

USING ONLINE ACTION RESEARCH TO IMPROVE A TEACHER EDUCATION COURSE

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Abstract

This paper describes how an online space has been used as a venue for action research in a teacher education program. The research context is a general methods course on Information and Communication Technologies (ICT) for elementary and secondary school teacher candidates in a teacher education program. This blended course used an online discussion forum to encourage teacher candidates to share with their peers as well as the instructor their experiences, needs and expectations of the course, their suggestions on modification, their observations of ICT availability and usage in their placement schools, and their reflections on learning experiences in the course. Teacher candidates' inputs have been seriously taken into consideration to improve the design and delivery of the course.

Introduction

Information and Communication Technologies (ICT) are becoming more and more widely used in different walks of life including educational settings. Educators are expected by their employers and students to have thorough knowledge and skills of ICT in order to utilize them to enhance their teaching and student learning. The definition of ICT varies, but we tend to agree that "ICT include, but are not limited to, personal computers, laptops, printers, LCD projectors, palm devices, iPods, fax machines, cell phones, Internet, and Intranet" (Zhang & Martinovic, 2008, p. 150). ICT literacy does not only mean knowledge and skills directly related to how to use technologies such as computer hardware and software, but also those related to cognitive and social domains, which means that in the educational setting, a responsible user of ICT is conscious of the fact that ICT are situated in the world that is technologically connected and users are conditioned by their cultural, social, political and economical backgrounds.

This paper reports how the author used the online component of his ICT course, *80-332/322: Instructional technology*, for pre-service teachers at the teacher education program at the University of Windsor, Canada as a venue for action research. The course was offered as a general methods course on ICT for elementary and secondary schoolteacher candidates. This course is designed to develop teacher candidates' ICT literacy and to model the integration of ICT in curriculum, but as ICT evolve almost daily, and a big range in terms of ICT proficiency exists among teacher candidates enrolled in the program, it is hard on the one hand for teacher educators to get up-to-date information about the availability and utilization of ICT in local schools, and on the other for the instructor of the course to meet the needs of all the course members satisfactorily. By using the online discussion forum, the ICT course asks teacher candidates to share with their peers as well as the instructor 1) their self-assessed ICT proficiency and expectations of the course, 2) their suggestions on adjustments of the course, 3) their observations during practicum, in terms of the availability of ICT in their placement schools, and how the schoolteachers use them, and 4) their reflections on the learning experiences in the course and suggestions for the improvement of this required general methods course. These inputs from teacher candidates are used as a resource that helps to guide the modification of the course so as to better meet the needs of the course members enrolled.

Theoretical Background

Over the last two decades, researchers have had various discussions on the use of ICT in educational settings, focusing on cognitive, technical, and social aspects. A number of studies examined the uses of ICT in various learning environments and concluded that ICT could be used as an enhancer for 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, many curriculum documents promote ICT as important teaching and learning enhancers and encourage schoolteachers to use them in their classroom teaching. In order to have teachers use ICT, educational administrations need to get teachers specifically trained so they know how to integrate ICT in their teaching (Batane, 2004; Jacobsen, Clifford, & Friesen, 2002; Markauskaite, 2007; Mitchem, Wells, & Wells, 2003; Yildirim, 2000).

In terms of innovation and change (reform of school systems), schools may be found resistant in one way or another (Kearsley, 2004), but ICT are increasingly and consistently affecting teaching and learning in schools (Reid, 2006). Therefore, when schools recruit new teachers, they expect that graduates from teacher education programs have a reasonable knowledge of how to use ICT (Montgomerie & Irvine, 2001). Oren, Mioduser, and Nachmias (2002) 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". People may assume that 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), but this group of students typically lack information literacy skills, and their critical thinking skills are often weak (Oblinger & Oblinger, 2005), and they "do not necessarily understand how their use of technology affects their literacy or habits of learning" (Barnes, Marateo, & Ferris, 2007).

A review of literature pertinent to ICT appropriation in teacher education programs finds two arguments. One emphasizes the importance of technological skills and the other the integration of ICT knowledge and skills in teaching and learning (Zhang & Martinovic, 2008). Supporters of the former argument urge teacher education programs to provide future teachers with as many technological skills (e.g., word processing, PowerPoint, webpage design, Internet searching, basic hardware and software troubleshooting) as possible, while those of the latter stress more on the importance of developing pre-service teachers' perspectives of and pedagogical knowledge about technology integration. Proponents of the integration argument believe that the most effective way for teacher candidates to learn how to integrate technology in their teaching is to have them exposed to content-related technology knowledge. This knowledge is referred to as *technology pedagogical content knowledge* (TPCK) (Mishra & Koehler, 2006). One of the current issues about the ICT use in Canadian schools is how they are integrated into the curriculum (Plante & Beattie, 2004), so in the context of Canada, curriculum designers for teacher education programs need to consider the development of teacher candidates' knowledge and skills on how to integrate ICT in their teaching as well as the development of such skills themselves.

