (-1.23).

Table 7: *Pearson Product Moment Correlations between Computer Use and the Experiential Cluster of Variables*

	Using Computers in a Computer Course	Using Computers for General Purposes
Experience Using Computers	.270**	.651**
Familiarity with Computer Terminology	-.123** (N=475)	-.252** (N=554)

P < .05. ** P< .01.

Table 8 shows that among the various learning style preferences, visual-verbal was the only one that significantly correlated with computer use. The negative correlation indicates that verbal learners were less frequent users of computers than the visual learners.

Table 8: *Pearson Product Moment Correlations between Computer Use and the Learning Style Cluster of Variables*

Learning Style	Using Computers in a Computer Course	Using Computers for General Purposes
Active/Reflective	-.030 N(474)	-.029 N(553)
Sensing/Intuitive	.077 N(473)	.044 N(552)
Visual/Verbal	-.123** N(474)	-.102* N(552)
Sequential/Global	-.038 N(473)	.004 N(552)

P < .05. ** P< .01.

Table 9 below shows that five motivational subscales (intrinsic, extrinsic, task value, success, and self-efficacy) were significantly correlated with either computer use in a computer course or for general purposes. The positive correlations indicate preservice teachers who scored higher on computer use were more likely to exhibit the motivational aspect in question.

Table 9: *Pearson Product Moment Correlations between Computer Use and the Motivation Cluster of Variables*

Motivation	Using Computers in a Computer Course	Using Computers for General Purposes
Intrinsic Motivation	.238**	.180**
	(N=472)	(N=536)
Extrinsic Motivation	.009	.103*
	(N=472)	(N=536)
Task Value	.123**	.083
	(N=472)	(N=536)
Control of Learning Beliefs	-.004	.021
	(N=472)	(N=536)
Success	.086	.165**
	(N=471)	(N=535)
Self-Efficacy	.065	.148**
	(N=472)	(N=536)

P < .05. ** P < .01.

Table 10 below shows that three personality traits (organization, sympathy, and originality) were significantly correlated with computer use. Positive correlations indicated that teachers who scored higher on computer use were more likely to exhibit the trait in question. Thus, they were showing a higher degree of organization, sympathy, and originality.

Table 10: *Pearson Product Moment Correlations between Computer Use and the Personality Cluster of Variables*

Personality	Using Computers in a Computer Course	Using Computers for General Purposes
Shyness	.053	.012
	(N=469)	N(548)
Organization	.103*	.140**
	(N=471)	(N=550)
Nervousness	-.002	-.018
	(N=470)	(N=549)
Sympathy	.102*	.117**
	(N=471)	(N=550)
Originality	.199**	.204**
	(N=471)	(N=549)

P < .05. ** P< .01.

Multiple Regression Analysis

A major purpose of this study was to develop a framework that contains clusters of variables that are personal to the learner and that represent prominent themes in theories of human motivation and decision making. More specifically the aim is to find out which of these clusters or variables that constitute them might explain computer use among preservice teachers. Moreover, of interest in this study was the use of computers in two different domains. The need to investigate or differentiate between these different uses is due to many reasons: first, the literature has revealed that the majority of research studies have focused on computer use for general purposes. Second, there is a need to differentiate between these two uses because computer software used in a computer training course is quite different from software required for general purposes. For example, a novice teacher might find him/herself obliged to use library database and blogs in a computer course, whereas these are not needed in his/her daily life. Moreover, there is a need to see how the two uses differ and where they meet.

As such, Multiple Regression Analyses (MRA) were conducted. The general purpose of a multiple regression is to learn more about the relationship between several independent or predictor variables and a dependent or criterion variable.

In this study the MRA was used: (a) to predict the scores of a dependent variable (DV) from one or more clusters of variables, (b) to assess the degree of relationship between dependent variables and the IVs that constitute each cluster of variables, and (c) to assess the relative importance of single independent variables.

The MRA was applied to the two-use components (computer use in a computer course and computer use for general purposes). According to Green (as mentioned in Tabachnick & Fidell, 1996), the simplest rules of thumb are $N \geq 50 + 8m$ (m is the number of IVs) for testing the multiple correlation and $104 + m$ for testing individual predictors. These rules of thumb assume a medium size relationship between independent variables and the dependent variable, $\alpha = .05$, $\beta = .20$. With a sample size above 450 and 29 IVs, the number of cases is well above the minimum requirement of 133 (104 + 29) for testing individual predictors in standard multiple regression.

Computer Use in a Computer Course.

A standard multiple regression analysis was run for each of the five quasi models (demographic, experiential, learning style, motivational, and personality) as independent variables (IVs) and computer use in a computer course as a dependent variable (see Table 11 below). Multiple R, R^2, and F value were reported for each cluster (model). Within each cluster the unstandardized coefficients (B), Standardized coefficients (Beta), t value, and significance for each individual predictor is reported.

Regression results show that the experiential cluster of variables was the most significant predictor of computer use in a computer course. It was responsible for 7.6% of variance in computer use. The lowest prediction was that of the Learning Style cluster of variables ($R^2 = .023$). When checking for individual variables, program of study, racial status (white/non white Canadian), experience, visual-verbal LS, intrinsic motivation, and originality were the only variables in the five models that significantly correlated with computer use.

Table 11: *Summary of Results from the Multiple Regression Analyses for each of the Five Sets of Variables with Computer Use in the Computer Course as the Dependent Measure*

Discussion	Model Summary		ANOVA					
	R	R^2	*F*	*p*	*B*	*Beta*	*t*	*p*
Demographic Cluster	.27	.073	2.79	.001				
Gender					-.122	-.087		
Age					.001	.002		
Marital Status					.040	.029		
Program of Study					.123	.139	2.63	$p < .01$
Children					-.013	-.019		
Education Level					-.066	-.043		
Location					.119	.057		
Racial Status					.178	.112	2.00	$p < .05$
Country of Birth					-.172	-.093		
Age Moved to Canada					.005	.055		
Age Spoke English					-.003	-.021		
Language at Home					.216	.107		
Experiential Cluster	.276	.076	19.42	.000				
Experience					.217	.270	5.57	$p < .001$
Familiarity with Terms					-.194			
Learning Style Cluster	.153	.023	2.79	.026				
Active/Reflective					-.002	-.002		
Sensing/Intuitive					.073	.078		
Visual/Verbal					-.117	-.123	-2.61	$p < .01$
Sequential/Global					-.06	-.055		
Motivational Cluster	.251	.063	5.186	.000				
Intrinsic					.201	.238	4.57	$p < .001$
Extrinsic					-.007	-.009		
Task Value					.020	.025		
Learning					-.030	-.036		
Success					.047	.049		
Self-Efficacy					-.033	-.039		
Personality Cluster	.220	.048	4.687	.000				
Shyness					.067	.054		
Organization					.052	.053		
Nervousness					-.020	-.018		
Sympathy					.015	.022		
Originality					.188	.186	3.85	$p < .001$

Note: In these analyses the dependent measure "Computer Use in a Computer Course" is based on the continuous scale rating using a five-point Likert scale.

Computer Use in General

The same series of Multiple Regression analyses was run for each of the five clusters of variables (see Table 12 below) as IVs and computer use in general as a dependent variable (DV). Regression results show that the experiential model was the first significant predictor of computer use. It predicted 43.2% of the variance in computer use. The lowest set of predictors was that of the Learning Style cluster of variables (R^2 = .013).

When checked for individual variables, it was found that gender, program of study, educational level, experience, familiarity with computer terminology, intrinsic motivation, and originality were the only variables that were significantly correlated with computer use for general purposes.

Based on the findings of the Pearson Product-Moment Correlations and the MRA of the five clusters of variables, only 19 independent variables (gender, age, marital status [single/other], program of study, children, educational level, residence, familiarity with computer terminology, language spoken at home, prior experience, visual/verbal LS, intrinsic motivation, extrinsic motivation, task value, success, self-efficacy, sympathy, originality, and organization.) will be included in the final multiple regression model.

Table 12: *Summary of Results form the Multiple Regression Analyses for each of the Five Sets of Variables with Computer Use in General as the Dependent Measure*

Discussion	Model Summary		ANOVA					
	R	R^2	*F*	*p*	*B*	*Beta*	*t*	*p*
Demographic Cluster	.286	.082	4	.000				
Gender					-.166	-.123	-2.81	$P < .01$
Age					-.036	-.070		
Marital Status					-.045	-.036		
Program of Study					.105	.125	2.84	$p < .001$
Children					-.066	-.099		
Education Level					-.169	-.107	-2.38	$p < .05$
Location					-.077	-.039		
Racial Status					-.003	-.002		
Country of Birth					.060	.035		
Age Moved to Canada					.002	.030		
Age spoke English					-.015	-.088		
Language at Home					.150	.079		
Experiential Cluster	.657	.432	209	.000				
Experience					.498	.627	18.8	$p < .001$
Familiarity with					-.290	.094	-2.84	$p < .01$
Learning Style Cluster	.112	.013	1.72	.143				
Active/Reflective					-.007	-.007		
Sensing/Intuitive					.035	.040		
Visual/Verbal					-.093	-.103	-2.33	$p < .05$
Sequential/Global					-.008	-.008		
Motivational Cluster	.237	.056	5.22	.000				
Intrinsic					.117	.149	3.02	$p < .01$
Extrinsic					.066	.084		
Task Value					-.012	-.016		
Learning					-.066	-.079		
Success					.087	.097		
Self-Efficacy					.042	.051		
Personality Cluster	.234	.055	6.23	.000				
Shyness					.028	.023		
Organization					.073	.082		
Nervousness					-.026	-.025		
Sympathy					.017	.026		
Originality					.170	.184	4.05	$p < .001$

Note: In these analyses the dependent measure "Computer Use in General" is based on the continuous scale rating using a five-point Likert scale.

