

ICT in teacher education: Examining needs, expectations and attitudes

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Abstract: An exploratory case study was designed to obtain pre-service teachers' expectations of and attitudes toward the learning and integrating of Information and Communication Technologies (ICT) into their teaching and learning. Given the diverse demographic backgrounds and social conditions of the teacher candidates, such as age, gender, English language proficiency, and previous education, a wide range of responses to the online survey and the semi-structured focus group interview questions was expected. Implementation of the sequential mixed method research design resulted in emerging themes related to participants' social conditions that impact their perceptions and attitudes regarding the ICT and beliefs about the use of ICT in their future careers. Findings from this study are compared to earlier studies done in the same setting. Findings from this case study show unexpected consistency in teacher candidates' comments despite changed circumstances. This study could be employed as a useful reference for the design of an ICT curriculum for Teacher Education programs.

Résumé : Une étude de cas exploratoire a été conçue afin de connaître les attentes et les dispositions des futurs enseignants à l'égard de l'apprentissage et de l'intégration des technologies de l'information et de la communication (TIC) dans leur pratique d'enseignement et leur apprentissage. L'obtention d'un large éventail de réponses à l'enquête en ligne et aux questions semi-structurées du groupe de discussion était prévue compte tenu de la diversité des horizons démographiques et des conditions sociales des candidats (notamment l'âge, le sexe, le niveau de connaissance de l'anglais et la formation antérieure). L'utilisation de la méthode de recherche séquentielle mixte a conduit à l'émergence de thèmes liés aux conditions sociales des participants, conditions qui influencent leurs perceptions et leurs dispositions à l'égard des TIC ainsi que leurs opinions au sujet de l'utilisation des TIC dans leur future carrière. Les résultats de cette étude sont comparés à des études antérieures effectuées dans un cadre similaire. Les résultats de cette étude de cas révèlent une cohérence inattendue des commentaires des futurs enseignants malgré des différences circonstanciées. Cette étude pourrait être utilisée en tant qu'outil de référence utile pour la conception de cours sur les TIC à l'intérieur des programmes de formation des enseignants.

Introduction

Information and Communication Technologies (ICT) that are becoming increasingly pervasive in societies around the world are also reaching schools. With numerous global advancements in ICT it is essential that educators have a thorough working knowledge of these media and their influence on the performance and engagement of their students. There is no firm agreement on the definition of ICT, as these technologies evolve almost daily. Here we assume that ICT includes, but is not limited to, personal computers, laptops, printers, LCD projectors, palm devices, iPods, fax machines, cell phones, Internet, and Intranet. Also we employ what the National (US) Higher Education ICT Initiative (2003) describes as the ICT proficiency in the higher education context:

[T]he ability to use digital technology, communication tools, and/or networks appropriately to solve information problems in order to function in an information society. This includes the ability to use technology as a tool to research, organize, evaluate, and communicate information and the possession of a fundamental understanding of the ethical/legal issues surrounding the access and use of information. (p. 11)

This definition encompasses three areas of ICT literacy, namely cognitive, technical, and social. It recognizes that in the technologically connected world, one does not live in isolation and therefore needs 'soft' as well as 'hard' skills to confidently, reliably, and responsibly use ICT.

This paper is based on an exploratory case study designed to obtain pre-service teachers' status of Information and Communication Technologies (ICT) literacy prior to entering the Teacher Education program, as well as their expectations of and attitudes toward learning ICT and integrating ICT into their practice and future classroom teaching. The findings presented in this paper are based on data collected through multiple channels including an online survey, semi-structured focus group meetings and review of course documents. In addition, we used our own observations and reflections from conducting courses related to teaching ICT and teaching with ICT in the teacher education program. Thus, what is offered here is partly informed by these experiences and is further informed by literature on technology implementation in teacher education programs and in schools.

By applying the sequential mixed method research design, we were able to identify emerging themes related to pre-service teachers' social conditions that impact their perceptions and attitudes regarding the ICT as well as beliefs about the use of ICT in their future teaching career. The audience for this work includes designers and facilitators of the curricula related to computer applications in teacher education programs.