To have the teacher candidates motivated in the learning process concerning ICT knowledge and skills, and their integration, the instructor needs to find out how ICT are used in schools and the attitudes and perspectives of the teacher candidates, as these are closely related to how future teachers will use ICT in their teaching (Sasseville, 2004). The development of teacher candidates' ICT proficiency requires the instructor to figure out how to accommodate the needs of individual learners as they often come to the teacher education program with a huge range regarding their ICT proficiency. 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 instructors to carry out action research so as to improve their ICT courses in teacher education programs.

Asynchronous online communication has the potential to enhance learning by providing users with extended time (Aviv, 2001) and participants can engage in discussions with their reflections after thinking about what has already been said (Bird, 2004). Moreover, this virtual environment may promote critical thinking that leads to higher achievement and more satisfaction in collaborative learning (Alavi, 1994). The online component of this ICT course has been used as a venue for action research that aims to keep improving the course to satisfactorily meet the needs of teacher candidates currently enrolled and those coming into the program.

Action Research

Educators use action research to make improvements of their practice as well as make contributions to knowledge. Rather than emphasizing the notion of a generalizable theory, action researchers pay more attention to the uniqueness of each research situation (Bassey, 1995). As Johnson and Christensen (2008) argue that "in order to deal with the complex and changing environments, teachers need to continuously identify new programs and try new actions to improve the situation" (p.12), action research is one of the adequate methods to respond to the rapidly changing ICT areas and to contextualize the uniqueness of individual school situations.

Whitehead (1989) argues that the values of action research in education are those qualities that give meaning and purpose to the personal and professional lives of those who are involved in such research, and suggests that by examining the ways to improve their practices, the practitioners can have their educational values represented. The instructor and teacher candidates of this ICT course used the action-research approach to "question their own underlying assumptions repeatedly and articulate the values that give meaning and direction to their work" (Farren, 2008). The specific purpose of this action research is to involve course

members to participate in the process of improving the pre-service teacher education course so as to apply their learned knowledge in their future career, and the online discussion forums provide a space for the teacher candidates to share their learning experiences in the course and the idiosyncratic situations of their placement schools regarding advancement or problems of ICT use.

Research Context

In the past three years I have taught an ICT course to teacher candidates in the teacher education program at the University of Windsor, and I positioned myself not only as an instructor of the course, but also as an action researcher by facilitating involvement of all course members and learning from their feedback so as to improve my practice.

The teacher education program described here is 36 weeks long with 12 weeks devoted to teaching practice in local primary and secondary schools. Teacher candidates enrolled in this program came with diverse backgrounds in terms of their academic and life experiences.

Teacher candidates enrolled in this program are required to take some general methods courses including this ICT literacy course besides those in their specific subject area(s) that are called “teachables”. The ICT literacy course is offered to all the teacher candidates in the Junior/Intermediate (J/I) and Intermediate/Senior (I/S) divisions. The following is a brief description of the course:

Objective. The 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 and promoting the philosophy of life-long learning rather than focusing only on computer skills training.

Content. This course comprises both theoretical and practical components. For the theoretical part, teacher candidates are provided five articles to read. These selected articles or book chapters are pertinent to uses of ICT in education, ICT literacy for school teachers and students, equity issues related to ICT, and integration of ICT across school curriculum. Class members are asked to not only summarize contents of the readings, but also critically discuss and examine significant issues, identify, discuss and make decisions that reflect a solid understanding of the issues covered in the text; For the practical part, activities are designed for teacher candidates to be exposed to a variety of applications of hardware (e.g., Windows and Mac computers, data projector, scanner, SmartBoard, storage devices, etc.) and software (e.g., Microsoft Office Suite, Adobe Photoshop, Dreamweaver, Star Office, FTP, and social network software such as Facebook, Myspace, Blog, WiKi, Twitter, etc.).

Course Delivery Methods. This course is designed as a blended course which has face-to-face meetings and online discussion forums. The course management system, CLEW is used as the online communication space (before 2007 ViCKi was used as the course management system). Besides hosting course materials such as syllabus and required readings, this space is used for discussions and reflections. Teacher candidates are asked to do four online discussions, three required and one optional.

