

**THE TEACHING AND LEARNING IMPLICATIONS FOR PRE-SERVICE AND  
FIRST YEAR TEACHERS OF INTRODUCING LAPTOP COMPUTERS IN A  
ONE YEAR BACHELOR OF EDUCATION PROGRAM**

**Heli Vail: Professor of Methods, Nipissing University, Ontario [heliv@nipissingu.ca](mailto:heliv@nipissingu.ca)**

**Darlene Brackenreed: Professor of Special Education [darleneb@nipissingu.ca](mailto:darleneb@nipissingu.ca)**

**Dr. Lorraine Frost: Professor of Special Education [lorrainef@nipissingu.ca](mailto:lorrainef@nipissingu.ca)**

**Dr. Cher Harvey: Professor of French as a Second Language [cherh@nipissingu.ca](mailto:cherh@nipissingu.ca)**

**Dr. Sandra Reid: Director of Concurrent Education [sandrar@nipissingu.ca](mailto:sandrar@nipissingu.ca)**

**ABSTRACT**

*Nipissing University recently introduced a laptop component in the Bachelor of Education program. Forty pre-service teachers used laptop computers in class, at home and during practice teaching. This paper presents the findings obtained from surveys during participants' pre-service year and from classroom observations and interviews in their first year of teaching.*

*Overall findings of the pre-service survey indicated no significant differences between the laptop group and the non-laptop group in self-reported knowledge, skills and attitudes. Classroom observations and interviews indicated all participants maintained positive attitudes towards technology but expressed frustration with the lack of hardware, software, resources and support in their schools.*

**Key words: laptop computers, education, pre-service teachers, technology**

## **Introduction**

In the new economy, change is driven by the rapid increase of knowledge, the proliferation of communication technologies, and the globalization of markets. Educators must understand in a profound way that the 21st century, in which our children will be lifelong learners and workers, is one in which comfort with and command over technology is a prerequisite for survival (Bains, 1997). Many educational institutions are taking a leadership role in helping prepare citizens to fulfill major economic and social goals. The paradigm shift from “preparing teachers to use technology to using technology to prepare teachers is evident” (Cassady, 2001 p.9). However, implementation of Information and Communication Technology (ICT) programs remains a challenge and analyzing the success of technology in education is becoming a global issue (Dean, 2001). In faculties of education there are specific calls for change.

"We can no longer ignore or minimize teacher training. Those in charge of school technology programs ... must shift ... budgets and efforts over to designing and implementing training programs for all teachers on integrating computers into the curriculum." (Tarleton, 2001)

Nipissing University in North Bay, Ontario, Canada is a small university situated in Northern Ontario having a full time enrollment of about three thousand students. Seven hundred of those students are in a one year consecutive Bachelor of Education program. The Faculty of Education introduced the ICT infused education program in 2001, making it the second university in Canada to implement laptops for pre-service teachers. The decision to move to a laptop program delivery came from the increased use of technological software by the Ministry of Education, the recommendations from the

Ontario College of Teachers to improve computer program delivery, and the high cost of computer labs for increasing student populations.

A four year plan was developed to provide successful implementation for all university stakeholders (Stetson & Bagwell, 1999). In year one, a pilot group of forty Junior/Intermediate Division pre-service teachers were given laptop computers to use in class, at home and during practice teaching. As well, along with other students in the faculty of education, they had access to a computer lab and the mandatory twelve hour course in ICT applications in education. This paper presents the findings obtained from surveys during the participants' pre-service year and from classroom observations and interviews in their first year of teaching.

### **Purpose of the study**

This two year longitudinal study evaluated the impact of intensive exposure to ICT through the use of laptop computers. Research questions were: 1. What impact does the introduction of a laptop computer component in a one year Bachelor of Education program have on the perceived knowledge, skills and attitudes of pre-service teachers? 2. What impact does the introduction of a laptop computer component in a one year Bachelor of Education program have on the knowledge, skills and attitudes of first year teachers? Examination of these questions allowed us to contribute to the paucity of research in this area. Providing data collected at two points in a longitudinal study offers richer understanding of participants' experiences than data collected at a single point.

