The Impact of Motivation on Prospective Teachers' Use of Information and Communication Technologies (ICTs)

Abstract

The purpose of this study is to understand the role of motivation in the use of ICTs by student teachers during their field practice. In all, 6998 student teachers participated in one of the largest studies in North America centered on various aspects of the use of ICTs in teacher education programs. Statistical analyses were conducted to assess the impact of motivation on the use of ICTs. They reveal that motivation is positively related to the use of ICTs during internship. Outcomes also highlight gender impacts on motivation and technological abilities. These results, issued from a large-scale study, could have important implications for teacher trainers, school principals, and policy makers.

Objective

The goal of this study was to understand the role of motivation on the use of ICTs by student teachers during their field practice. We also wanted to find out which factor played a significant role on the use of ICTs by prospective teachers working with students. Moreover, we were looking to uncover some of the factors playing a significant role in bringing prospective teachers to have their students use computers regularly at school, in their academic classes.

Problem: The Need for Scientific, Empirical Studies on ICTs and Teacher Education Programs in Quebec (Canada)

Schools and universities responsible for teacher education programs are evolving within a context of change in terms of the relationship to knowledge and are entering full force into the maelstrom of numerical information, computers and the Internet. For many, this technological revolution brings with it countless advantages that schools and universities can and must value while accomplishing their fundamental mission of education. Today, ICTs, capable of enabling universal access to knowledge, hold a power and reach for schools that not even Edison could have imagined. ICTs can simultaneously combine text, image, sound, interactivity and programming. They can also "record" and transmit worldwide. Indeed, the integration and judicious use of ICTs could allow the field of education as a whole to grow by enabling collaboration, improving research environments and contributing to intellectual production conditions in a significant manner.

In 2005, we might also hope that newly trained teachers have the necessary competencies to make regular, pedagogical use of technologies. But is this truly the case? More evidence is indeed mounting to support the claims of technology advocates that ICTs (communication tools, computer-assisted instructional applications, etc.) can positively influence student learning. However, beyond the discourse asserting the "intrinsic virtues" of ICTs in terms of learning, the coming together of technologies and education is emerging as an independent field of research, requiring specific scientific study, probing and analysis. There are a variety of contexts in which technologies are integrated that have not – yet – scientifically and systematically proven themselves to be effective. In fact, experiences are varied and numerous but not all are valuable for learning, nor efficient for teaching.

Despite the overwhelming presence of technologies in teacher education programs and the constant increase of pilot projects focusing on teaching with ICTs, there are still many unanswered questions on their true effectiveness (see for example Ruano-Borbalan, 2001; Zhao and Frank, 2003) and a lack of well-documented and rigorous experiments. For instance, Ungerleider (2002, p. 19) argues that "There are simply too few studies of sufficiently rigorous design to permit informed policy choices. This is especially troubling given that the use of ICTs requires significant expenditure of scarce resources".

Hence, the arrival of new technologies in many schools and classrooms currently appears to be one of the great focuses of teacher training programs and education reforms in Europe and North America. Across Canada, a new approach can be noted in initial teacher training, stemming away from technological training and heading towards training centered on the pedagogical integration of technologies. Yet there is a certain danger in this – perhaps too hasty – swing of the pendulum.

Though it appears understandable that the ultimate objective for teacher education should be the *pedagogical integration of technologies*, it is not, however, obvious that teachers do indeed already possess the technological abilities for such an assimilation of ICTs within teaching or learning. In Quebec (Canada)[2], this uncertainty with regard to the new conception of teacher training has generated much questioning from academics in terms of the competency of future teachers to integrate ICTs, as well criticisms from school principals who feel that new teachers are not adequately prepared to integrate ICTs.

Theoretical Framework

While it appears that ICTs can, in principle, be integrated into teaching practices to nurture learning and increase student achievement, various constraints have often muffled teachers' use of ICTs. Indeed, Osborne and Henessy (2003) highlight that even where technology is available, it is often underused and hindered by a set of practical constraints and teacher reservations. Various studies conducted both in Europe and North America have also shown that regardless of

teacher training programs and an increase in ICT resources, there has been a disappointingly slow uptake of ICTs in schools by the majority of teachers (Cuban, 2001).

Various explanations could be given for this lack of sustained increase in the pedagogical use of ICTs in the classroom, such as the lack of time (Cuban, Kirkpatrick and Peck, 2001; Fabry and Higgs, 1997; Preston, Cox and Cox, 2000), the lack of self-confidence in using ICTs (Pelgrum, 2001; Yan and Piper, 2003), negative experiences with ICTs in the past (Snoeyink and Ertmer, 2001), classroom management difficulties (Drenoyianni and Selwood, 1998), and particularly, the insufficient motivation of teachers (Braak, 2000; Carter and Leeh, 2001; Cox, Preston and Cox, 1999a; Cox, Preston and Cox, 1999b; Hammond, 2002; Kankaanranta, 2001; Snoeyink and Ertmer, 2001).

