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## Singapore's preservice teachers' perspectives in integrating information and communication technology (ICT) during practicum

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### Abstract

The purpose of the study is to investigate preservice teachers' perspectives in technology integration in Singapore. The preservice teachers participated in three surveys: 1) before taking the technology course, 2) after completing the course, and 3) after completing the ten-week teaching practicum. The first two questionnaires collected data related to their thoughts of using technology in their future teaching. The third questionnaire asked about their actual integration of technology during their ten-week teaching practicum. Qualitative data was also collected from ten purposefully selected participants to gather more in-depth information about how they planned to integrate technology and how they actually used technology in their teaching practicum. The findings from the quantitative survey data and the qualitative information were consistent and complemented each other. The results of the study provided a better understanding of preservice teachers' thoughts and actual practices in integrating technology into their teaching.

## **Introduction**

Preservice teachers' attitudes and beliefs towards technology integration have been widely discussed in different studies (Abbott & Farris, 2000; Ertmer, 1999; Pope, Hare & Howard, 2002; Swain, 2006). Many previous studies suggested what could be included in preservice teachers' teaching practicum to promote the integration of technology with the support of cooperating teachers and teacher educators. However, there has been limited research that tried to track the change of preservice teachers' perspectives in technology integration from the beginning of teacher education courses till the end of teaching practicum.

### *Preparing pre-service teachers for technology integration*

Based on one U.S. educational policy analysis on technology investment and its effectiveness, it was concluded that "the most direct and cost-effective way to educate teachers about technology is through the preservice education they receive in the college of education or other institutions" (U.S. Congress, 1995, p. 166-167). A review of studies on preservice teachers' learning to teach with information technology indicated a trend: from taking on-campus technology stand-alone courses to extending learning into field-based technology teaching practices. Technology courses have successfully shown advantages in developing the pre-service teachers' basic knowledge and skills in a manageable way, changing the pre-service teachers' attitudes toward information technology and perceived self-efficacy when using technology (Abbott & Faris, 2000; Albion & Ertmer, 2002; Ertmer, 2005; Mibrath & Kinzie, 2000; Persichitte, Caffarella & Tharp, 1999). However, short-term exposure to technology is not sufficient in preparing the pre-service teachers with the necessary skills and knowledge for effectively integrating technology into their teaching (Moursand & Bielefeldt, 1999).

Furthermore, a stand-alone course often helps in building basic knowledge, but inhibits the necessary transfer of skills. This is because such an approach lacks practice opportunities in real-life classroom environment. Over time, preservice teachers tend to forget the knowledge and skills they learned in the stand-alone courses and found it difficult to apply the knowledge and skills related to technology integration in their teaching (Bain & McNaught, 2006).

The actual experience of teaching itself can be a powerful influence on a teacher's learning (Zeichner & Tabachnick, 1985). Stuhlmann (1998) argued that the reinforcement and practice in technology over time had an enormous impact on the preservice teachers' abilities to transfer their technology related knowledge and skills to other educational situations. Many studies suggested that when preparing the preservice teachers to teach with technology, they should be contextually and socially situated in the school-based learning environment rather than be taught in isolated course work in universities for better transfer of knowledge and skills (Hooper & Rieber 1995; McIntyre & Tlusty, 1995). In addition, Mullen (2001) found that preservice teachers' technology field practices have a positive impact on their attitudes toward teaching with technology in the future. As the preservice teachers have experiences in integrating technology during their field practices, they became more confident in applying technology in their teaching as full fledged teachers (Stuhlmann, 1998). Therefore, one way to improve preservice teacher technology preparation is to go beyond the stand-alone courses offered in university classrooms. Teacher education programmes should be providing opportunities for preservice teachers to practise their knowledge and skills related to the integration of technology during the field experiences (Bullock, 2004; Dexter & Riedel, 2003).

While many suggested what should be done in the preservice teachers' field experience, limited studies that tracked the change of student teachers' attitudes, beliefs and practice in technology integration from the beginning of coursework till the end of field experience. Numerous studies such as Brown and Warschauer (2006) investigated preservice teachers' perceptions of integrating technology in teaching during coursework and even field placements. Their findings suggested that there was a lack of exposure to technology integration during field experience. However, most studies did not investigate if the preservice teachers had used technology during field experience, how did they use technology and why they chose to use or not use technology during field experience.

#### *Preparing preservice teachers for technology integration in Singapore*

As the sole preservice teacher education provider in Singapore, the National Institute of Education (NIE) plays an integral role in preparing the preservice teachers for all Singapore schools. In addition to preparing the preservice teachers to integrate technology in their future teaching, it is also important to match the development of their knowledge and skills in technology integration with the expectations of the Masterplans for Information and Communication Technology (ICT) launched by the Singapore Ministry of Education. The development of Singapore's first and second Masterplan for ICT showed that integrating technology into Primary and Secondary education (Grades 1 – 12) was one of the main educational priorities in the education system. The first Masterplan was launched in 1997 (Singapore Ministry of Education, 2006). It focused on developing the infrastructure, resources and providing teacher training. The second Masterplan in 2002 geared toward changing the culture of the classroom and school to support and motivate thinking and independent learning

among young students (Ministry of Education, 2006). Some of the intended outcomes for Masterplan 2 were: students use ICT effectively for active learning, schools and teachers connecting curriculum, instruction and assessments effectively by using ICT tools; and conducting active research in ICT in education. In order to achieve these intended outcomes, the roles of the teachers are changed from being the main knowledge provider to that of a facilitator in the learning process. In addition, the roles of students are to become engaged in constructing their own learning. Finally, technologies are being integrated as supportive tools in the students' learning process rather than being used mainly by teachers as presentation tools.