Table 13 below shows the findings of the standard multiple regressions that were performed with the 19 IVs (gender, age, marital status (single/other), racial/ethnic status [white Canadian/other], program of study, children, educational level, residence, familiarity with computer terminology, language spoken at home, prior experience, sensing/intuitive LS, visual/verbal LS, intrinsic motivation, extrinsic motivation, task value, success, self-efficacy, sympathy, originality, organization, and computer use in a computer course. Only five variables (experience, intrinsic motivation, gender, language spoken at home, and program of study) contributed significantly to the prediction of computer use in a computer course.

Table 13: *Summary of Results from the Multiple Regression Analyses for the Nineteen Variables Used for Model Building with Computer Use in a Computer Course as the Dependent Measure.*

Discussion	Model Summary		ANOVA					
	R	R^2	*F*	*p*	*B*	*Beta*	*t*	*p*
Model	.43	.19	5.549	.000				
Gender					-.134	-.095	-2.03	$p < .05$
Age					-0.02	.004		
Marital Status					-0.03	-.002		
Residence					.160	.076		
Program of Study					.105	.119	2.57	$p < .05$
Children					0.02	.029		
Educational Level					-0.05	-.036		
Language at Home					.223	.110	2.41	$p < .05$
Familiarity					-.150	-.045		
Experience					.175	.205	4.34	$p < .001$
Visual/Verbal					-.06	-.071		
Intrinsic Motivation					.150	.179	3.54	$p < .001$
Extrinsic Motivation					-0.01	-.017		
Success					.048	.049		
Self-Efficacy					-.078	-.092		
Task Value					.029	.038		
Organization					.049	.049		
Sympathy					.016	.023		
Originality					.101	.101		

Note: In these analyses the dependent measure "Computer Use in a Computer Course" is based on the continuous scale rating using a five-point Likert scale.

Table 14 shows the findings of the standard multiple regressions that were performed with the nineteen IVs (gender, age, marital status [single/other], program of study, children, educational level, residence, familiarity with computer terminology, language spoken at home, prior experience, visual/verbal LS, intrinsic motivation, extrinsic motivation, success, self-efficacy, sympathy, originality, and organization.) and computer use in general as the dependent variable. Only six of the IVs (experience, intrinsic motivation, gender, educational level, program of study, and familiarity with computer terminology) contributed significantly to computer use in general.

The five variables that were found to be significant predictors of computer use in a computer course (experience, intrinsic motivation, program of study, and gender) were entered to predict this dependent variable (Table 15 below). Table 16 shows the results of the MRA when only the six IVs (experience, intrinsic motivation, gender, educational level, program of study, and familiarity with computer terminology) that contributed significantly to computer use for general purposes. It is noticed that the five variables (experience, intrinsic motivation, program of study, and gender) predicted only 14% of the amount of variance of computer use in a computer course, almost 5% less than the original model (twenty-variable model). As to computer use in general, the six variables (experience, intrinsic motivation, gender, educational level, program of study, and familiarity with computer terminology) almost predicted the same amount of variance (45%).

Table 14: *Summary of Results from the Multiple Regression Analyses for the Nineteen Variables Used for Model Building with Computer Use in General*

Discussion	Model Summary		ANOVA					
	R	R^2	*F*	*p*	*B*	*Beta*	*t*	*p*
Model	.681	.46	23.3	.000				
Gender					-.158	-.118	-3.32	$p < .01$
Age					-.004	-.008		
Martial Status (Single)					-.058	-.046		
Residence					-.042	-.022		
Program of Study					.073	.087	2.46	$p < .05$
Children					-.000	.000		
Educational Level					-.113	-.073	-2.05	$p < .05$
Language at Home					.066	.035		
Familiarity					-.234	-.075	-2.15	$p < .05$
Experience					.454	.573	15.6	$p < .001$
Visual/Verbal LS					-.013	-.015		
Intrinsic Motivation					.067	.089	2.30	$p < .05$
Extrinsic Motivation					.041	.051		
Success					.007	.008		
Self-Efficacy					-.032	-.041		
Task Value					.035	.047		
Organization					.004	.005		
Sympathy					.001	.003		
Originality					.047	.052		

Note: In these analyses the dependent measure "Computer Use in General" is based on the continuous scale rating using a five-point Likert scale.

Table 15: *Summary of Results from the Multiple Regression Analyses for the Five Variables Used for Model Building with Computer Use in a Computer Course*

Discussion	Model Summary		ANOVA					
	R	R^2	*F*	*P*	*B*	*Beta*	*t*	*P*
Model	.38	.14	16	.000				
Experience					.196	.229	5.30	$p < .001$
Intrinsic					.170	.200	4.81	$p < .001$
Language at home					.183	.090	-1.61	$p < .05$
Program of Study					.113	.128	2.92	$p < .01$
Gender					-.083	-.059		

Note: In these analyses the dependent measure "Computer Use in a Computer Course" is based on the continuous scale rating using a five-point Likert scale.

Table 16: *Summary of Results from the Multiple Regression Analyses for the Six Variables Used for Model Building with Computer Use in General*

Discussion	Model Summary		ANOVA					
	R	R^2	*F*	*p*	*B*	*Beta*	*t*	*p*
Model	.67	.45	85.3	.000				
Experience					.472	.596	17.6	$p < .001$
Intrinsic					.084	.107	3.27	$p < .01$
Gender					-.134	-.100	-3.04	$p < .01$
Program of Study					.058	.069	2.07	$p < .05$
Educational Level					-.114	-.074	-2.23	$p < .05$
Familiarity					-.242	-.077	-2.29	$p < .05$

Note: In these analyses the dependent measure "Computer Use in General" is based on the continuous scale rating using a five-point Likert scale.

Qualitative Phase

Introduction

Given the prominence of the role of experience which emerged from the quantitative results, there was a clear rationale to explore various aspects of experience in more depth. To better achieve this goal, a follow-up qualitative study was conducted. The focus of this qualitative phase was to extend and explain the quantitative findings. In particular, this phase would allow a clearer understanding of preservice teachers' general experience with computers, as well as experiences related to courses offered at the Faculty of Education. Moreover, preservice teachers' expectations about the computer experience they prefer to receive in the preservice program were investigated.

Methodology

Data analyses were based on interviewing preservice teachers and transcribing the interviews. Before commencing with quantitative data collection, preservice teachers who were interested in the follow-up phase of the study were asked to write down their phone numbers so that the researcher could contact them. Fifteen preservice teachers agreed to do the interviews; however, only twelve showed up on the interview date. Before conducting the interviews, preservice teachers had to sign the Consent for Audio Taping the interviews (see Appendix B2). Interviews were conducted during the first week of February 2006 in the researcher's office at the Faculty of Education. By this time preservice teachers had been enrolled in the preservice program for almost six months. This period represents 75% of the whole program. Moreover, by the time preservice teachers were interviewed, they had two practicums completed and only two were left.

The use of advanced technology (Digital Multi Media Player and Recorder) to audiotape the interviews has allowed transferring all the data files (interviews) to a personal computer. This process has helped in easily listening to and interpreting the data. For the sake of consistency the researcher alone transcribed the interviews. Transcriptions were done using pencil and paper. Creswell (2002) suggests the use of hand analysis when the researcher is dealing with a small data base (less than 500 pages of transcripts) and when he/she "wants to be close to the data and have a hands-on feel for it without the intrusion of a machine" (p. 261).

Exploring the data by reading through all of the information was the first step in data analysis. Creswell (2002) recommends a preliminary exploratory analysis for the sake of obtaining a general sense of the data. Agar (1980) also suggests that researchers "read the transcripts in their entirety several times. Immerse yourself [researcher] in the details, trying to get sense of the interview as a whole before breaking it into parts" (p. 130).

After reading the transcripts several times to obtain a general sense of the data, the focus was on examining the data in detail to develop themes or broad categories of ideas from the data. Coding was the procedure followed to help acquire this aim. Coding is the process of assigning a code word or phrase that accurately describes the meaning of a paragraph or sentences that relate to one idea (Creswell 2002). After the whole material was coded, similar codes were brought together to form major ideas in the database. Out of these ideas, major and minor themes were obtained. As such, the interviews have addressed the following questions:

1. How much experience do you have using computers? (Preservice teachers were asked to report on any type of experience they have with computers and how they acquired it. They were also asked about the most commonly used software, programs and the history of such use.)
2. Does the preservice teacher program provide you with the computer training and experiences that are enough to successfully and efficiently implement computer technology in the classroom?
3. What should professors do to make instruction in a computer class more influential?

Table 17 below provides background information about gender, age, and program of study of the twelve preservice teachers who participated in this phase of the study. For purposes of confidentiality names are not mentioned. Each preservice teacher was given a letter. For example Student A will represent one of the participants. Student B will represent another one, etc.