Description of the Program and the Course

The teacher education program described here is 36 weeks long with 12 weeks devoted to teaching practice, organized in four blocks. This program, at least in recent years, has had an immense diversity of students enrolled in it. In 2006/07, the year when this study was conducted, the target population for this study consisted of 135 pre-service teachers enrolled in the Intermediate/Senior (I/S) division, all of whom had a previously obtained undergraduate degree. There were 52% (N = 70) females in this group, which presents the I/S division as more gender-balanced in comparison to Primary-Junior (P/J) and

Junior/Intermediate (J/I) divisions which consist predominantly of females. In addition, the age range in I/S division was from 20 to 50 and more than one-third of the group were non-native speakers of English who received their previous degrees from countries other than Canada.

Students enrolled in this program are required to take one ICT literacy course besides other foundations courses and those that are in the pre-service teachers' specific subject area(s). Some of these courses also involve use of ICT. Instructional Technology (Computer Methods) is a general methods course offered to all the students in the J/I and I/S divisions. This course is offered to I/S division during the first semester only and to J/I division as a full year course. P/J students do not have any course dedicated to ICT. The following is a brief description of the course.

Objective

The Instructional Technology (Computer Methods) course is designed for pre-service teachers with the aim of building an intelligent and thoughtful disposition toward the integration of ICT into teaching and learning in classroom and school contexts. The emphasis of this course is on developing ICT literacy competencies and promoting the philosophy of life-long learning rather than on computer skills training.

Content

This course comprises a mixture of theory and practice as it covers most influential theories related to implementation of ICT in education as well as the actual applications of ICT in schools. In the theoretical part of the course, students read and reflect on five articles on topics such as, research on ICT use in education; ICT literacy; and social issues in ICT implementation. In the practical part of the course, students acquire both hardware and software knowledge and skills.

Course Delivery Methods

This course utilizes a blend of online and in-class delivery methods. Activities in the course include:

1. Face-to-face discussions on readings, designed to develop students' critical thinking and facilitating skills,
2. Online discussions, used mainly for formative evaluation and sharing students' reflections during their practice teaching in schools,
3. Tech workshops, for sharing ICT knowledge and skills the students already have or have just gained, and
4. Final group projects, done in a digital format and relevant to ICT in education.

Theoretical Background

Over the last two decades, the use of ICT has been an important topic in education. On the one hand, studies have shown that ICT can enhance teaching and learning outcomes. For example, in science and mathematics education, scholars have documented that the use

of ICT can improve students' conceptual understanding, problem solving, and team working skills (Culp, Honey & Mandinach, 2005; Gerban, 1992; Tao & Gunstone, 1999; Toomey & Ketterer, 1995; Zhou, Brouwer, Nocente & Martin, 2005). As a result, most curriculum documents state the importance of ICT and encourage schoolteachers to use them. However, teachers need to be specifically trained in order to integrate ICT in their teaching (Batane, 2004; Jacobsen, Clifford & Friesen, 2002; Markauskaite, 2007; Mitchem, Wells & Wells, 2003; Yildirim, 2000).

Although schools are known to be resistant to innovation and change (Kearsley, 2004), the proliferation of ICT is beginning to affect how teachers teach (Reid, 2002). One of the current issues about the use of ICT in Canadian schools is how it is integrated into the curriculum (Plante & Beattie, 2004). Since the curriculum documents provide arguments for introducing ICT in the school setting, schools expect that graduates from teacher education programs have a reasonable knowledge of how to use ICT (Montgomerie & Irvine, 2001). However, this may not be the case as is noted by Oren, Mioduser, and Nachmias (2002), who argue that

Most current teachers' pre-service preparation, and subsequent in-service courses were devised in reference to traditional educational technology and settings. ... Thus, [the participants in these courses] are not familiar with the processes, interaction patterns, features and possibilities of technology-mediated educational transactions. (Implications of these studies, ¶)

What compounds this issue even more is that although the students who were born in or after 1982 belong to the "Net Generation," and are accustomed to operating in a digital environment for communication, information gathering and analysis (Oblinger, 2004), they typically lack information literacy skills, and their critical thinking skills are often weak (Oblinger & Oblinger, 2005). The problem is that students "do not necessarily understand how their use of technology affects their literacy or habits of learning" (Barnes, Marateo & Ferris, 2007, Independence, Autonomy, and Learning, ¶).