### **Significance**

This study is significant for several reasons. First, during the process of change, it is very difficult to conduct research (Fullan, 2001). As few other faculties of education

have documented research on laptop implementation it was important to determine the impact the introduction of a laptop program has on beginning teachers, considering the time and expense of such programs.

Second, Nipissing University's laptop program in the Faculty of Education is the first program of its kind in Ontario and the second in Canada to encompass the use of laptops in all subject and course areas, offering an infused ICT program. Laptops are used by the students not only in the university classroom, but also at home and while they are out in their practice teaching sessions.

Third, the research provides information that may help determine if student access to laptops, as opposed to desktop computers in laboratories on campus, has significant advantages or disadvantages. Results of the study could be used by teacher educators and administrators who are considering introducing ICT infused programs into their teacher preparation. As well, the four year implementation model may provide teacher educators with a framework for understanding and adapting to technological change. This is an important initiative since few universities have developed strategic plans for guiding the appropriate and efficient use of mobile computers to enhance learning (COU, 2000).

Fourth, the results may help teacher educators and administrators to determine the value associated with introducing laptops in teacher preparation programs as well as understanding the difficulties and challenges faced by teachers and students in school systems.

### **Literature review**

To prepare youth of today for this century's global markets, teachers from all disciplines must collaborate to adapt practices for technological change. "Teachers must

be competent users of technology if school systems are to keep up with rapid change" (Dickson, 1994). Schools are expected to teach students the skills necessary to succeed in a global market (Karchmer, 2001). Rapidly increasing computer use in industry and home has caused education systems to respond by trying to offer more opportunities for students to use ICT. Simply providing a computer and software in the classroom, however, does not guarantee an optimal learning experience for students. "The educational use of information technology best improves learning when those technologies are accessible, flexible, responsive, participatory and integrated thoroughly into all public school programs" (Government of Nova Scotia, 1999). Some provincial policies have developed generalized expectations for each subject. "The use of computers can extend and enrich students' learning in important and unique ways. Whenever possible therefore, students should be encouraged to use computers" (Government of Ontario, 1998). Some have articulated a need to revise current teaching practices.

The integration of information technology within the public school program allows teachers and students to create and employ novel, alternative ways of achieving outcomes. For some students, it provides access to previously inaccessible curriculum. It affords all learners sophisticated cross-curricular learning opportunities through changes in pedagogy. (Government of Alberta, 1999)

These current policies reflect initial attempts by governments to address issues of information technology in education, but are often vague or too broad in scope. Research relevant to education and lifelong learning is needed to provide information

for educators and policy makers to examine technological change as a challenge to learning (American Society for Training and Development, 2001).

While many schools struggle with the costs of acquiring hardware and software, they are equally challenged in finding teachers who have adequate expertise in the educational applications of ICT. Yildirim (2000) indicated that a conclusive body of literature exists that shows lack of adequate teacher education in ICT is “the biggest obstacle to teachers using technology in their classrooms”. It is important that investment of scarce education dollars in educational ICT provide the best outcomes for students. Home use of computers by students may expose them to some applications, but usually not those that truly enhance learning. For many students, the school still provides more access to computers than the home (Trotter, 2003). Therefore, it is important that teacher education institutions ensure that new graduates are sufficiently versant in ICT to use it well in their classrooms.

Providing pre-service teachers with the knowledge, skills and attitudes necessary to work with ICT in their classrooms can be accomplished most effectively by an ICT infused curriculum in their program of study. Reed, Ervin, and Oughton (1995), in their review of research on computers and students in elementary teacher education programs, found that the amount of computer experience provided during education programs may affect the extent to which new teachers will implement technology in their own teaching. Although many teacher education programs provide students with a course on computer technology in which the basics of computer use are taught, pilot projects demonstrate that “the sooner school teachers are equipped with a personal laptop, the sooner they will engage in producing digital, educational materials for their classroom” (Laferrière,

Breleux & Bracewell, 1999, p.12). Abbott and Faris (2000) also found that integrating computer technology into the curriculum of teacher education programs better enables new teachers to use technology in their teaching.