Table 17: *Background Information of the Twelve Preservice Teachers Who Participated in the Follow-up Phase*

Student ID	Gender	Age	Program	Professor	Degree
Student A	Female	21-25	JI	Dr. X	History
Student B	Female	35-40	PJ	Dr. O	English
Student C	Female	21-25	PJ	Dr. Z	Business
Student D	Male	21-25	PJ	Dr. Z	P. science
Student E	Female	36-40	IS	Dr. X	Drama
Student F	Female	36-40	PJ	Dr. Y	History
Student G	Female	26-30	JI	Dr. X	Biology
Student H	Female	31-35	PJ	Dr. Z	Psychology
Student I	Female	41-Over	PJ	Dr. Z	Psychology
Student J	Male	36-40	JI	Dr. X	Music
Student K	Female	26-30	JI	Dr. X	English
Student L	Female	26-30	PJ	Dr. O	Psychology

Results

General Experience with Computer Technology

When asked about computer experiences acquired outside the university or preservice teacher program, the twelve preservice teachers stated that computer use was limited mainly to typing and playing games. Moreover, three kinds of uses were noticed at this stage: (a) use limited to childhood experiences, (b) use limited to school, and (c) use limited to job purposes.

Four preservice teachers (Students A, D, E, F) reported having computers at home since they were in elementary school. Students A, E and F said that they had "Commodore 64." However, the four preservice teachers said that use was mainly limited to playing games: For example, Student F said: "I had a computer when I was ten. I remember playing games at that one. Then we upgraded it."

As to computer use at school, Students A, D, F, and K reported having computers in elementary school. Students A, D, and F said that what they remember of elementary school use was mainly limited to typing or printing. For example Student K said: "I had some print jobs in grade 5." Another one (Student A) said: "We had computer classes in elementary school, but we learned how to type, write down a paragraph." Student D said: "We had two computers at school. But there wasn't much we could do, just some typing." Student F said: "I remember we did have a couple of courses in grade school, but I don't remember what it was."

At the high school level, Students D and A stated that they used the Internet. However, they didn't give much detail of such use. For example, Student D said: "There started to be some Internet stuff. We did some Website building." Student A said: "I don't remember taking much at high school. I would use e-mail and chat."

As to computer use at the university level, except for Student I, the other 11 preservice teachers reported using computers at the university level. The main use at university was limited to typing assignments, doing online search, e-mailing, and chatting with friends. For example student B said: "When I went to university, I had to use a lot of it, but it was just basics: typing, online search, and e-mail." Student G said: "I used them [computers] for school work and e-mail, e-mail most probably." Another preservice teacher (Student D) said: "One of my roommates was a computer technician. This is how I got to computers. I use them for school work, e-mail, games, and music." Student C stated that she used them to "type essays, search for online information, and chat with friends and family." Similarly Student H stated that she used them "for school work, mainly to look for information and to chat with friends."

When asked about how often they use computers in the preservice program, the twelve preservice teachers stated that they are using computers "on a daily basis" or "every day" to do "school work" and "communicate with friends." Microsoft Word, e-mail, chat, printing software, and search engines were the most commonly used software or programs. In addition, some preservice teachers reported the use of more software: For example, Students K, G, F, and L reported using Power Point to do "class presentations." However, Students F and G described their use of Power Point as "sometimes" and "a little bit" respectively. Moreover, four preservice teachers reported that they use Excel (Students B, F, E, and K). Students A, D, J, and L reported using scanning software. Students K and E reported using Publisher. Only one preservice teacher (Student D) mentioned that he used video and photo editing software. Out of the whole group, only one preservice teacher revealed that she has very limited experience with computers: Student I said: "I didn't have any real experience until this year. I can do some Microsoft Word things. I struggle with MSN when I want to chat with friends."

Only two preservice teachers indicated that their jobs required them to use computers. Student H said that when she got a job she had to take some computer training. The training focused on learning "Microsoft Office Suite, Excel, and Power Point." This preservice teacher added she is "pretty comfortable" with computers. Student E said: "I manage a retail store. So I use [a] computer for transactions, to do reports, for data base management."

Computer Experience Acquired in the BEd Program

Preservice teachers' responses to the type of experiences acquired in the preservice program fall under two main categories: responses related to (a) experience acquired in computer training courses and (b) experience acquired in the other courses. The qualitative findings showed that experiences acquired in the computer training courses were basically influenced by program of study: There was a significant difference between the seven Primary/Junior preservice teachers' responses on the one hand and the five Junior/Intermediate and Intermediate/Senior responses on the other hand. This difference is because P/Js are not taking additional computer training course.

The seven P/J preservice teachers interviewed revealed that there was no specific computer training course offered at the Faculty of Education. Computer training was provided to them as a part of another course (Issues in Education). Preservice teachers agreed that experiences acquired in these classes are not enough to adopt computers as an instructional tool. One preservice teacher (student B) said: "A computer technology component is not enough. The Issues in Education Course should be technology oriented. We need to learn computer stuff." Student C said: "They are not really telling us how to use it [she means computers]. They tell us about its value, more in theory but not how to do it." Another female preservice (student H) said:

> We learned how to set a blog in the Issues course. I am not going to set up a blog for my grade 3 students. It would be useful to know how to make a Power Point presentation and show it so that you can do things really functional in

> your class. They are not doing this. Some people don't even know Microsoft Word skills which would make your life as a teacher easier.

Student I said:

> It doesn't help me at all. I go to younger people for help. I am not capable. It hasn't been introduced to me. You have to tell me how to use them. The blogging is a wonderful experience in itself, but it is not anything of what we need in the classroom.

Last but not least Student D said: "Not much computers! Any of the people who don't have the basic skills won't learn at all. It is not satisfying at all. We don't do anything."

On the other hand, J/I and I/S preservice teachers receive a computer training course. The focus of this course is on providing teachers with knowledge and experience on how to implement computer technology in the classroom. The five J/I and I/S who participated in this study (Students A, E, G, J, & K) stated that the computer technology course is helpful, but there is a need to teach basic computer skills: One preservice teacher (Student J) said:

> They are helping a lot. The focus is mainly on how to incorporate skills than on teaching skills. However we need computer basic skills first. There are programs I don't know how to use. They should teach us more. There is an assumption that everybody knows how to use computers.

Another preservice teacher (Student A) said the she has learned to do blogs and how to use new software like Smart Ideas and Math Tracker:

> My computer class here introduced me to programs that I never heard about before. [However she added] There is an assumption we already know how to use them, to a certain degree. It is more focused on how to incorporate computers in the classroom.

Similarly Student K said: "Definitely good, but we could do more. It is a good start but I think there should be more expansion on it. To me it is fine but to others with little skills it is not." Student G said that she is not yet ready to use computers:

> We have made some assignments on Kids Pics. I have done one assignment in which you pretend that you are presenting the water cycle using Kids Pics. That was the only thing. I would have to go and teach myself before going to use them in the classroom.

Two preservice teachers also stated that class assignments have to focus more on practical issues than on evaluating and critiquing articles. Student A said that many times the focus is on: "Hey, look at this thing in your classes. You might be able to use this, but it is not like giving specific stuff." Another (Student G) said: "Assignments are basically general. We have to go learn ourselves. There are some specifics but not a lot."

As to computer experience provided by other courses in the program, the twelve interviewees revealed that there is no real focus on computers. Preservice teachers mainly use computers to type assignments and do online search. However such use was rarely initiated or encouraged by professors. Very rare were the professors who encourage the students to use computers. One preservice teacher (Student D) said, "Aside from psychology classes we are a generation behind.

Professors haven't had the experience the younger teachers had." Similarly, Student L said that computer use was restricted to the psychology class where some students "did Power Point presentations or video editing." Student G said: "Nobody encourages us to use computers. No one tells us you have to do something [with computers]."

Preservice teachers were also asked about the computer experience they had in the teaching practicum. Important findings were noticed: First, all preservice teachers reported that computers were available in the schools. Students have access to computers either in the classrooms or in the computer lab. However, preservice teachers reported that computers were not used by associate teachers: For example, one preservice teacher (Student C) said: "Associate teachers are not interested in integrating technology. They don't know how to check e-mail." Another one (Student B) said: "Computers [were] just sitting there. Nobody was using them. They should train teachers who are really in the field." Another one (Student H) said: "There are computers. No one is using them." Only one teacher (Student K) stated that the associate teacher encouraged her to use computers. Five preservice teachers reported that they used computer in at least one of the two placements. Two others planned to use them. Yet there were some obstacles. For example one preservice teacher (Student A) said:

> I have planned that I will go online and look at the BNA Act. I had all things planned, I had the links. We got the lab. It didn't work. For whatever reason, we couldn't get to the links." Student E said: "I wanted to use computers. I couldn't get the computer lab. It was booked."

Another important comment that was common to all preservice teachers was that students at schools know more about computers than their teachers: For example, Student B said: “Kids in schools know all tricks about computers. We should be catching up.” Another one (Student E) said, “High school students know more than we do.” Similarly Student D said: “Kids know a lot more than teachers.” Student F said, “Lot of teachers are in a situation they want to teach their students about computers and their student know more than they do.”

Expectations about Computer Courses

Preservice teachers were asked about the changes instructors and people in charge have to bring to the computer class so that computer technology is implemented with greater efficiency. Responses revealed interesting findings. Particularly, preservice teachers strongly suggested a change in the pedagogy of computer training adopted in these courses.