It seems that effective development of pre-service teachers' ICT proficiency is not a straightforward process, but is the one that asks for a careful, multilayered approach. First, a needs assessment is important to find out what ICT skills and knowledge teachers need at schools. Second, designers of teacher education programs should know the pre-service teachers' perceptions of ICT and their attitudes toward ICT integration into curriculum (Murphy, 2000). This is because these attitudes and perceptions are instrumental in how future teachers will use ICT in their teaching (Sasseville, 2004). Although there is a great deal of research on technology and teacher education, because of specifics of various teacher education programs, changes in population trends, and rapid technology advancements, there is a constant need for more research about the role of ICT in teacher education programs in this specific context. Third, teacher education programs need to take into account the two typical arguments in favour of the ICT appropriation in schools. One argument emphasises the importance of technological skills. Supporters of this argument urge teacher education programs to provide future teachers with as many technological skills as possible. The other argument accords a more important role to developing pre-service teachers' perspectives of and pedagogical knowledge about

technology integration. Proponents of the latter argument believe that content-related technology knowledge is the most important factor for technology integration in teaching. This knowledge is referred to as technology pedagogical content knowledge (TPCK) (Mishra & Koehler, 2006). The institutions that uphold the teacher education programs need to be aware of these two competing arguments and use the opportunity to build a balanced ICT program for pre-service teachers.

In preparation for this report, the authors especially turned to the results of some recent relevant research done by the graduates in the Master's and Doctorate in Education programs at the University of Windsor, Canada. These studies (e.g., Magliaro, 2006; Qureshi, 2004; Zogheib, 2003; Zogheib, 2006) were done, at least partially, among the pre-service teachers at the Faculty of Education.

Previous Research

In the empirical study on P/J and J/I pre-service teachers, Zogheib (2003) investigated the relationship between their attitudes (confidence in their own ability to use the Internet and liking of the Internet); achievement-related and value-related motivational beliefs about the Internet; and their perceived likelihood to use the Internet in instruction. The author examined the achievement-related beliefs within a motivational framework that described pre-service teachers' actual knowledge and perceived experience about the Internet. Value-related beliefs encompassed six measures for which the Internet would be valuable: personal needs, future career goals, a partner, children, future students, and society in general. Likelihood of using the Internet in instruction focused on teaching needs, students' learning, and differential access to resources. Overall, three out of the four independent variables were significant for future Internet use: attitudes, perceived experience, and perceived values. Value-related beliefs were the most dominant predictors of almost every item of Internet use. Perceived experience was a significant predictor only for pre-service teachers creating a homepage for students to use. An attitude (confidence and liking of the Internet) was only a significant predictor when pre-service teachers' access was restricted to the school. Surprisingly, actual knowledge was never a main predictor of future Internet use. Zogheib concluded that the computer course "provided [pre-service teachers] with a clear and effective plan [on] how to use the Internet in the classroom" (p. 103). It appears that the course was not the problem, but the problem was in the lack of opportunities for pre-service teachers to use the Internet during teaching practice due to associate teachers' lack of experience in that domain. Zogheib finished the report with recommendation that faculties of education should focus on ensuring that computer-related knowledge is "translated into practical applications in classroom settings" (p. 108).

In the next study, Zogheib (2006) investigated computer use among pre-service teachers in view of their experience with technology, demographic factors, motivation for use, personality factors and learning styles. Data collection in this explanatory mixed-method design study was done through conducting a survey and interviews. The quantitative part of the study indicated that female pre-service teachers use computers less than their male

counterparts. Also, pre-service teachers in P/J division used computers less than those in J/I and I/S divisions. Data revealed that those pre-service teachers, who do not speak English at home, use computers more than others. In the interviews pre-service teachers reflected on the "computer training" course that was then part of the teacher education program and is also the topic of the study described in this paper. Pre-service teachers stated that the course was informative but that it started from the wrong assumption that participants had some previous computer technology training. Those who were advanced computer users did not find the course too difficult, while those who were in initial stages of technology use thought they would have to re-teach themselves if they ever intended to use the programs briefly described in class. One of the suggestions was to have class assignments focus more on practical issues than on evaluating and critiquing articles.

The twelve interviewees criticized the whole teacher education program for not providing enough computer experience. This experience was mainly limited to using the text editors or online searches. The participants stated that very few professors in the program encouraged the pre-service teachers to use computers. This whole issue was compounded by similar and even worse experiences in the teaching practicum: associate teachers did not use computers and appeared disinterested in integrating technology in their classes. There was a discrepancy between computer skills of associate teachers and their students who knew "a lot more" (Zogheib, 2006, p. 92). Further major findings in the Zogheib (2006) study were that the Primary/Junior teacher education program lacks computer training, that other programs need extended time for the computer course and that the course should consist of two stages. The first stage should provide the basic skills training, while the second stage should be about pedagogy related to use of these skills.