That many teachers feel poorly prepared to use ICT in their classrooms, and that they under-use available technology has been well established. To encourage pre-service teachers to use technology, education faculty must model the use of technology in their courses (Cassady & Pavlechko, 2001; Duhaney, 2001; Kruger, Hansen & Smaldino, 2000). Many researchers suggest that teacher education programs must respond to the need for better preparation in educational ICT, and that the best way to respond is through an ICT infused program that emphasizes technology applications throughout the entire education program (Duhaney, 2001; Kreuger et al., 2000; Luke et al. 1998). However, long-term effects on the practice of graduates from an ICT infused program have *not* been established. The relatively recent and emerging literature focuses on the most effective way to graduate new teachers who are sufficiently ICT capable in their teaching. ICT infused teacher education programs are few in number, and therefore, substantive literature is not available on the actual impact of such programs on teaching practices of the graduates.

### **Research methods**

The quantitative data was collected in year one of this study. In 2001-2002, eighty pre-service teachers were divided into two groups of forty students, one with laptops and one without, chosen by random selection. The group with laptops was the pilot project section for the four year laptop program implementation at the faculty of education. Data

collected from these pre-service teachers included a survey at the beginning of the year and a survey at the end of the year.

The qualitative data was collected in year two. In 2002-2003, six first year teachers, three randomly selected students from the laptop group and three from the non-laptop group, gave consent to the researchers for a half-day, in-class observation and a one hour interview in the schools where they were employed. Our initial intent was to have a large number of students continue for our qualitative data, but that was not the case. Thirteen participants agreed to continue with the research in their first year of teaching. Due to factors such as hiring practice, participant drop out, and regional inaccessibility, only six participants were available. We looked at their stories as narrative and treated the information as case study data (Stake, 1995).

### **Data collection**

The Technology Survey completed by pre-service teachers was divided into two sections to measure knowledge and skills in Part A, and attitudes in Part B. The survey consisted of a series of thirty-nine statements to which respondents selected an appropriate answer. The Likert scale consisted of integers ranging from 1 (Disagree) to 5 (Agree). The following possible responses rate knowledge, skills and attitude with respect to ICT: (1) Disagree, (2) Tend to Disagree, (3) Unsure, (4) Tend to Agree and (5) Agree. One open-ended question at the end of the questionnaire invited respondents to make additional comments. The Likert scale responses were analyzed by percentages.

The In Class Observation was completed by researchers while observing first year teachers, both laptop and non-laptop, who volunteered to participate in this segment of the study. For the half day in-class observation researchers used a criteria checklist to

determine the use of technology for the development, implementation and assessment of lessons. Criteria included a check for concrete evidence of technology in the classroom, teacher and student use of technology in the classroom, collaborative interactions regarding technological use, and the first year teacher's attitude towards technology. Data was analyzed for frequency of occurrence.

The Interview of First Year Teachers, both laptop and non-laptop, occurred after the classroom observation. Researchers asked participants specific and open-ended questions related to their use of technology. Questions centred on enablers and barriers to the use and integration of technology into their teaching. The interviews were audio-taped and then transcribed. The transcripts were analyzed for statements of use of ICT, as well as emerging themes.

### **Participants**

It is important to look at the characteristics of the participants in each of the two groups before reading the themes that emerged from the data. Specifically, the control participants each had a very strong background in computers, and perhaps this interest is why they continued to be participants in their first year of teaching.

The pilot group included: one female who had previously taught computers at the college level; one female, a recent undergraduate, still living at home; and one female, a recent undergraduate, who liked technology, had a positive attitude, and was a spokes person for her friends.

The control group included: one male who had previously taught computers as a technical assistant in the school system; one male who admits to being a computer junkie and had previously been an educational assistant in the school system; and one female,

directly from her undergraduate degree, demonstrating leadership within her section, and monitored an additional course in her B.Ed. year.

## **Findings**

Overall findings of the technological survey for pre-service teachers indicated no significant differences between the laptop and the non-laptop group in self-reported knowledge, skills and attitudes. This survey revealed that both groups used their knowledge of technology to complete educational and professional tasks. The questions relating to knowledge revealed that both groups knew about the responsible use of technology and incorporated technological expectations into the planning, development and implementation of their lessons.

The questions relating to skills revealed that both groups possessed the skills for planning, managing routine tasks, implementing policies, teaching, and collaborating with others for professional growth. The questions relating to attitude revealed that all participants self reported positive attitudes towards the use of ITC.