The most significant finding was that Primary/Junior preservice teachers reported the lack of efficient training. Some of these people even stated that “there is no actual computer course.” Preservice teachers revealed and stressed the need to have computer training courses that focus on teaching basic computer skills as well as how to incorporate these skills in the classroom. One preservice teacher (Student H) said: “What courses! We need a computer training course. Some people don’t even have basic Word skills. Give me the skills. Then give me some sort of road map when to use them.” Another one (Student I) said: “I would love to learn about Power Point, to share it with my Grade 6 students. Maybe during summer, I have to take some training. I want to learn.” Similarly, Student C said: “There is no actual computer class. It would be helpful to have one. I need to have some skills, Excel for example. My knowledge is very limited." Student L said:

> If a professor is teaching a course that involves the use of computers and computer programs, he/she shouldn't assume that the students are familiar with that program. Basic skills should be provided for those students who don't have much experience.

Last but not least, Student B said: "I am very impressed they don't have computer course at the PJ level. I can't imagine without it [computers]. Why don't they cut social classes and give more time to computers."

Primary/Junior preservice teachers' call for a microcomputer course that focuses mainly on teaching basic computer skills, as well as providing training on how to incorporate these skills, is also shared by the group of J/I and I/S preservice teachers. Student A said: "We should learn specific skills, as well as strategies that we can actually use. Tell us what we can do and how we can do it. I would like to see ways that can keep kids on track." Another one (Student G) said:

> They should introduce it [computer technology] better to people, I think. I wish they teach everything, like when you do this; this is how you do this, and then teach us how to implement it in the classroom. Just take 30 minutes to refresh us. It is important to teach skills and methodology.

Student E said: "We should have one semester for skills and one for methodology." These words are very similar to Student K's words: "The course should be divided into two classes, one for skills and one for how to implement these skills."

Another common thread that came out was that the time dedicated to computer training courses was not enough. Interestingly, the five preservice teachers who are receiving computer training courses (J/Is and I/Ss) reported that the time dedicated for these courses was not enough to cover all the topics of interest and to meet the demands of the various preservice teachers. For example, Student A said: "Maybe professors need more time to do a better job." Student E said: "Most of the problem is because we have to take so many things in a short period." One P/J preservice teacher (Student B) said:

"Why don't they combine other classes and give more time to computers."

Another suggestion raised by a couple of preservice teachers was the need to have computer classes that train teachers to implement computer technology in the various classes: for example, the history class, the science class, the math class, etc. Student E said: "We should have computer for specific courses, like history, math, etc." Similarly, Student A said: "Give me something that I can use in the history class, language class."

A couple of preservice teachers indicated that females might not feel as comfortable around computers as males. One preservice teacher (Student B) said:

"It is also a matter of interest. I do think they should get the women to be interested."

This same preservice teacher added that women value computers but something should be done to keep them "motivated" and "ready" to implement technology. Another one (Student L) said: "Women are afraid to play with computers and depend on guys for support."

However, it is essential to mention that all preservice teachers indicated that computers are important and they like to be well-trained on how to incorporate computer skills into the school curriculum. For example, Student E said: "Computers are a great tool. We need to know where to use it and how." Similarly Student A said: "You can't live without computers anymore. I freak out when the Internet connection is down." Student G said just the same: "You can't live without computers anymore."

Discussion

The purpose of this study was to develop a conceptual framework that addresses the relative importance of specific determinants of computer use—demographics, experience, learning style, motivation, and personality—for preservice teachers. The significance of the new framework lies in the fact that there is no expectation for one cluster over another. The main purpose was to see which of the variable clusters or variables that constitute them might explain computer use among preservice teachers. In this chapter, the results of the descriptive and inferential statistics are considered. Qualitative findings are also discussed. Conclusions are drawn based on these results. Implications of the findings, recommendations for future research, and limitations of the study are also explored.

The Demographic Cluster of variables

The finding that age did not correlate with or predict computer use in a computer course is consistent with the findings of many earlier researchers who found that age did not have any significant influence on either teachers' computer use (e.g., Cates & McNaull, 1993) or achievement in a computer course (e.g., Marcinkiewicz, 1993/1994).

Similarly, age was not a significant predictor of computer use for general purposes. Regression findings seem to indicate that in the presence of other dominant factors (e.g., experience and motivation) the role of age is marginal. However, correlation results (Table 6) showed that age was negatively correlated with computer use for general purposes. This indicates that younger preservice teachers used computers more than their older colleagues. This finding sounds logical, especially because younger generations were born and grew up knowing computer technology was present in society (Ferreiro, 2005). As such, these people might have had more access to computers than older ones. Moreover, other factors might be preventing older preservice teachers from using computers for general purposes. An elaboration on such factors is presented in a section below that discusses the influence of educational level and number of children on computer use.

Generally speaking, the finding that age did not correlate with or predict computer use in a computer course seems logical. A possible explanation could be that, whether young or old, preservice teachers enrolled in the BEd program know that they need to learn how to use computers so that they will not fail the course. It is also possible that the nature of the BEd program requires preservice teachers to use computer technology for a variety of reasons: for example, to type assignments, communicate with friends, and access online information. Moreover, the BEd program provides an opportunity to learn about computer technology from people (professors) knowledgeable about the field. This is supported by the qualitative findings: For example, one preservice teacher said: "If we don't learn it [computers] here, where do we learn it?" Although preservice teachers might work on their own to acquire this knowledge, it is quite evident that the most efficient computer training is mainly provided at Faculties of Education. Computer training courses are provided to both inservice and preservice teachers. These courses are supposed to be designed and taught by people who have great expertise and knowledge about the field. Moreover, preservice teachers might have positive attitudes towards computer technology and its role in the classrooms that minimizes the influence of age. This explanation is supported by findings of earlier researchers (e.g., Zogheib, 2001) who found that preservice teachers have positive attitudes toward computer technology. Above all, the qualitative phase of this research study revealed that preservice teachers of the various age groups value computer technology and the need to successfully implement it in the classrooms. For example, Student E said: "Computers are a great tool. We need to know where to use it and how." Another one (Student I) said: "I would love to learn about Power Point, to share it with my grade 6 students." Student F said: "A lot of teachers want to teach their students about computers." Similarly Student A said: "You can't live without computers anymore. I freak out when the Internet connection is down."

When gender is examined as a demographic variable, the results show that female preservice teachers used computers less than males. This finding is consistent with the findings of a number of earlier studies which found gender differences in computer literacy and experience (e.g., Kay, 1989). These results are also consistent with the findings of the *Report of the Pan-Canadian Education Indication Program* (Canadian Education Statistics Council, 2003) which revealed that among fifteen-year old students more males than females frequently used computers. The proportions were 45% and 34%, respectively.

Similar to age, the few research studies that found no significant influence for gender on computer achievement (e.g., Woodrow, 1991) had a few shortcomings that were investigated earlier in this paper. The author herself talked about a possible non-linear relationship between demographic factors and computer achievement.

It is also important to mention that gender seems to influence not only preservice teachers' computer use but also their interest in learning about computers on their own. Some of the participants in the qualitative phase of the study stated that they learned computer basic skills from "playing with computers." Yet not all people are "ready to learn on their own." For example, one female preservice teacher (Student L) stated that "women are mainly afraid to play with computers." Student B said: "I do think they should get the women to be interested."

Consequently, the notion that computer use has been coupled more with males in the work and school environment than females (Kirk, 1992; Qureshi, 2003) seems to still hold true despite the fact that the majority of people today believe in the value and role of computers in education, business, and industry. However, earlier research that found gender was not an influential factor raised the need to reinvestigate this issue with more depth, an attempt that the current research study tried to achieve. The current research focused on investigating the influence of gender as a part of a larger framework, which strengthens the study's findings.

As such, on the teacher education level, efforts should be made to eliminate any obstacles that might prevent female preservice teachers from using computers more efficiently, particularly because female preservice teachers constitute the majority of the preservice teacher population (71% in our sample). One way of addressing this problem could be to provide computer training that teaches basic skills before commencing with teaching the strategies and techniques on how to implement these skills in the classroom. Teaching basic skills can help reduce the fear, hesitation, and/or discomfort that might be preventing female preservice teachers from using computers for instructional purposes. The twelve preservice teachers who participated in the qualitative phase of the research—including the male preservice teachers who had experience with computers (Student D, for example)—have argued for the need to teach basic skills. Another possibility would be to provide hands-on experiences that focus on group work; this would allow people to learn from a peer who is more knowledgeable. The qualitative findings revealed that female preservice teachers favour going to peers for help. For example one preservice teacher (Student B) said: "Women depend on guys for support." Another one said that she goes to "younger colleagues" for help. However, this could be one side of the problem. There is a need to examine computer use among females with more depth. There might be other personal or external factors that seem to prevent females from using computer technology with more comfort and ease and at more frequent levels.