Qureshi (2004) investigated correlations between university students' demographic characteristics (gender, age, marital status, employment status, student status, and number of dependents), their prior online/computer experiences, preferred learning styles, motivation, and elements of the online course design, as independent variables, and their satisfaction with the online course components, as dependent variable. Although the pre-service teachers were not included in this study, its results may be relevant for this research. Qureshi recommended that a specific course design model should be used for the Web-based environment. The individual characteristics of students, their learning preferences and previous experience with technology and online learning should be taken into account in designing the online courses. Also, adequate technical support appeared to be relevant for students' satisfaction with online courses.

Through a concurrent mixed-model approach, Magliaro (2006) investigated whether variables such as: gender, age, ethnic origin, previous undergraduate degree, division, computer experience, use of software packages, computer training, computer ownership and socio-economic status have a statistically significant impact on the computer self-efficacy beliefs of pre-service teachers. In addition, Magliaro used open-ended questions to explore pre-service teachers' computer self-efficacy results by examining their past technological interaction experiences and beliefs based on the four sources of self-efficacy

(performance accomplishments, vicarious experiences, verbal persuasion, and emotional arousal). Magliaro reported a significant difference among the study participants with respect to their undergraduate degree (in favour of participants with a Science degree), division (only between P/J and J/I), and previous experience with computers and software packages. However, there was no noted significant difference across genders (Magliaro & Ezeife, 2007).

In addition to research done elsewhere, these four studies in particular informed the research and the methodological approach used in this study. Consequently, the authors developed a survey instrument having in mind possible triangulation of the final results. The intent was to provide a "big picture" of the findings along the common themes in all the abovementioned studies, with the aim to infer conclusions that will potentially affect the decision-making procedures in teacher education programs.

Research Method

The goal of this study was to determine the needs of the teacher candidates currently enrolled in the Teacher Education program based on their ICT knowledge and skills, as well as their expectations of an ICT course that could have helped them to integrate ICT into their classroom teaching. The research questions for this study were:

1. What was the status of ICT literacy of the pre-service teachers in the Intermediate/Senior division prior to entering the Teacher Education program?
2. What are the pre-service teachers' expectations of and attitudes toward ICT learning and integration during and after the program?
3. How can the ICT literacy course be designed and taught in order to better meet the needs of the diverse pre-service teacher population?

Recruitment of participants for this study happened in two successive stages: in early February for the online survey; and in April, after the fourth block of practicum, for the focus group interviews. Students from the four I/S sections (N = 135) were invited to voluntarily complete the online survey and three volunteers from each section were invited for the focus group interviews (n = 12).

Online Survey

A questionnaire was designed to collect the baseline data on the participants' demographic information, their needs for ICT knowledge and skills, and their expectations of the Teacher Education program in terms of learning and teaching with ICT. The online version of the survey was created using the Pronto Survey software. The online survey was hosted on a network server in the Faculty of Education and an e-mail message was sent out to all the students in the I/S division, asking them to voluntarily participate in the study. A \$50 prize draw was used to encourage participation. Survey questions addressed, among others, participants' demographic background including age, gender, English language proficiency, previous educational experiences, and life experience in Canada. This information was used in the follow-up qualitative part of the study to fine-tune interview questions. By doing so, we followed Morgan (1988), who suggested for "the later stages of

a survey, when the data are in and the analysis begins, [to use focus groups] as a follow-up data collection, pursuing 'exploratory' aspects of the analysis" (p. 35).

Focus Group Meetings

Self-selected I/S pre-service teachers were organized into two focus groups. Semi-structured interviews were conducted in April, with six participants in each group. These interviews were tailored to further determine the participants' needs of ICT knowledge and skills, as well as their attitudes toward and perceptions of ICT integration into their classroom teaching. The interviews were carried out with the assistance of a graduate assistant. Focus group meetings were recorded digitally and recordings were transcribed by the graduate assistant before the data analysis commenced. In accordance with the nature of the semi-structured focus group interview, the interviewers used the guided approach to start each interview topic and allowed the participants to express their views (Gall, Gall & Borg, 2007). To obtain in-depth responses, the interviewers asked for elaboration on emerging topics. By the time data collection started, the course grades were already submitted, so participants did not fear the consequences should any of them decline to participate in the interview or answer specific questions.