Indeed, motivation, a force that energizes and directs behavior toward a goal (Eggen and Kauchak, 1994), is critical for learning, and several researchers have found a positive and robust correlation between motivation and teachers' use of ICTs in Europe (Braak, 2000) and North America (Lin, Hsieh and Pierson, 2004). In their investigation, Yan and Piper (2003) examined, among other things, the relationship between self-efficacy, attitudes, and teachers' implementation of computers in the classroom. They found a strong relationship between motivation and computer use in the classroom.

Are computers playing a significant role in teachers' instructional practices? Larry Cuban continues to argue that they are not (Cuban, 2000; Cuban, 2001). Using data from a national survey of 4100 teachers' pedagogy, computer use, and teaching environment, Becker and Ravitz (2001) show that Cuban's postulate is true, in a statistical sense. Is it still the case now? What is the impact of motivation on teachers' use of information and communication technology with school children? These are some of the questions that led to our undertaking of one of the largest studies on ICTs and teacher training ever carried out in North America or Europe[3].

Method

Participants

In all, 6998 student teachers participated in this research centered on various aspects of the use of ICTs by prospective teachers. The subjects represented 70 % of all prospective teachers enrolled in a four-year teacher education program from all Quebec (Canada) universities offering initial teacher training in 2003. They had a mean age of 21.3 years old, and 85% were women, while 15% were men. This gender distribution corresponds to the usual breakdown of the population enrolled in teacher training in Quebec. Finally, the subjects are present almost equally in each of the four years of study ranging from 21.8% to 28.0%.

Procedure and Measures

The study consisted of a questionnaire administered to prospective teachers from all francophone Quebec universities (N = 9) offering initial teacher-training programs in 2003. In order to reach as many student teachers as possible, the questionnaire was administered during compulsory courses, with the necessary authorizations. The questionnaire was composed of several open-ended questions such as *"In which context did you use ICTs during your last internship"*. It also included several validated scales measuring prospective teachers' motivation towards technology, as well as their technological abilities with ICTs. The scales were identified by a review of the literature on ICTs and student teaching. The attitude-motivation scale is based on Deci and Ryan's motivation theory (2000) and was validated in previous studies (see Karsenti, Savoie-Zajc and Larose, 2001**)**. We used the Dussault, Villeneuve and Deaudelin scale (2001) to measure self-efficacy beliefs about teachers' use of ICTs.

The internal consistency of the subscales was assessed with the use of the Cronbach alpha. Results from this study reveal that the internal consistency of all subscales is excellent, ranging from .78 to .91. The self-efficacy scale was based on Bandura's self-efficacy theory (1977, 1989). Self-efficacy, the beliefs in one's capabilities to organize and execute the sources of action required to manage prospective situations (Bandura, 1989) should influence the choices one makes, the effort put forth and how long one persists when confronted with obstacles or failures. For Bandura (1997), self-efficacy is both context-limited and action-specific. It also comprises two components: *efficacy expectations* and *outcome expectations*. *Efficacy expectations* refer to the belief in one's capacity to achieve a given action in a specific context. Many researchers refer to this concept as *perceived competence*. *Outcome expectations* refer to the belief that the action performed will result in a particular, desired outcome. Many such as Pajares (2001) refer to this second concept as *perceived value*. In this study, we used *perceived competence* and *perceived value* as the two components of self-efficacy beliefs.

The final procedural step of our investigation consisted of statistical analyses to assess the impact of motivation on the use of ICTs by student teachers. We wanted to ascertain the underlying factors (in particular attitudes toward ICTs and technological abilities) related to student teachers' use of ICTs during their field practice.

Measures of correlation were used to describe the degree of relationship between variables (Glass & Hopkins, 1984), namely the "Use of ICTs during internship" variable, versus the "perceived competence" variable and the "perceived value of ICTs" variable. SPSS 11.0.1 (on Mac OSX) was used to create a correlation matrix. According to Tabachnick & Fidell (2001, p. 35), "an analysis of variance is a set of analytic procedures based on a comparison of estimates of variance" which is "used to compare two or more mean to see if there are any reliable differences among them". In our study, it helped determine differences between ICTs users and non-users for the five types of motivation (Deci & Ryan, 2000).

Results

Overall, the data collected sheds an interesting light on the motivation and competencies related to ICTs for newly trained teachers. Furthermore, as those questioned were undertaking their field practice, it is noteworthy to add that the results of this study also give us insight into the use of technologies for close to 7000 Canadian classrooms.