Inferential statistics also revealed that the program of study preservice teachers enrolled in was a significant predictor of computer use in a computer course. Such findings are expected, because preservice teachers in the J/I and I/S divisions were provided with computer training courses that focus mainly on providing skills and expertise on how to implement computer technology in the classrooms. For example, preservice teachers were taught how to create a Power Point presentation or do online search to look for information that would inform classroom instruction. Those in the P/J classes did not have such courses. They learned about computer technology from the Issues in Education Course. The focus of this course is on exploring "various Canadian educational issues such as religious pluralism, racism, gender differences, ICT (Information and Computer Technology) integration in the classroom, sex, education, standardized testing, and other issues of interest to students." This indicates that only a very little portion of this course is focused on providing computer training. As such, it is common that computer technology courses will allow more use of computers than courses with partial focus on computers. This also raises the need to provide computer technology courses that focus mainly on providing hands-on experiences that would help preservice teachers adopt technology more efficiently.

Another explanation could be that preservice teachers believe that students at the intermediate and senior levels are expected to use computers for study more than students who are in lower grades. The qualitative findings support such an explanation: Preservice teachers enrolled in the various programs believe that the need to use computer technology increases at each successive grade. Qualitative findings also revealed that there is a strong belief among preservice teachers in all the divisions that the new generation knows a lot about computers which stimulates the J/I and I/S preservice teachers to be more engaged in computer courses. For example, Student B said: "Kids in schools know games, all tricks about computers. We should be catching up!"

The finding that preservice teachers whose first language was not English used computers more than native speakers of English is quite surprising. This seems to contradict the expectation that North Americans have more access and experience with computers than the other cultures. One possible explanation is that non-native English preservice teachers are mainly immigrants who had to meet certain educational criteria before being allowed to immigrate to Canada. This opinion is supported by research findings. The Canadian Education Statistics Council (2003) showed that the immigrant working force is more educated than the native Canadians:

> Among these recent immigrants, both sexes tended to be highly educated. About 45% of men and 37% of women had a university degree in 2001. For the rest of the working-age population, 23% of both men and women were university graduates (p. 154).

Even for immigrants who were born in Canada, it seems that the family culture still dominates the way those people think. Such a home culture seems to stress the importance of being successful in the new country: One way of achieving success is through the use of computers, especially because computer technology is becoming a major part of the business, school, and home environment.

Similar to computer use in a computer course, multiple regression analysis results revealed that gender and program of study were found to significantly predict computer use for general purposes. It seems that even for general purposes females are not as comfortable and interested in using computers as males. It could also be that females have other concerns that occupy most of their time: for example, house work, raising children, shopping, and cooking. As to the program of study, it also sounds logical that people who use computers more for school purposes will use them more for general purposes. General use could include communicating with colleagues and professors, doing online search (just for fun purposes), reading newspapers, and many other recreational activities that are available online. Moreover, the educational level was also found to be a significant predictor of computer use. This finding is supported by the findings of Pearson product moment correlations about age (see earlier discussion about age). The first age group (21 thru 25) were the ones who used computer technology the most. It is essential to mention that preservice teachers with higher degrees were older than their colleagues (above 31 years old). It is also essential to mention that preservice teachers with higher degrees are mainly married and have more children than their colleagues. The correlation results showed that preservice teachers who have more children used computers less than those with fewer or no children. It could be possible that this group have computers at home, yet they seem to have less access to computers. Their children could be "occupying the space." It could also be that those preservice teachers lack the financial resources to have a personal computer at home. Another possible explanation could be that they have other chores occupying their time: for example, helping their children with homework, cooking, cleaning, washing, in addition to social duties.

The Experiential Cluster of variables

The hypothesis that the experiential cluster of variables would be a significant predictor of computer use was strongly supported by the findings of this research study. Regression analyses revealed that the experiential cluster of variables was the most significant predictor of computer use. These findings were corroborated by the findings of the literature (e.g., Jaber & Moore, 1999; Vanvossen, 2001; Wiesenmayer & Koul, 1999) that found computer experience to be the main factor influencing teachers' computer use, and their attitudes towards computers.

The qualitative findings of the study provide very interesting and "enriching" information about the role of experience: First of all, one has to distinguish between two types of experiences: experience with basic computer skills versus experience with the use of computers as an instructional tool. Interestingly, preservice teachers mentioned that the first requirement for a successful implementation of computer technology in the classroom is familiarity with basic computer skills and software. Next comes the need to provide training on how to implement these skills in an educational context. Although some preservice teachers stated that they acquired computer skills on their own, they stated that there are some skills that need to be taught. For example, one preservice teacher said: "We can learn basic skills on our own, typing for example, but where to learn the more complex ones." Another one stated that she needs to be taught "how to make a Power Point presentation." Such attitudes indicate that instruction has to focus on teaching computer skills first.

Moreover, the qualitative findings indicate that factors such as classroom pedagogy and tasks (assignments) also have a direct influence on the kind and amount of experiences preservice teachers are acquiring in such courses: For instance, the J/I and I/S preservice teachers stated that the computer courses offered at the Faculty of Education focus mainly on providing training on how to incorporate computer skills in the classroom. In this sense, computer technology training provided at the Faculty of Education adopts a pedagogy-based training approach at the expense of a technical-based approach. Particularly, this approach adopts the "computer technology as part of the teaching methods" pedagogy which focuses on providing preservice teachers with the training on how to integrate computer technology in an educational context. This finding is consistent with Jung's (2005) statement that in North America the focus is on the development of ICT pedagogy integration skills of educators by sharing successful cases and practical ideas. However, this should not undermine the necessity to provide training about basic computer skills. The twelve preservice teachers who participated in the qualitative phase of the study stated that there is a need to teach both skills and how to incorporate these skills. However, this group believes that less emphasis should be laid on learning about the value and role of computer technology. A possible explanation for this attitude could be that preservice teachers value computer technology and believe in its role, but what they really need is learning some practical issues about this technology. As to reading, they can do it on their own.

It is also important to state that preservice teachers stress the value and importance of computer experiences that could be offered by other courses in the BEd program. Preservice teachers mentioned that very few professors encouraged them to use computers. Some preservice teachers even said that "older professors do not have the experience of younger ones." It might be lack of experience that led those professors to ignore or underestimate the importance of encouraging computer use among their students. Other factors might exist. Although preservice teachers stated clearly that they need computer training courses that provide them with both skills and methodology to incorporate these skills, one should not ignore help that can come from other courses in the program.

Regression analyses results revealed that the experiential cluster of variables was the most significant predictor of computer use in a computer course. However, this cluster of variables was a weak predictor. It has only contributed to 7.3% of the variance of computer use in a computer course. Moreover, the full model that was generated as a result of this research was only responsible for 19% of the variance of computer use in a computer course.

Generally, these numbers and findings indicate that experience has to be a part of a larger framework that explains computer use among teachers. Moreover, a closer look reveals that there is a need to develop a larger experiential model that includes all the variables and factors that might feed into the "broad experiential model." A digital literacy framework may be the best representative for such a broader framework.

The importance of a digital literacy framework lies in the fact that it umbrellas other variables and factors that seem to feed into and influence computer use in many ways. Whereas prior experience as operationalized in this research is limited only to "past use and familiarity" with computer technology skills, other aspects of computer/digital literacy should be taken into consideration when planning future research.

Gilster (1997) defined digital literacy as "the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers" (p.1). Similarly, Ferreiro (2005) defines digital literacy as follows: "In education, it [digital literacy] is not only a matter of searching for information, but also of doing something with it, transforming information into knowledge" (p. 38). It is evident from these definitions that digital literacy encompasses more than practical issues about computer technology (having prior experience). However, possessing the skills to use computers is an integral part of digital literacy. Possessing such skills will allow the individual to function more efficiently in the digital world. Moreover, a digitally-literate person should have literacy skills because digital literacy depends on and enhances communication abilities (Veenhof, Clermont, & Sciadas, 2005). The need for literacy skills stems from the fact that digital literacy requires the person to have cognitive skills, such as those underlying reading and problem solving that are basic to using Information and Communication technology (ICT) effectively (International ICT literacy panel, 2002). Similarly, Larson (2000) in her *Digital Literacy Checklist* emphasizes the importance of measuring critical thinking literacy: For example, computer technology users should have the potential to tell "whether information on a Website is reliable and valid." Larson reveals that digital literacy requires the person to have many competencies such as: (a) keyboard, mouse and related skills, (b) desktop competencies, (c) writing and word processing competencies, (d) presentation competencies, (e) communication competencies, (f) general Web process competencies, (g) and Information Literacy.

In sum, it is evident that digital literacy is a much broader framework that encompasses many factors that might contribute to computer technology use. As such, it could be of great benefit to include prior computer experience as a part of a computer literacy model that focuses not only on past experience with computer technology, but also on aspects related to understanding the characteristics, capabilities, and value of such technology. One wonders how much percentage of the variance in computer use such a broader literacy model would predict. It is also interesting to know how much such a digital literacy model will contribute to the larger framework of the study.