Reflections from Instructors

One author of this article is the instructor of the ICT course and the other uses ICT extensively in a subject area course. After the interview data were collected and analyzed, we reflected on findings based on our teaching journals.

Analysis

Survey Data

The online survey attracted about 17% of eligible teacher candidates, which is an acceptable response rate for this type of data collection. By using the online survey, the researchers were able to contact the target population of pre-service teachers in the I/S division. Research comparing response rates among online, mail, and telephone surveys suggests that response rates are generally lower for online surveys than for mail or telephone surveys (Kraut et al., 2004); however, cost and convenience often outweigh the known disadvantages of online surveys (Reips, 2002). Although validity of data could not be claimed given such a low response rate, and selection bias might be a factor that contributes to the limitations of this study, some valuable interpretations emerged based on the survey data, especially in conjunction with the results of previous studies done on the same site.

Twenty-three students (17%, N=135) completed the online survey. Table 1 shows a snapshot of the demographic information of the respondents of the online survey (gender, age range, English language proficiency, online education experiences and academic degrees obtained before entering the program).

Based on Table 1, it seems that learners with previous online discussion experiences felt

more comfortable participating in online activities (including filling out an online survey) and females were more apt to participate in the research study. Most of these participants had an academic background in science or engineering while only a few ($n = 5$) had a background in the arts. As such, this sample although voluntary, was demographically similar to the make-up of the whole I/S pre-service teachers' population. However, since 70% of the online survey respondents were females, this sample was more gender-biased than the I/S division population, of which about 52% were females.

Table 1. *Online survey respondents' demographic information.*

Gender		Age Range			English Language Proficiency		Online Experience		Previous Degree		
Female	Male	20s	30s	40s	Native	Non-native	Yes	No	Bachelor	Master's	Doctorate
16	7	15	5	3	16	7	16	7	23	6	2
(70%)	(30%)	(65%)	(22%)	(13%)	(70%)	(30%)	(70%)	(30%)	(100%)	(26%)	(9%)

Note: Out of six participants with a Master's degree, one had two Master's degrees; one participant with a doctorate did not have a Master's degree.

There was a clear distinction in terms of number of participants between responses to the online survey obtained from the participants with a background in science or engineering compared to the participants with a background in arts or humanities. This phenomenon might be interpreted that pre-service teachers who had gained more experience in ICT during their previous program of studies, felt more comfortable filling out an online survey.

Twelve of the survey participants accepted the invitation to take part in the focus group meetings, which were organized twice, two days in a row, with six participants each.

Focus Groups' Data

A few themes emerged from the focus group interview data, including lack of agreement about what ICT are, challenges the participants experienced in the course Instructional Technology (Computer Methods), strategies they used to cope with the course assignments, expectations the participants had about the course, their attitudes toward learning and teaching of ICT, and suggestions for developers of ICT literacy courses.

Definition of ICT

Most participants agreed that "anything used to transform knowledge," both software and hardware should be counted as ICT. One participant stated that "all is technology." However, this omnipresence of technology is not without problems. The participants used statements like, "it exists just to be there" and "it is here but it is not there," to express frustration with ICT not being actually used in schools in which they did practice teaching.

Challenges the Participants Experienced in the Course Instructional Technology

(Computer Methods)

Challenges came from the level of the course and that of the program. The shared opinion between the pre-service teachers in this study was that there was not enough time to practice what was learned in class. The participants also indicated that although ICT should be integrated in all the courses of the teacher education program, since some faculty members are not skilled enough in ICT, such integration was not adequately modeled for them as future teachers. There were repeated requests to make the ICT literacy course more relevant because, as one participant declared, "in Physical Education it is difficult to incorporate technology."

Expectations the Participants had about the Course

The overarching expectation expressed by the participants was that the ICT literacy course will help them bridge technological skills/experiences they gained during their own schooling with those of teachers in the present Ontario school system. For example, one participant stated that during her elementary school placement, "[it] blew [her] mind seeing small children pointing fingers at the SmartBoard." However, at the time when this study was conducted, SmartBoards were not available at the Faculty of Education.

Depending on their background, other pre-service teachers' expectations of the course varied. For example, some of the participants thought this was a computer skills course. At the beginning of the semester, the students were told that this course was designed to develop their ICT literacy, and that it would have both theoretical and practical components. Still, the participants thought the required readings were "useless" or "not relevant." Those with little ICT knowledge and skills found the course overwhelming while those with a stronger background in the field found they could learn little from it. Some of the participants preferred learning some "hard skills," while others saw the class time as an opportunity for all to practice and be brought to the same level.