Use of ICTs

In one of the sections of the questionnaire, we were trying to understand if future teachers use ICTs in a teaching context during their field practice. In this matter, we believe we obtained the most interesting results of our study. For the question *"During your last field practice, did you use ICTs?"*, 45% of student teachers answered "never" or "rarely". However, for the whole of the respondents registered in the preschool and elementary teacher training program, the use of ICTs is more frequent (only 35% indicate that they never or very rarely use ICTs).

The number of participants that were using ICTs during internship differed significantly by training program (only elementary and secondary programs were considered), as supported by our results, $F(1, 3772) = 345.41$, $p < .001$.

As confirmed by an analysis of variance (ANOVA), it is also interesting to note that gender had a significant impact on the use of ICTs during internship, $F(1, 4946) = 83.63$, $p < .001$.

Motivation of Future Teachers Towards ICTs

Self-determination results.A great number of studies have shown that human factors such as motivation and feelings of competence are likely to support or inhibit behaviors (see for example Deci and Ryan, 2000), such as the use of technologies in the classroom (Ungerleider, 2002). We were therefore not surprised by the results (e.g. Table 1) of our study showing that a high level of motivation (according to Deci and Ryan's self-determination theory) and a strong self-efficacy belief with regard to ICTs go hand in hand with a greater use of ICTs in the classroom.

- - - INSERT TABLE 1 HERE - - -

Figure 1 highlights that the average score obtained by prospective teachers who use ICTs during their field practice, for the types of motivation reflecting a high self-determination are significantly higher than the average score of those who do not use ICTs, namely introjected regulation, $F(1, 4910) = 54.89$, $p < .001$, identified regulation, $F(1, 4918) = 210.89$, $p < .001$ and intrinsic motivation, $F(1, 4920) = 281.40$, $p < .001$).

- - - INSERT FIGURE 1 HERE - - -

Also, for the type of motivation reflecting the lowest level of self-determination (amotivation) an ANOVA reveals that the average score obtained by preservice teachers who use ICTs during their field practice is significantly lower than the average score of those who do not use ICTs, $F(1, 4907) = 197.26$, $p < .001$.

Discussion

Surveys and investigations always involve a certain margin of error and we must be cautious in our analysis and interpretation of the data collected. Nonetheless, a total of 70% of the future teachers (6998) trained in Quebec participated in our investigation.

Indeed, we could have presented all the innovative and exemplary uses of ICTs observed (and they are often impressive), but the objective of our study was to understand the role of motivation in the use of ICTs. Moreover, we wanted to uncover some of the factors playing a significant role in bringing prospective teachers to have their students use computers regularly at school, in their classes.

This would help us understand if, in general, future teachers in Quebec are adequately trained to integrate ICTs. That is why our analysis was mainly centered upon the respondents as a whole, and not on the exemplary use of ICTs by certain student teachers. Finally, it is important to highlight that our results are specific to the Quebec context, different from others, but also similar to many.

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Footnote

[1]Excerpt from a speech by Thomas Edison en 1913. Source: National Digital Library, http://memory.loc.gov (last consulted in June 2004).

[2]Though we sometimes refer indifferently to Quebec or Canada, it is important to note that education in Canada is the responsibility of each province (there are ten provinces, and Quebec is one of them). Nevertheless, there are many similarities among the educational systems of each province, including teacher education programs.

[3]This study was conducted with a grant from the Social and Human Sciences Research Council of Canada.

[4]In Quebec (Canada), every teacher education program lasts fours years and student teachers are required to complete 120 days of supervised practicum (field practice) in schools associated with universities.

[5]Source : *Ministry of Education*: http://www.meq.gouv.qc.ca/CPRESS/cprss99/c990614.htm

[6]Source : Ipsos-Reid ICT survey : http://www.ipsos-reid.com

[7]Source : http://www.statcan.ca

Table 1

Percentage of female and male students enrolled by program and academic year

Training program (N = 6998)			
Education program	Female (%)	Male (%)	Total (%)
Preschool and elementary	49.8	3.1	53.0
Special education	15.6	0.7	16.3
French or english as a second language	1.1	0.4	1.5
Physical education	3.0	3.6	6.5
Secondary	15.5	7.2	22.6
Academic year (N = 6998)			
Year	Female (%)	Male (%)	Total (%)
First	23.4	4.9	28.3
Second	18.7	3.1	21.8
Third	23.1	3.8	26.9
Fourth	19.8	3.2	23.0

Table 2

Parameters for ICT use by prospective teachers enrolled in Primary and Secondary programs

	Elementary (n = 2649)		Secondary (n = 1124)				
Source	*M*	*SD*	*M*	*SD*	*df*	*F*	*p*
Use of ICTs	2.73	0.98	2.05	1.14	1	345.41*	0.001