Online Activities

Besides providing course materials and other relevant resources, the online space of the course is used as a venue for online activities that are designed for action research. The following table gives a brief summary of the online activities:

Table 1: Online activities

Activity	Time	Purpose	Required/optional
1 st discussion	First week	Learning students' ICT literacy self assessment and expectations	Required
Formative assessment	Third week	Getting feedback regarding the course for adjustments	Optional
2 nd discussion	First practicum	Sharing observation and reflections on school ICT availability and use	Required
3 rd discussion	Last week	Reflecting on learning experiences and perspective/attitude change	Required

First required online discussion: As the teacher candidates population changes each year, and there is always a big range of teacher candidates' ICT proficiency in each class, it is necessary to learn their backgrounds and expectations at the beginning of the course. This self assessment is used to inform the instructor and all class members each teacher candidates' background in ICT and what should be addressed in the course. Teacher candidates also used this information to help them find group members for their class assignments, which are mostly group projects.

Formative assessment: By the end of each course, the University asks students to do an evaluation of the course and the instructor. This summative evaluation could be useful for administrative purposes, but students who are enrolled in the course will have no chance to benefit from the improvements made to the course based on their feedback, because by the time the instructor sees the evaluation results, the students enrolled have already completed the course. Formative assessment, which is carried out prior to the completion of the course, can provide prompt feedback to the course so the instructor can make adjustments to the course in order to better meet the needs of the students (Nan, 2003). A few weeks after the course starts, teacher candidates are asked to do a formative assessment of the course, with the purpose to help the instructor make necessary adjustments to the syllabus according to the feedback. My previous experience indicates that teacher candidates would be more willing to share their "real" opinions if such an assessment was made optional so they can choose to post their feedback if they want to and do not have to post something that does not really express their thoughts. Besides expressing their positive learning experiences, some teacher candidates made suggestions as to how to make changes to the course so as to better meet their specific needs. The formative assessment received many constructive suggestions. For example, when I first taught this course, I tried to have teacher candidates exposed to as much software packages available as possible, until the following message brought the importance of trouble shooting to my attention:

...The only thing I wish was more apparent in the course is use of HARDWARE and not just software. I think one of the big reasons technology hasn't seeped into the classroom is the "mystery" of using the school hardware. All it takes is that "Nightmare" class where the tech is out of whack and the teacher has to resort to their backup plan. After that fiasco, the teacher may say, "I won't do THAT again." If the course could address fixable problems with projectors, jump drives, digital screens, Data Samplers etc, I think the course will remove some of the mystery and help the ICT integration effort altogether.

There were other similar messages posted in the formative assessment and I modified the syllabus to keep a balance between hardware and software. Students who use Mac laptop computers told me that it was important for them to learn that they needed an adaptor to connect their computer to a data projector so they always had their own adaptor ready when they went to a school for their practicum.

Second required online discussion: During the first practicum, teacher candidates are asked to observe what ICT their placement school has and how they are used for teaching and learning. Teacher candidates responded to this discussion topic with their observations/inquiries and comments. Some of them described the hardware and software available in their placement schools. From these descriptions, we can see that the availability of ICT in schools differs significantly, meaning a variety of resources are available to some schools while there are only a limited few for others. One I/S teacher candidate stated that:

I am at [High School]. As far as I have seen, there is very little to no ICT in the classroom. There is an overhead projector - that's it. The Science Prep room has one computer, and the staff room has 2 computers. But from what I have seen the teachers use it to order Tiger's Tickets (Go Tigers!).

A J/I teacher candidate posted the following message describing the ICT infrastructure of her placement school and her experience of using them in her class:

The school where I went has a very limited number of computers: probably less than thirty and the teachers complain that some of those computers don't even work most of the time. For the three weeks that I was there, my class used the computer room only once and two or three students had to share a computer since many of them do not work. The students were working on muscular system. The students did not return there because the ICT was not beneficial. Only a few computers worked. We kept them in the classroom and the teacher used the overhead. My associate teacher had a computer in her room and she shared it with other teachers.

Besides observations, some teacher candidates also went an extra step to find out the plans of the school in terms of their ICT related resources. For example, one I/S teacher candidate stated that:

Regarding ICT in the classroom, my associate [teacher] has access to a variety of resources. Within the classroom itself, there is an overhead projector, CD player, TV, DVD player and a VCR. My associate teacher often uses the overhead projector with his lesson plans. However, he has used the TV and VCR to play a section of the CBC docudrama "Canada: A People's History".

In a grander sense the school itself has a lot of ICT resources available. There is a computer lab for teachers to use during prep, as well as a photocopier and printer. The school library has a minimal amount of books as students have access to an extensive online library. There are several computers available for student use in the library too.

The school also has approximately five LCD projectors for teacher use. Additionally all of the classrooms are hardwired for computer and internet access. The school also plans to utilize TV in the classroom, by creating video announcements next fall.