Strategies used to Cope with the Course Assignments

The participants employed various "survivalist" strategies in the course. Those who felt less knowledgeable took a less active role in the group work or required assistance from those with more expertise. In one of the course assignments, the pre-service teachers were asked to give a workshop on a topic related to the use of ICT in teaching and learning and many of them chose a topic they felt more comfortable about, even though they might have been more interested in something else. As mentioned earlier, this course included group work for students to develop their collaboration skills and different workshops were assigned with the intention to provide opportunities for students to "learn by doing" (Mishra & Koehler, 2006). Some of the participants understood the value of such activities but others considered group work as a "waste of time" as they preferred to learn from the instructor rather than from their peers, whom they did not see as knowledgeable enough (e.g., "I'd like to learn from experts and not from others who do not know enough").

Attitudes Toward Learning and Teaching of ICT

The participants were univocal in saying that it is important for teachers to become ICT literate, given that ICT can be utilized in all subject areas as a learning enhancer and a useful tool to assist students with special needs. They were especially enthusiastic about the World Wide Web stating that "knowing how to create [a] website is important for every teacher." One participant, obviously irritated, uttered "ICT is good, you should use it, but we do not know how." It appeared that the pre-service teachers coming from the science-related areas were more skills-oriented as they did not value theory-based reading materials as much as their peers with a background in arts or humanities did.

Suggestions for Curriculum Developers

Some suggestions for improvement were geared towards the ICT literacy course itself, while others were more related to the program in general. Regarding the course, it was suggested that the discussions on readings should be organized online instead of face-to-face as it was originally done. By doing so, more time could be allocated for other in-class activities. The participants also wished to be more exposed to hardware and software available at the school boards in order for their learning to have more practical value.

At the program level, the participants wanted the Instructional Technology (*Computer Methods*) course to expand from one to two semesters, so that they would not have to rush through the course material, as obtaining ICT knowledge and skills takes time. Some also suggested decreasing the number of courses offered in the Teacher Education program and redesigning the program in favour of an integrated curriculum so that learning could be more systematic and effective. Having a computer lab with a 24-hour access was seen as imperative by the participants.¹

Reflections from the Instructor

The first author of this paper was also the instructor of the Instructional Technology (*Computer Methods*) course. One of the biggest challenges he faced in the course was to accommodate the needs of pre-service teachers with different academic backgrounds as they perceive theory quite differently and their expectations of the course vary. Generally, the students with a background in science or technology have more skills in ICT, but have less appreciation in class activities such as discussions on readings. Other students with a background in the arts or humanities can come to the class with very limited knowledge and skills in ICT, which mostly consist of no more than basic e-mail use and/or basic word processing. These students tend to value the course readings more and participate in critiques of the readings with more advanced critical thinking than the students with science backgrounds.

Individuals or groups of up to four students did the tech workshops on topics chosen by the students. The instructor encouraged practical topics that were closely related to the students' teaching and learning. Consequently, most tech workshops were related to

software programs such as Microsoft Office Suite, MarkBook, Adobe Photoshop, Dreamweaver, and brief introductions to hardware such as laptop computers, digital still and video cameras, and PDAs. Feedback on the formative evaluation carried out on the course website indicated that some students found the tech workshops to be easy while others were overwhelmed. The latter group wished they had more time to practice and that handouts were distributed for future reference.

The instructor minimized lecturing in class as this course was designed with a learner-centered approach. Besides giving a few short lectures and workshops on ICT literacy and curriculum theories, the instructor acted as a moderator for the class activities and provided guidance and assistance when needed. In order to give students some good modeling of integrating ICT in teaching and learning, the instructor employed ICT in various ways in his lectures and workshops. After each class discussion on a reading or student tech workshop presentation, the instructor would elaborate or provide feedback. Most of the time the instructor's role was to clarify the course requirements and to correct misconceptions. Sometimes discussions on assigned readings took more time than what was allocated in class, so remaining questions would be posted on the discussion board on the course website. In such a way, the online environment served as a venue for extended discussions, even though there were only a few who participated.

For the purpose of developing students' collaborative learning skills, the students did a final project in groups of up to five members. The project was about integrating ICT in teaching and learning and had to be in a digital format such as a website, an interactive PowerPoint presentation, a movie, a computer-aided learning program, or a combination of those technologies. Through these projects, students gained more in-depth understanding of ICT applications, through enhancing their technology skills.