Table 3

Parameters for ICT use by prospective teachers for female and male in all training programs

	Female (n = 4224)		Male (n = 723)				
Source	*M*	*SD*	*M*	*SD*	*df*	*F*	*p*
Use of ICTs	2.55	1.08	2.15	1.14	1	83.63*	0.001

Notes. All programs are included in the descriptive analysis

Table 4
Mean Likert scores of self-perceived competency with ICTs applications for female and male students

Type of software	Female	Male	Total
Word processing			
M	3.63	3.62	3.63
SD	0.78	0.86	0.79
Presentation			
M	2.32*	2.47*	2.34
SD	1.10	1.21	1.12
Spreadsheet			
M	2.17*	2.49*	2.21
SD	1.02	1.15	1.05
Webpage editor			
M	1.50*	1.70*	1.53
SD	0.83	1.02	0.87

Note. *$p <$ .001. Shows a significant difference between female

average score and male average score.

Table 5
Parameters for the five motivational types for ICT users and non ICT users prospective teachers

	ICT users		Non ICT users		ANOVA	
Motivation type	*M*	*SD*	*M*	*SD*	*df*	*F*
Amotivation	1.52	0.76	1.88	1.05	1	197.26*
Regulated	3.89	1.06	3.90	1.04	1	0.08
Introjected	3.59	1.29	3.32	1.20	1	54.89*
Identified	5.17	1.17	4.65	1.32	1	210.89*
Intrinsic	5.00	1.27	4.35	1.42	1	281.40*

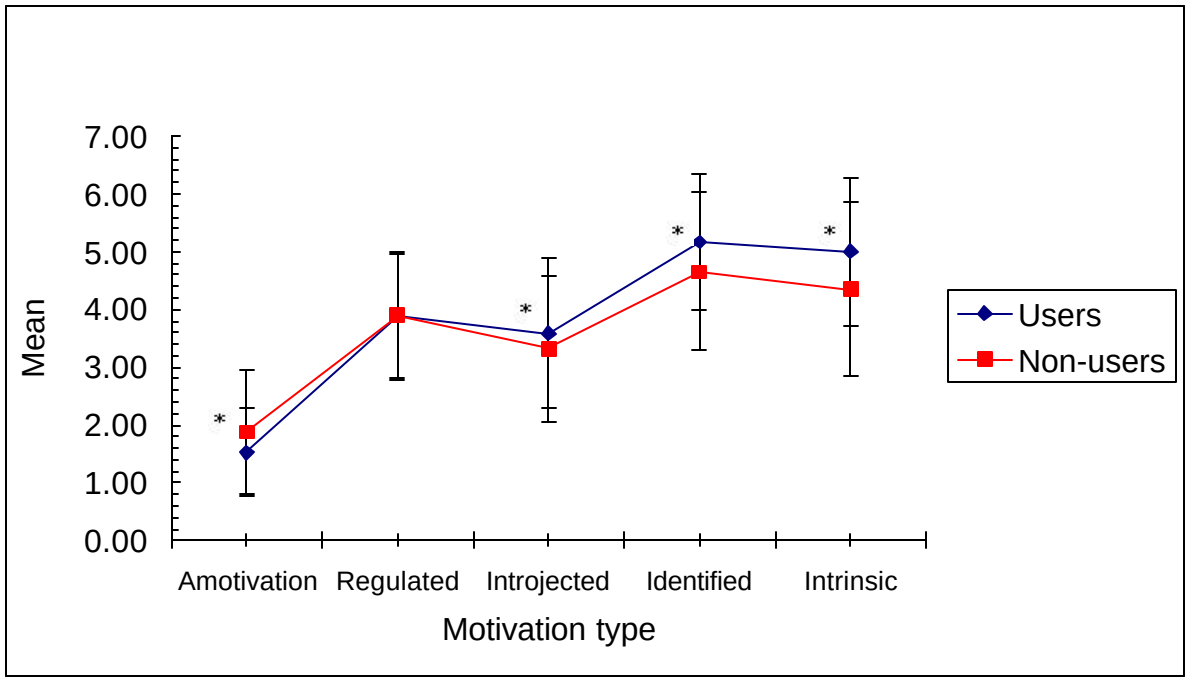
*$p < .001$

Table 6
Mean, standard deviation and correlations of the self-efficacy scale

			Use of ICTs by student-teacher
	M	*SD*	Correlation
1.Perceived competence subscale	3.62	0.67	0.376*
2. Perceived value subscale	3.55	0.75	0.253*
3. Self-efficacy scale	3.59	0.59	-

Note. *$p < .01$.

Figure Captions
Figure 1. Comparison between mean Likert scores of motivational profiles for user and non-user prospective teachers.



Note. $*p < .001$. Shows that there is a significant difference between Users and Non-users average scores