Associate teachers' ICT literacy was also reported as part of the observation:

My practicum is in an arts program at [High School] and the teacher I am working with is a self described computer illiterate, as am I. Having said that, the only ICT I have seen used are a CD player and a video player for movies. I should mention that I was very briefly shown the school website and my teacher's email routine for school business, etc. She also showed me how students check books out of the library with the school computer system. So I think the school actually is fairly up to date with its use of ICT, It's just that I haven't come in too much contact with it due to my teachable.

Some of the teacher candidates did not only give a description but also made reflections based on their observations of the school in regard of ICT availability and usage:

After the first week, I must say: High schools have come a long way since I left mine in 2001.

I was deeply impressed with my placement's ICT resources. Among the standard high school computer labs, there was Wi-Fi internet connections, projectors, high school accounts, and "computer carts".

In one lab day, students had to measure the pressure of the gas from a yeast and peroxide reaction. (If memory serves me well) The students shifted their row of desks to the middle of the classroom; then they rolled in the computer carts in the newly available space. They booted up the computers, connected via Wi-Fi, then started collecting electronic data from a Data Sampler Port called a "ThinkStation". The Software provided instant feedback with graphics. Students then saved their work on their computer accounts to work on later. After the lab, students shutdown the computers then rolled them back to their original space.

After seeing how well that lab was executed, I'm now a firm believer of computer resources being "modular". That way, they can be shared among many classrooms and maintain the "Traditional Classroom" where necessary.

For awhile, I was concerned of computers undermining a teacher's authority, but after that lab day, I'm pretty optimistic. :)

In the University classroom we use comparatively newer technology than many schools do, and we should not assume that the use of ICT is the same in these two different contexts. It was from the inputs of the teacher candidates that I realized that the SmartBoard in my classroom is mounted on the wall and a data projector came as part of the system, but in schools many SmartBoards and data projectors are portable and teacher candidates should learn how to connect their laptop computers to a projector, and they should be reminded to calibrate a portable SmartBoard before it is used.

An analysis of the messages posted by I/S and J/I teacher candidates of the past three years indicates that the ICT related resources have seen some improvements with time but there still exists a significant imbalance between school boards and among schools in the same school boards, which means inequality in ICT access,

especially digital divide (Mehra, Merkel & Bishop, 2004), is an issue that should be discussed so as to get enough attention of administrators and educators.

Postings to this discussion did not only serve as a "reality check" about school ICT availability and usage. Most postings indicated which schools the observation was done so those who will be placed for their next practicum at those schools will get some information about the schools they are going to, and by knowing the school in this regard can help them better prepared for their ICT use in those schools.

Besides teaching the course, I also act as a faculty adviser to some teacher candidates. I use the opportunity of visiting my advisees in their placement schools to observe and talk with the associate teachers to find out what ICT are there and how they are integrated in the classroom. I post my observations and reflections to the discussion area like my students are asked to do so we share our ideas through the discussions, and this also gives my students a feeling that we are all participating in the action research as a team to achieve our goal for a better course. Class members are encouraged to come back to this thread and post their observations and reflections during their following practica, but in order to facilitate valuable postings, the follow-up activity is made voluntary.

Third required online discussion: Towards the end of the course, teacher candidates are asked to post a message to 1) reflect on what they have learned in the ICT course and 2) share how their perspectives of and attitudes toward using ICT for teaching and learning have changed through the course, and 3) make suggestions for the improvement of the course and curriculum. Due to their previous ICT proficiency, some teacher candidates felt they learned a lot in this course while others thought they just learned a few new items. However, most of them said that their perspectives and attitudes changed from perceiving ICT only as tools before taking the course to believing appropriate and effective use of them could enhance teaching and learning.

Conclusion

ICT and student population keep changing so it is important to conduct action research in the teacher education program to improve the practice. The asynchronous online discussion forum provides a space for teacher candidates to post their inputs which are used as guidelines to modify the design and delivery of the course. In the past three years, the action research I have conducted through the online component of the ICT course has helped me as the instructor to have a better understanding of the teacher candidates in each class in regard of their ICT needs and learning experiences in the course. Teacher candidates enrolled in the course shared their ideas and suggestions through the online discussions which provided valuable inputs for the improvement of not only the course, but also the ICT curriculum of the teacher education program. This online action research has also given me updated information about ICT availability and usage in schools where my students have their practice teaching. This information is useful for us teacher educators to find ways to prepare our teacher candidates with knowledge and skills that are not only expected by schools, but also can possibly provide leadership in ICT integration in classrooms. What is equally, or more important about the action research is that by carrying it out as an ongoing project, the improvements having been done based on the participants' inputs have benefited students enrolled in each academic year, and each cycle of the action research makes new improvements to satisfactorily serve every section of the course in the teacher education program.

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