The Learning Style Cluster of variables

Regression analyses results showed that a person's learning style does not predict computer use in a computer course. This result does not agree with the findings of some research studies (e.g., Ross, Dayle, & Schultz, 2001) that revealed certain learning styles (Abstract Sequential) achieved better in a computer course than others (Abstract Random). The authors' explanation for these findings was that students showing dominance on the sequential dimension tend to prefer working with computers because the computer is seen as an extension of the sequential person's mind. On the other hand, Abstract Random individuals are inherently social and enjoy working with others. However, it is essential to mention that research studies that examined the influence of learning styles on computer use (e.g., Ross, et al., 2001) have many limitations: First of all, these research studies have focused mainly on investigating the influence of learning styles on performance in computer courses (e.g., Ross, et al., 2001) or on teachers' attitudes towards computers (e.g., Anderson & Reed 1998; Shaw & Marlow, 1999); actual computer use was never investigated in relation to learning styles. Although performance could be related to use, one has to keep in mind that it is not necessary that every one who uses computers is going to perform well on the test. There might be factors other than knowledge and experience that affect the student's performance during the exam. Performance could be also limited to specific tasks. Moreover, such research has underestimated or ignored the importance of other factors: Learning style was investigated as an isolated factor; No framework was adopted to examine the influence of the learning style as a part of a greater model. Most importantly, the literature shows that the studies that investigated the influence of learning styles on preservice teachers' computer use were very few.

As such, the finding of the current research that a preservice teacher's learning style does not predict computer use in a computer course seems to be relevant for three main reasons: First, it seems that the majority of preservice teachers, regardless of their learning style preference, believe that as part of being enrolled in the BEd program they need to be computer technology literate; otherwise, they will not pass the course. This is also consistent with the findings of Jones (1994) who mentioned that preservice teachers know that they have no other choice than passing the computer training course, if they want to attain a BEd degree. This minimizes any possible influence for learning styles. Second, it seems that preservice teachers hold positive attitudes towards computer technology and its role in the teaching/learning process. Such attitudes are supported by the qualitative findings (mentioned earlier). These findings show that preservice teachers value computers and the positive role they could have in the classroom. This makes preservice teachers ready to learn about computer technology despite all the obstacles that might be hindering a successful and flexible adoption: For instance the qualitative phase showed that preservice teachers are not satisfied with the computer training pedagogy provided at the Faculty of Education. Nevertheless, those people still believe they need to learn about computer technology in ways that would allow them to successfully implement it in their classrooms. Most importantly, this research study investigated the influence of a learning style cluster of variables as part of a larger framework that incorporated many of the variables or factors that were dominant or underestimated in educational computing research. Such an aspect adds strength to the findings of this research.

The Motivational Cluster of variables

Intrinsic motivation was the only motivational construct that predicted computer use in a computer course. This is consistent with other research findings demonstrating that achievement in a computer course was mainly dependent on intrinsic motivation (Chapula, Chen, & Charles, 2001; Chen & Chapula, 2003) where students who were intrinsically motivated achieved better than those who were less motivated. These findings are a clear indication of the significant role that is played by intrinsic motivation in courses that focus mainly on teaching computers skills and applications, as well as in courses where computer technology is the main means of instructional delivery (Web-Based or online courses).

The Pearson product moment correlations also revealed significant correlation between computer use and task value. This shows that valuing the tasks that are required in computer courses is one way of motivating learners to become more interested in a computer course. Value is a basic component of expectancy-value theory. In this theory, for "effort" to occur, the person must value the task. High task value will lead to more involvement in one's own learning. "When students see the value of learning and believe that they have the ability to be successful, they would try to accomplish the task in the face of difficulty" (Chen & Chapula, 2003, p. 114). This is also supported by the qualitative findings: Preservice teachers stated that tasks should be provided in a way that will keep them motivated and enthusiastic about learning in a computer class. For example Student B said: "They should keep us motivated." Preservice teachers emphasized the need to have assignments that focus on hands-on experiences and not only on reading and critiquing journal articles. Student E said: "We should have computers for specific courses, like history, math, etc." Student H said: "It would be useful to know how to make a Power Point presentation and show it so that you can do things really functional in your class."

Therefore, in an instructional situation, the learning task needs to be presented in a situation that is engaging and meaningful to the learner. Students can be motivated through activities and applications that capture their imagination and stimulate a desire to seek more knowledge. Moreover, instructors in a computer course can show students how the course, assignments, and projects are relevant to their academic, professional, and personal needs. This could be done by planning and encouraging discussions that both relate the learning material to the learners' personal experiences, and show how it can be used in their own classrooms.

As such, successful and efficient training would adopt a pedagogy that meets the demands of the various groups. Time dedicated to these courses has to be taken into consideration when designing such courses. Moreover, professors other than those involved in computer courses should incorporate computer technology in their teaching and encourage preservice teachers to make presentations that adopt this technology. Preservice teachers have to feel that the whole atmosphere at Faculties of Education is one that adopts and encourages computer use.

Similar to computer use in a computer course, of the six motivational variables only intrinsic motivation predicted computer use for general purposes. This finding indicates that preservice teachers need to always feel motivated about computer technology so that they will keep using them for the various purposes. This also supports the need for instructors who teach computer courses at the BEd program to plan their instruction in a way that keeps students motivated. Such planning will serve two purposes: First, it will help promote better use and understanding of the role of computer technology in education. Second, when students feel motivated about computer technology and its role in instruction, this will indirectly affect using this technology for general purposes.

In sum, this research has clearly shown that motivation plays a significant role in predicting preservice teachers' computer use. This seems to be due to the notion that preservice teachers are mature responsible motivated adults who seem to value and believe in what they are doing. They have set a goal for themselves and are trying their best to achieve such a goal (Cranton, 1989).

The Personality Cluster of variables

Regression analysis showed that none of the personality traits predicted computer use in a computer course and for general purposes. However, it is important to mention that when entering the personality cluster of variables alone into the regression model, only the originality trait had a significant influence on computer use in a computer course and for general purposes. Originality could be influential because people who are not creative and imaginative may find it very difficult to adapt to the new innovation (computer technology).

A possible explanation of this unexpected result could be the fact that teachers and educators today believe in the role of technology and how valuable it is to the instructional process (Industry Canada, 2003). Such a belief seems to undermine the role of personality. Moreover, one has to keep in mind that the findings of this research showed that preservice teachers not only believe in computer technology but they also want to learn about it. As such, even if their personality trait seems not to favour computers, preservice teachers know that they have to learn about this technology so that they can successfully implement it in their schools. Another possible explanation could be that in the presence of factors such as gender, experience, and motivation, the role of personality diminishes to a great extent.

Limitations and Implications for Future Research

Although the sample size of students who participated in this study was large and included students with various backgrounds, it is not possible to ensure that it is truly representative of the entire population of preservice teachers in Ontario, since this sample was solely comprised of students from one university in Ontario. For this reason, findings from this research cannot be generalized to all preservice teachers in Ontario.

Attempts were also made to control for extraneous variables. One of the major concerns about this study was to eliminate the fatigue factor when answering the questionnaire. Due to the length of the questionnaire, preservice teachers may have grown tired during the completion process. To reduce the effect of fatigue, six different formats of the instrument were adopted. In each of these formats the order of the questionnaires was different. For example, in Format 1 the prior experience questionnaire was placed before the rest of the questionnaire, in Format 2 the learning style questionnaire was placed before the rest, etc. However, one still wonders how helpful this procedure has been in compensating for fatigue effects while filling out the questionnaires.

This research study was an attempt to provide a conceptual framework that can best explain computer use among preservice teachers. Findings from this research are important and have many implications for future researchers. Such implications extend into the realms of both research and practice. To begin with, there is a need to conduct more research in the area of teacher education, both on the preservice and inservice level. It could be helpful to find out if the generated framework can be generalized to include the whole teacher population. Also, it would be interesting to see if such a framework can be generalized to other disciplines: business, nursing, fine arts, etc. Moreover, as the focus of this research was on preservice teachers' perceptions of computer use, it would be helpful for future research to investigate preservice teachers' behaviours (actual use) in the computer classroom.

Furthermore, there is a need to elaborate on the findings of this study. For example, one needs to know if there are other factors that might interfere with preservice teachers' computer use in the classroom. Most importantly, there is a need to investigate the place of experience as a part of a larger computer or digital literacy model.

The current research also yields significant implications about the pedagogy that should be adopted in computer-training classes offered at Faculties of Education: It showed the need to adopt a pedagogy that incorporates both teaching computer skills and how to incorporate these skills in a teaching environment. It also revealed that other factors could be influential: for example, time dedicated to these courses. Of great importance also is to involve all faculty members in creating an atmosphere that adopts and encourages computer use among students. However, it is essential to mention that these results were limited to one Canadian university. Particularly, there is a need to investigate other groups of preservice teachers and their attitudes towards such a pedagogy.

Last but not least, from the instructors' perspective, there is a need to do research on faculty who teach at Faculties of Education. Particularly, there is a need to investigate the reasons or factors that might be impeding/encouraging faculty in the BEd program from driving and encouraging their students to use computer technology for courses other than those providing computer training.

Conclusion

In conclusion, the findings of this research served two main purposes, both of which are very important to the field of teacher education: First, this study has provided a conceptual framework that can help explain computer use among preservice teachers. Such a framework seems to encompass not only preservice teachers but also other educators: for example, inservice teachers, principals, and librarians. Second, this study has informed instructional design: Significant findings were revealed about the type of computer- training pedagogy that has to take place in Faculties of Education. Findings of the qualitative phase have also informed the framework of the study.

The main purpose of this study was to provide a conceptual framework that explains computer use among preservice teachers. The research findings revealed that a number of factors combined together to provide such a framework. Among these factors, prior experience with computer technology, gender, intrinsic motivation, program of study, language spoken at home, familiarity with computer terminology, and educational level were the only significant predictors. However, this framework predicted only 19% of the variance of computer use in a computer course and 46% of the variance of computer use for general purposes. This indicates the need to do more investigation of this issue. The current framework itself could be a part of a larger framework that takes into consideration the findings of this research and their implications. For example, as mentioned earlier, there could be a need to expand the experiential cluster of variables to include factors that might feed into computer use.