The Observation Checklist of the first year teachers included four components. The first component focused on the observance of concrete indicators of the use of technology in the classroom by the teacher and the student. The results for teacher indicators showed that both laptop and non-laptop groups used desktops and laptop computers in the school. Neither group had posters, positive messages, organizational references or reference books visible in their classrooms.

The results of the second component indicating teacher use of technology in the classroom was varied. All of the first year teachers, both laptop and non-laptop groups, used technology for concept development, word processing and for completing

assignments. Both groups used technology to find resources, and to prepare activities and handouts requiring the use of technology. Both groups also used technology to find curriculum expectations and resources. The three laptop teachers used technology to record marks, compared to some of the non-laptop teachers using technology for this purpose. The laptop group used technological means to communicate with students. The non-laptop group did not.

The third component of the in-class observation, the collaborative interactions regarding technology, showed no observable difference between first year laptop teachers and the first year non-laptop teachers.

The fourth component, the first year teachers' attitudes towards technology, revealed that both the laptop and non-laptop groups had positive attitudes around the use of technology. They indicated that it made planning, development, implementation and assessment tasks easier, faster and more efficient. The students of the laptop and non-laptop first year teachers stated that they needed more up-to-date availability of hardware and software in their classrooms.

The Interview of first year teachers indicated, for all participants, a wish to have a laptop devoted exclusively to them for use in planning, developing and implementing lessons. During their first year of teaching they felt technology was useful to them for the planning, development and implementation of lesson and unit plans. All expressed a desire to have greater access to technology for their students during class time. Those with some access to technology for their students stated that it had empowered their students' learning. Although both groups had maintained their positive attitude towards

technology in their first year of teaching, all stated that they were frustrated by the lack of hardware, software, resources and support in their schools.

### **Findings**

The themes emerging from the interviews indicated that all first year teachers had learned a lot in our program about computers and educational software, had a comfort level with technology skills, and felt that computers are helpful. The strongest theme to emerge was the feeling of frustration with the lack of technology available in classroom as well as the frustration of not having their own laptop and having to stay late at school to use a laptop.

### **Implications for practice**

The results of this study have several implications for university administrators and faculty as well as teachers, principals and administrators in school boards. This research may enhance understanding of technological change by faculty, pre-service teachers, teachers, students and school systems (Matthews & Karr-Kidwell, 1999). The impact of mobile computing programs on university teaching and learning may give educators more information about the use of technology in teacher education programs (Heck & Wallace, 1999). In addition, the results of this study may inform educators of the advantages and disadvantages of implementing a mobile computing program.

The research also provides information to educators concerning the use of communication technology in education since laptop computers provide fast, mobile communication at university, school and home. Faculty and students were able to communicate, problem solve and peer mentor using tools, such as e-mail and web-based applications, from a distance. Wireless computers enabled instant access to global resources.

Results from the pre-service technology survey indicated positive attitudes towards technology in the pre-service year. These positive attitudes continued in the first year of teaching; however, attitudes reflected frustration because of the lack of hardware, software, resources, and support in their schools. As well, results from the first year teacher in class observation and interview indicated positive attitudes towards technology in the first year of teaching; however, attitudes reflected frustration because of the lack of hardware, software, resources, and support in their schools. This information may help school administrators make better informed decisions when developing strategic plans, budgets and programs.

### **Higher order applications of technology**

This research has far-reaching implications for all pre-service teacher candidates, and more importantly, the students they will be teaching in the future. Will it be necessary to ensure that all our students have access to a laptop to implement the best learning environment? Will laptop technology be a viable substitute for traditional methods of collecting, recording, storing and retrieving information for students in the classroom? Related to this are additional implications around methods of providing information about student progress to both students and parents/guardians. The advantages of maintaining a physical classroom environment versus a virtual on-line environment has been a question that has been posed since the introduction of technology in the classroom.

### **Diversity and equity**

Instruction supported intensively through the use of technology has tremendous benefits for all special-needs students who require additional modifications and

accommodations to be successful. A laptop computer program in a Faculty of Education enables all individuals to have equal access to information, effective learning strategies and a means for efficient communication to help support individual learning. Teachers can design, develop and utilize technological systems to meet the needs of their students through the use of laptops and assistive technology software.

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