The purpose of this study is to investigate the change of the preservice teachers' perspectives. Perspectives are defined as how people interpret their environments and use such interpretations to direct their actions (Calderhead, 1989; Zeichner & Tabachnick, 1985). It is different from beliefs and attitudes because perspectives comprise actions and not merely people's dispositions to act (Zeichner, Tabachnick & Densmore, 1987). They asserted that "teachers' thinking/thoughts and their behaviours are inseparable and are part of the same event." In addition, perspectives are specific to situations rather than generalized beliefs. There are plenty of studies that investigated preservice teachers' beliefs and attitudes in technology integration (Swain, 2006; Abbott & Faris, 2000). However, research studies focusing on the preservice teachers' actual actions and perspectives in integrating technology in their teaching are limited.

## **Methodology**

This study explored the change in Singapore's preservice teachers' perspectives in technology integration during their initial teacher preparation programme. In this study,

preservice teachers' perspectives are defined as their thoughts and actual actions about integrating technology in their future teaching. We looked at their change in thoughts in integrating technology at the beginning and the end of their ICT course. Then, we compared their thoughts from the end of ICT course with their actual action during teaching practicum.

The research questions are:

1. What are the thoughts of preservice teachers in integrating technology before they take and after they complete the ICT course?
2. What are their actual actions in integrating technology during the 10-week teaching practicum?
3. What are the changes in their thoughts and actions? Are the preservice teachers able to translate their thoughts of integrating technology into actual actions?

Quantitative data collection was divided into three main stages: pre-ICT course; post-ICT course; and post-practicum. The preservice teachers who were enrolled in the one-year Post Graduate Diploma in Education (PGDE) teacher preparation programme at the National Institute of Education (NIE), Singapore, were invited to voluntarily participate in the study.

There were 310 preservice teachers enrolled in the PGDE (Primary) programme. 108 of them completed all three surveys. This study used the data collected from these 108 participants to conduct statistical analyses. The average age of the participants was 27.8. As all the preservice teachers are required to complete their undergraduate degree before their PGDE teacher preparation programme, the youngest participants were 22 years old. These participants probably joined the teacher preparation programme directly after they obtained their undergraduate degrees from universities. The age group from 22 to 26 comprised 50% of the total participants;

and another 30% of them fell in between 27 – 31. Only two participants were above 40 years of age. There were more female (76%) than male (24%) participants.

The questionnaire consisting of 38 items on a 5-point Likert scale (Strongly Disagree: 1, Somewhat Disagree: 2, Neutral: 3, Somewhat Agree: 4, and Strongly Agree: 5) was used to collect the data. The pre-and post-ICT course questionnaires comprised statements like:

- I will use ICT to implement problem-based learning in my classroom;
- I will use ICT to help me implement problem-based learning in my classroom; and
- I will spend less time lecturing to let my students conduct online research in class.

In the post-practicum survey, the preservice teachers were asked to evaluate what they have done during their teaching practicum. As a result, most of the wording of the survey remained the same with only minor revisions. There were also seven additional statements added to find out the importance of different sources of support that led to their success in integrating technology during their teaching practicum. Here are some sample statements from the post-practicum survey:

- I used IT to implement problem-based learning in my classroom;
- I spent less time lecturing to let my students conduct online research in class;
- I used ICT to help me implement problem-based learning in my classroom; and
- I find that the support from my school/ cooperating teachers is important to help me integrate IT in my classroom.

In-depth interviews were conducted with ten purposefully selected participants to get qualitative information about why and how the preservice teachers used ICT during practicum. These participants were selected based on their self-reported confidence levels in using technology in the pre-ICT course survey. Some of them expressed that they were very confident



in using ICT, but they showed that they are not confident at all. The participants with different technology confidence backgrounds were selected in order to find out how different participants may practise technology integration differently during teacher practicum. Their actions and responses were collected through lesson observations and in-depth interviews to support the quantitative data obtained from the questionnaire.

### **Data Analysis and Results**

Although there were 310 preservice teachers enrolled in the PGDE (Primary) programme, only 108 of them completed all three surveys. This study used the data collected from these 108 participants to conduct statistical analyses.

Cronbach alpha of the questionnaire was 0.89, which showed that the instrument was fairly reliable. Factor analysis revealed five factors that carried eigenvalues higher than 1.2 from the 38-item questionnaire. These factors were:

- Factor one: ICT for classroom management and teaching;
- Factor two: ICT for student-centred learning;
- Factor three: Being a facilitator;
- Factor four: Confidence in leading the integration of ICT in school; and
- Factor five: Support from school and peers.