In the final online reflections on the course, many students, especially those who had come to the course with very limited ICT knowledge and skills, expressed their excitement and appreciation as they were able to create a website or to make a movie – something they thought earlier to be beyond their capabilities. However, students still disliked group work as they had not yet developed collaborative ICT skills to work on projects online. For them finding enough time to meet face-to-face and taking charge of their learning continued to be challenge.

Discussion

Recent studies show that although there has been strong pressure (from ministries of education, parents and students) to incorporate ICT in classroom teaching and learning, there has been insufficient support for teachers in terms of professional development, release time, educational resources and model instructional methods. In order to equip teachers with the knowledge and skills necessary to apply the rapidly evolving ICT in their teaching, it is important that even in their pre-service years teachers become knowledgeable about and amenable to these technologies.

In this paper, we present outcomes of the consultation process with pre-service teachers

after they completed the one-semester methods course on ICT literacy. Participants in this study demonstrated varied expectations of and attitudes towards ICT learning due to their academic backgrounds and other social and cultural conditions. However, there was little discrepancy pertaining to notions of the relevancy the ICT have and their integration into the Teacher Education program and the school curricula. As expected, the participants were mostly interested in features of the course that were skills oriented. Especially to pre-service teachers with science or engineering background, the theoretical elements of the course, including readings, seem irrelevant and an additional burden in a busy program. Even towards the end of the program, the pre-service teachers seemed to prefer options that would satisfy their current needs in the field, rather than those that would show them possibilities and innovative pedagogies. Nevertheless, it is encouraging that these future teachers value integration of ICT within teacher education curriculum and support differentiated course delivery as its participants arrive to the program with varied skills and attitudes.

This study obtained valuable input from participants including suggestions for improvements for the ICT literacy course and the design of the curriculum for the Teacher Education program. It was striking to see how close the opinions and suggestions emerging from this study were to those found in Zogheib's (2006) study. About five years passed between data collection for these two studies; different instructors taught the ICT literacy course; design of this course went through several changes and still the attitudes of pre-service teachers towards the course, ICT, and the program in comparison to their needs, stayed almost the same.

Similar to Magliaro's (2006) research, this study found the pre-service teacher population to be bimodal in terms of undergraduate degree (science vs. arts or humanities) and previous experience with computer technology (experienced vs. novice) with respect to their attitudes towards technology.

Since this study was undertaken, the computer lab at the Faculty of Education was modernized, its working hours were extended, lab assistants were employed, and the science and mathematics classroom were equipped with SmartBoards in addition to two mobile SmartBoards to be shared by faculty members. Given what has been learned from the pre-service teachers' data and instructors' reflections in this study, only minor changes occurred in the design of the course: readings were updated and required online discussions were increased from two to three. However, there were no changes in the Teacher Education program in terms of increased ICT training for all pre-service teachers (including P/J) and extension of the ICT literacy course to two semesters.

Conclusions

The findings in this study present technology education in the pre-service program as slow to change and lagging behind the advancements in the field. It takes time to learn and appropriate ICT, so having only one semester ICT literacy course is not advisable. Based on the results of prior studies done in the same setting and the results of this study, it

would be best to offer the ICT literacy course in two semesters and on two levels. While the introductory course would be ICT skills-based, its sequel would cover ICT pedagogical content knowledge training.

Recommendations about greater use of the online facilities should be taken into consideration, and instructors also need to find ways to engage pre-service teachers in online discussions. It seems that overall the best motivational strategy for pre-service teachers' involvement in the ICT literacy course would be to relate what is offered in the course to ICT available in schools. Still, it is of concern that pre-service teachers' perceptions around future use of ICT material are equated with the present status of ICT in schools. As demonstrated by this study, faculties of education sometimes use less advanced technologies than those presently available in schools to prepare future teachers to bring about positive changes in the school system, including technological.

One limitation of this study is in the small sample of Intermediate/Senior pre-service teachers who participated. Also, based on our findings, it is hard to see how relevant the pre-service teachers' learning in the ICT literacy course will be once they are in the field. However, this study identifies a number of issues that point to challenges teacher education programs may have when designing ICT learning experiences to prepare teachers to teach with technology.

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1. At the time when this study was done, there was one computer lab with about 30 workstations available during working hours (9am-4pm)