Another factor that has to be taken into consideration is the pedagogy of computer training that takes place in the computer classroom. This pedagogy seems to be a main factor that influences preservice teachers' readiness and ability to use computer technology in their classrooms. The qualitative phase showed that what preservice teachers are asking for in a computer technology training course is a pedagogy-based training that incorporates two main categories: (a) computer technology as "main content focus" and (b) computer technology as "part of teaching methods." Put simply, as they stated clearly, they want to learn computer skills first, then how to incorporate these skills into their lessons. The time factor was also found to be important. Preservice teacher reported that more time should be dedicated to these courses: Three hours a week is not enough to teach both skills and techniques to incorporate them in the classrooms. Moreover, professors other than those involved in computer courses should incorporate computer technology in their teaching and encourage teachers to make presentations using this technology. Preservice teachers have to feel that the whole atmosphere at Faculties of Education is one that adopts and encourages computer use. Also, such pedagogy has to eliminate any gender influence and ensure that all preservice teachers are motivated and "excited" to learn about computer technology.

In sum, the quantitative phase of the study has generated a framework that is made up of nineteen variables (prior experience with computer technology, familiarity with computer terminology, gender, age, marital status, residence, program of study, children, educational level, language spoken at home, visual/verbal LS, intrinsic motivation, extrinsic motivation, success, self-efficacy, task value, organization, sympathy, and originality). However, among these variables, experience, intrinsic motivation, gender, program of study, language spoken at home, familiarity with computer terminology, and educational level were the only significant predictors of computer use. In addition to these variables, the qualitative phase revealed that the pedagogy that is adopted in computer courses is very crucial. Time dedicated to these courses is also a factor. All these factors seem to feed into a larger digital literacy framework that will help explain computer use among novice teachers. Such a framework could be generalized to other disciplines such as business and pharmacy.

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Appendix A: Instrumentation

Appendix A 1: Demographic History Questionnaire

Choose the appropriate response for the following questions.

1) **Your gender**
   a. Male
   b. Female

2) **How old are you?**
   a. 21-25
   b. 26-30
   c. 31-35
   d. 36-40
   e. Over 40

3) **What is your marital status?**
   a. Single (never married)
   b. Married/Living with partner
   c. Divorced/separated
   d. Widow/Widower

4) **Preservice program enrolled in**:
   a. Primary/Junior
   b. Junior/Intermediate
   c. Intermediate/Senior

5) **Number of Children: ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 or more**

6) **What is your highest level of education?**
   a. Bachelor's degree (specialization:________________________)
   b. Master's (specialization:_________________________________)
   c. Doctoral (specialization:_________________________________)
   d. Other (please explain): _________________________________)

7) **What best describes the location in which you presently reside?**
   a. Urban (city, including suburbs)
   b. Rural (outside of city e.g., farm, village)

8) **Indicate your <u>racial/ethnic</u> status** [*circle one*]
   a. Asian
   b. African
   c. Middle Eastern
   d. Native Canadian (Aboriginal)
   e. White Canadian
   f. Others (please specify):______________________________

9) **In which country were you born?**
   a. Canada *[If Canada, go to question 11]*
   b. Other *[If not Canada, go to question 10]*

10) **At what <u>age</u> did you <u>move</u> to Canada?** (specify in years):__________

11) **At what <u>age</u> did you <u>learn</u> to speak <u>English</u>?** (specify):________________

12) **What language is spoken at home?**
   a. English
   b. Other (specify):____

13) **Computer terminology:** (Check (X) the terms you are familiar with or would feel comfortable defining)

Cut/paste	☐	Mouse	☐	Download	☐
Spreadsheet	☐	Data base	☐	Scan	☐
Search engines	☐	URL	☐	Blogs	☐

Appendix A 2: Previous Computer Experience Questionnaire

For the following question, please mark the response that best reflects your understandings according to the code listed below.

1 = Strongly Disagree **2 = Disagree**
3 = Neither Agree nor Disagree **4 = Agree** **5 – Strongly Agree**

I have experience in using the following:

Word Processing Software (Word, Word Perfect, etc.)	1	2	3	4	5
Spread Sheet Software (Excel, Lotus, etc.)	1	2	3	4	5
Statistical Packages (SASS, SPSS, etc.)	1	2	3	4	5
Web Based Database (e.g., Eric, Merriam Webster's Online)	1	2	3	4	5
Library Database (e.g., Eric, CBCA Education)	1	2	3	4	5
Software Database (e.g., Oracle, Windows)	1	2	3	4	5
Printing software	1	2	3	4	5
Scanning software	1	2	3	4	5
E-mail	1	2	3	4	5
Chat	1	2	3	4	5
Graphics	1	2	3	4	5
Text/Hypertext	1	2	3	4	5
Search engines	1	2	3	4	5
Games	1	2	3	4	5
Movies	1	2	3	4	5
Web boards	1	2	3	4	5
E-books, Newspapers (online)	1	2	3	4	5
Blogs	1	2	3	4	5

Appendix A 3: Learning Styles Questionnaire

For each item below select the answer that applies more frequently to you

1. I understand something better after I
    a. try it out.
    b. think it through.

2. I would rather be considered
    a. realistic.
    b. innovative.

3. When I think about what I did yesterday, I am most likely to get
    a. a picture.
    b. words.

4. I tend to
    a. understand details of a subject but may be fuzzy about its overall structure.
    b. understand the overall structure but may be fuzzy about details.

5. When I am learning something new, it helps me to
    a. talk about it.
    b. think about it.

6. If I were a teacher, I would rather teach a course
    a. that deals more with facts and real life situations.
    b. that deals with ideas and theories.

7. I prefer to receive new information in
    a. pictures, diagrams, graphs, or maps.
    b. written directions or verbal information.

8. Once I understand
    a. all of the parts, I understand the whole thing.
    b. the whole thing, I see how the parts fit.

9. In a study group working on difficult material, I am more likely to
    a. jump in and contribute ideas.
    b. sit back and listen.

10. I find it easier
    a. to learn facts.
    b. to learn concepts.

11. In a book with lots of pictures and charts, I am likely to
    a. look over the pictures and charts carefully.
    b. focus on the written text.

12. It is more important to me that an instructor
    a. lay out the material in clear sequential steps.
    b. give me an overall picture and relate the material to other subjects.

13. I prefer to study
    a. in a study group.
    b. alone.

14. I am more likely to be
    a. careful about the details of my work.
    b. creative about how to do my work.

15. When I get directions to a new place, I prefer
    a. a map.
    b. written instructions.

16. I learn
    a. at a fairly regular pace. If I study hard, I'll "get it."
    b. in fits and starts. I'll be totally confused and then suddenly it all "clicks."

17. I would rather first
    a. try things out.
    b. think about how I'm going to do it.

18. When I am reading for enjoyment, I like writers to
    a. clearly say what they mean.
    b. say things in creative, interesting ways.

19. I remember best
    a. what I see.
    b. what I hear.

20. Some instructors start their classes with an outline of what they will cover. Such outlines are
    a. somewhat helpful to me.
    b. very helpful to me.

Appendix A 4: Motivations to Learn Questionnaire

For each of the following statements, mark the response that best reflects your feelings according to the code listed below.

1 = Strongly Disagree   2 = Disagree   3 = Neither Agree nor Disagree

4 = Agree   5 – Strongly Agree

1. In a class like this, I prefer course material that really challenges me so I can learn new things.	1	2	3	4	5
2. The most satisfying thing for me in this course is trying to understand the content as thoroughly as possible.	1	2	3	4	5
3. When I have the opportunity in this class, I choose course assignments that I can learn from even if they don't guarantee a good grade.	1	2	3	4	5
4. Getting a good grade in this class is the most satisfying thing for me right now.	1	2	3	4	5
5. If I can, I want to get better grades in this class than most of the other students.	1	2	3	4	5
6. I want to do well in this class because it is important to show my ability to my family, friends, employer, or other.	1	2	3	4	5
7. I think I will be able to use what I learn in this course in other courses.	1	2	3	4	5
8. It is important for me to learn the course material in this class.	1	2	3	4	5
9. I am very interested in the content area of this course.	1	2	3	4	5
10. If I study in appropriate ways, then I'll be able to learn the material in this course.	1	2	3	4	5
11. It is my own fault if I don't learn the material in this course.	1	2	3	4	5

12. If I try hard enough, then I will understand the course material.	1	2	3	4	5
13. I believe I will receive an excellent grade in this class.	1	2	3	4	5
14. I'm certain I can understand the most difficult material presented in the readings for this course.	1	2	3	4	5
15. I'm confident I can do an excellent job on the assignments and tests in this course.	1	2	3	4	5
16. Considering the difficulty of this course, the teacher, and my skills, I think I will do well in this class.	1	2	3	4	5

Appendix A 5: SONSO Personality Inventory

Rate yourself on each of the following descriptive words by circling one of the five numbers after each word. Work rapidly. Guess if you have to, but ensure that you circle one number for each word.