The one-way ANOVA conducted showed that there were significant differences in the preservice teachers' perspectives towards integration of ICT across the three data collection points in all five factors (see Table 1). When comparing the means of their thoughts in the pre and post-ICT course, three of the five factors increased significantly. Preservice teachers perceived that they were significantly more confident in factor two, ICT for student-centred

learning (3.89 to 3.96), factor three, being a facilitator (3.65 to 3.85), and factor four, leading integration in ICT after the course (3.56 to 3.84). For factor one, ICT for classroom management and teaching, there were no significant change from pre to post-ICT course. However, for factor five, Support from schools and peers, a significant decrease from 4.08 to 4.00 was reported. The result for factor five could imply that the preservice teachers felt that they did not need as much support from schools and peers by the end of the ICT course.

When comparing their post-ICT thoughts with their actual actions during classroom teaching in the use of technology during practicum, the means decreased significantly in all five factors. The biggest decrease is shown in factor three, being a facilitator, from 3.85 after the ICT course to 3.04 after practicum (see Table 1). Factor one, which is related to using ICT for classroom management and teaching, decreased from 4.08 to 3.70, factor two, which is related to using ICT for student-centred learning, dropped from 3.96 to 3.24, and factor five, support from schools and peers, decreased from 4.00 to 3.46. The smallest decrease was found in factor four, their confidence in leading the ICT integration in school, which went from 3.84 to 3.64. As a result, the comparisons showed that even though they perceived themselves as confident in integrating ICT in future teaching, many of them were unable to translate their thoughts into actual actions during their teaching practicum.

Factors	Pre-ICT course	Post-ICT course	Post-Practicum	F
1. ICT for classroom management and teaching	4.10	4.08	3.70	34.52*
2. ICT for student-centred learning	3.89	3.96	3.24	59.41*
3. Being a facilitator	3.65	3.85	3.04	55.00*
4. Confidence in leading the integration of ICT in school	3.56	3.84	3.64	10.99*
5. Support from schools and peers	4.08	4.00	3.46	25.39*

Table 1. Student teachers' perceptions and practices in integrating technology in their teaching (\*p-value < 0.05).

An examination of the in-depth interviews revealed consistency with the quantitative results. Preservice teachers with different technology confidence level expressed some differences in their plans to integrate technology in their future teaching at the beginning of the ICT course. Some had more ideas to share about using different software tools to present and gain their students' attention; others expressed concerns in using technology in their teaching as they were not confident in using technology and worried that their students could be distracted by the technology rather than learn from it. At the end of the ICT course, almost all of the preservice teachers could elaborate on their ideas about technology integration. Some of the participants shared that they planned to conduct small group learning activities with their students in the teaching practicum and many others expressed that they planned to use technology as effective supporting tools to present information to their students during teaching practicum. They were also able to articulate their concerns about using technology. For example, many of them expressed that classroom management could be an issue when they plan to bring their students to the computer laboratories; they also believed that it will be difficult to integrate technology into teaching and small group learning activities because they are required to cover the pre-determined curriculum in a limited amount of time.

Lesson observations of the selected preservice teachers during the teaching practicum showed that nine out of the ten participants used some technology during teaching practicum on a regular basis. The preservice teacher who chose not to frequently use technology in his teaching practicum did so because he did not feel confident in using technology. In addition, he felt that he could teach better without using technology as he viewed technology as an additional challenge in his classroom. However, he found out that the students expected him to use technology at least as a presentation tool during teaching. When he was not using technology in

class, students were not motivated to learn and not paying attention. As a result, he tried learning to cope with technology and integrated it into his teaching once to meet his students' needs.

Further investigation in the integration of technology among the other preservice teachers showed that most of them were only using technology as presentation tools and to capture their students' attention in class. There were only two preservice teachers who tried to promote student-centred learning and act as a facilitator in their teaching. At the end of the lesson observations period, the majority of the preservice teachers in the selected group did not try to use technology to promote collaborative learning in their lessons. The findings from the lesson observations showed consistency with the quantitative results where there were significant decreases in using ICT to promote student-centred learning and being a facilitator.

### **Conclusion and Implications**

The purpose of this study was to investigate the change in preservice teachers' perspectives in integrating technology in teaching. The significant increase in their thoughts after the ICT course could be because they gained knowledge and skills in how to integrate technology. However, they were unable to translate their positive thinking in technology integration into actual actions during teaching practicum. (This may be because as new teachers, they had other responsibilities, such as managing the classroom, learning and delivering the curriculum, that were viewed as being more important than integrating technology in their teaching.

The results showed that the ICT course might be sufficient in enhancing preservice teachers' thoughts towards technology integration, but not sufficient in helping them to actually integrate ICT in teaching. The actual experience of teaching itself can be a powerful influence on

a teacher's learning (Zeichner and Tabachnick, 1985). Preservice teachers using ICT during practicum become more confident in integrating technology in their teaching (Stuhlmann & Taylor, 1998). Therefore, the results suggested that teacher educators need to provide more support and modeling throughout the teacher preparation programme and the teaching practicum to inculcate in preservice teachers the practice of integrating ICT into their teaching.

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