1 = Strongly Does Not Describe Me   2 = Does Not Describe Me at All   3 = Neutral

4 = Describes Me   5 = Strongly Describes Me

1) CREATIVE	1	2	3	4	5	26) INVENTIVE	1	2	3	4	5
2) TROUBLED	1	2	3	4	5	27) WORRYING	1	2	3	4	5
3) SHY	1	2	3	4	5	28) EFFICIENT	1	2	3	4	5
4) THOROUGH	1	2	3	4	5	29) BASHFUL	1	2	3	4	5
5) WARM	1	2	3	4	5	30) COMPASSIONATE	1	2	3	4	5
6) INSIGHTFUL	1	2	3	4	5	31) ARTISTIC	1	2	3	4	5
7) SOLEMN	1	2	3	4	5	32) DEPRESSED	1	2	3	4	5
8) PRACTICAL	1	2	3	4	5	33) RESERVED	1	2	3	4	5
9) TENSE	1	2	3	4	5	34) GENTLE	1	2	3	4	5
10) INDIVIDUALISTIC	1	2	3	4	5	35) SYSTEMATIC	1	2	3	4	5
11) KIND	1	2	3	4	5	36) UNCONVENTIONAL	1	2	3	4	5
12) QUIET	1	2	3	4	5	37) SILENT	1	2	3	4	5
13) NERVOUS	1	2	3	4	5	38) IRRITABLE	1	2	3	4	5
14) RESPONSIBLE	1	2	3	4	5	39) DILIGENT	1	2	3	4	5
15) TENDER	1	2	3	4	5	40) SOFT-HEARTED	1	2	3	4	5
16) RECLUSIVE	1	2	3	4	5	41) SOLITARY	1	2	3	4	5
17) IMAGINITIVE	1	2	3	4	5	42) UNEASY	1	2	3	4	5
18) FRUSTRATED	1	2	3	4	5	43) ORIGINAL	1	2	3	4	5
19) ORGANIZED	1	2	3	4	5	44)SYMPATHETIC	1	2	3	4	5
20) UNDERSTANDING	1	2	3	4	5	45) ORDERLY	1	2	3	4	5
21) INQUISITIVE	1	2	3	4	5	46) MILD	1	2	3	4	5
22) TEMPERMENTAL	1	2	3	4	5	47) PHILOSOPHICAL	1	2	3	4	5
23) PROMPT	1	2	3	4	5	48) MOODY	1	2	3	4	5
24) UNASSERTIVE	1	2	3	4	5	49) PRECISE	1	2	3	4	5
25) PLEASANT	1	2	3	4	5	50) NICE	1	2	3	4	5

Appendix A 6: Computer Technology Use Instrument

How do you often use the following? Please respond to each statement, even if you have not had a great amount of experience with a particular type of computer technology. The section on the **left** describes your frequency of use **for the instructional technology or computer courses** you are taking in the BEd program. The one on the **right** describes your frequency of use for **general purposes.**

1 = Never **2** = At Least Once/Year **3** = At Least Once/Month
4 = At Least Once/Week **5** = Daily

For the Computer Course					*Categories*	*For General Use*				
1	2	3	4	5	Word Processing Software (Word, Word Perfect, etc.)	1	2	3	4	5
1	2	3	4	5	Spread Sheet Software (Excel, Lotus, etc.)	1	2	3	4	5
1	2	3	4	5	Statistical Packages (SASS, SPSS, etc.)	1	2	3	4	5
1	2	3	4	5	Web Based Database (e.g., Eric, Merriam Webster's Online)	1	2	3	4	5
1	2	3	4	5	Library Database (e.g., Eric, PsychINFO, Math SciNet)	1	2	3	4	5
1	2	3	4	5	Software Database (e.g., Oracle, Windows)	1	2	3	4	5
1	2	3	4	5	Printing software	1	2	3	4	5
1	2	3	4	5	Scanning software	1	2	3	4	5
1	2	3	4	5	E-mail	1	2	3	4	5
1	2	3	4	5	Chat	1	2	3	4	5
1	2	3	4	5	Graphics	1	2	3	4	5
1	2	3	4	5	Text/Hypertext	1	2	3	4	5

1	2	3	4	5	Search engines	1	2	3	4	5
1	2	3	4	5	Games	1	2	3	4	5
1	2	3	4	5	Movies	1	2	3	4	5
1	2	3	4	5	Web boards	1	2	3	4	5
1	2	3	4	5	E-books, News papers (online)	1	2	3	4	5
1	2	3	4	5	Blogs	1	2	3	4	5

Appendix B: Consent Forms

Appendix B 1: Consent to Participate in Research

UNIVERSITY OF
WINDSOR

Title of Study: **Collating the Disparate Determinants of Computer Use in Novice Teachers: The Next Step in Model Building**

You are asked to participate in a research study conducted by ***Salah Zogheib***, a PhD student from the ***Faculty of Education*** at the University of Windsor, under the supervision of **Dr. Larry Morton, the results of which will be *utilized in a doctoral dissertation.***

If you have any questions or concerns about the research, please feel free to contact ***Salah Zogheib at xxxxx***

$ **PURPOSE OF THE STUDY**

The purpose of this study is to develop a framework that addresses the relative importance of specific determinants of computer use—demographics, experience, learning style, motivation, and personality—for new teachers. These determinants represent prominent themes in theories of human motivation and decision making and are expected to relate to preservice teachers' computer use. Whereas the literature shows that empirical research has failed to provide a theoretically integrated framework that can best predict computer use, the purpose of this research is to enrich not only theory but also practice.

$ **PROCEDURES**

Please answer the questions to reflect your own personal feelings and to the best of your ability.

There are two phases for this study: a quantitative one, and a qualitative one.

Participating in the quantitative phase requires only about 25 minutes on your part to answer the questions.

If you would also consider participating in a follow up interview, please leave your "phone number" and "your first name" on the questionnaire. The investigator will be happy to call you to explore the possibility of a subsequent interview.

The interview ranges from 45 to 60 minutes, and will be conducted at the faculty of Education in the Researcher's office.

$ **POTENTIAL RISKS AND DISCOMFORTS**

There are no risks at all as a result of participating in the study.

$ **POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY**

Findings from this research will be valuable for many reasons:

First, the literature reveals that educational computing research has lacked a theoretical framework for exploring and explaining its findings. This research attempts to develop a framework that provides a solid background for the analysis and understanding of the relative influence of factors that are expected to affect novice teachers' readiness and preparation to use computers.

Second, for the sake of this study, the researcher has designed and adopted conceptually relevant variable clusters--an aspect that is missing in the literature--that will facilitate model builiding and thoeretical development for future research. The choice of these Clusters is deeply rooted in theories of human motivation and decision making.

Distance education applications will also benefit from the findings of this study. The literature on distance/online education has also revealed the lack of theoretical models that can determine the nature of factors that might impact the learner's preparation to be involved in online courses. Findings will inform teachers who use an online format and help them focus on aspects that are personal to the learners when planning their instruction.

Last but not least, this research will inform instructional technology. Findings will generate implications for curriculum designers, educators, as well as learners.

$ **PAYMENT FOR PARTICIPATION**

Subjects will receive no payment for participation.

$ **CONFIDENTIALITY**

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission. After contacting the students who are willing to participate in the follow-up study, the part of the questionnaire that includes their name will be torn away. Data collected will be held for a maximum of two years and tape records will be stored in a secure location.

$ **PARTICIPATION AND WITHDRAWAL**

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may exercise the option of removing your data from the study. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

$ **FEEDBACK OF THE RESULTS OF THIS STUDY TO THE SUBJECTS**

Final results will be available in the library by September 2006. The results will be also posted on the website of Research Ethics Board of the University of Windsor.

• **SUBSEQUENT USE OF DATA**

Data may be used in studies of similar nature. Results might be presented at an educational conference and/or published in relevant educational or technology journals.

$ **RIGHTS OF RESEARCH SUBJECTS**

You may withdraw your consent at any time and discontinue participation without penalty. This study has been reviewed and received ethics clearance through the University of Windsor Research Ethics Board. If you have questions regarding your rights as a research subject, contact:

Research Ethics Coordinator
University of Windsor
Windsor, Ontario
N9B 3P4

Telephone: 519-253-3000, ext. 3916
:
ethics@uwindsor.ca

$ SIGNATURE OF RESEARCH SUBJECT/LEGAL REPRESENTATIVE

I understand the information provided for the study **Collating the Disparate Determinants of Computer Use in Novice Teachers: The Next Step in Model Building** as described herein. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

____
Name of Subject

____
Signature of Subject

Date

$ SIGNATURE OF INVESTIGATOR

These are the terms under which I will conduct research.

____
Signature of Investigator

Date

Appendix B 2: Consent for Audio Taping

UNIVERSITY OF
WINDSOR

Research Subject Name:

Title of the Project: Collating the Disparate Determinants of Computer Use in Novice Teachers: The Next Step in Model Building
ID# Number:

Birth date:

I consent to the audio taping of interviews, procedures, or treatment.

I understand these are voluntary procedures and that I am free to withdraw at any time by requesting that either the taping be stopped or the viewing be discontinued. I also understand that my name will not be revealed to anyone and that taping and viewing will be kept confidential. Tapes are filed by number only and store in a locked cabinet.

I understand that confidentiality will be respected and the viewing of materials will be for professional use only.

(Research Subject)________________________________

(Date)______________________

Vita Auctoris

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