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## Singapore student teachers' intentions and practices in integrating technology in their teaching

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The purpose of this study is to investigate the development of student teachers' intentions and practices in integrating Information and Communication Technology (ICT) into teaching. Data was collected before and after the ICT course on their intentions to use ICT in future teaching, and after the two practicum school attachments to find out their practices in integrating ICT during their student teaching. The results showed that student teachers' intentions to integrate ICT were positive before and after the ICT course. There was a significant decrease in their practices to integrate ICT as an administrative tool and a student learning tool during the first practicum attachment. However, there were significant increases in their ICT practices during their second practicum attachment. The student teachers also reported positive overall attitude towards the use of ICT in teaching throughout their two-year teacher education programme.

Keywords: technology integration, intentions, practices, practicum attachments

### Introduction

Integrating information and communication technology (ICT) into the classrooms has been a major initiative worldwide. Many research studies in ICT integration focused on student teachers' attitudes, beliefs and perceptions (Phelps & Maddison, 2008; Swain, 2006). However, limited studies have investigated the student teachers' intentions to use ICT in their future teaching and their practices in using ICT during their teaching.

Ajzen and Fishbein (1980) defined intention as an anticipated outcome that guides a person's planned actions or behaviour. It could be a measurement of the likelihood that a person will engage in a given behaviour in the future. Therefore, in this study, the student teachers' intention is defined as their likelihood to integrate ICT in their future teaching. On the other hand, the student teachers' practice is defined as their behaviours in

integrating technology during their five-week Teaching Assistantship and ten-week Teaching Practice attachments. Recent studies reported that student teachers have positive intentions to integrate ICT in future teaching (Choy, Wong, & Gao, 2009). The new generations of student teachers seemed to have higher confidence and self-efficacy in integrating technology in their teaching (Wang, Ertmer, & Newby, 2004). However, most of their ideas about technology integration remained superficial because they perceived that using ICT tools to present and capture their students' attention were considered using ICT effectively (Choy et al., 2009).

Constructivist learning theory was adopted as the theoretical framework of this study. Student teachers construct their own meaning about integrating ICT in teaching through the interactions of what they already know with the new ideas and activities which they experience (Brophy, 1991). This study investigated the student teachers' intentions to integrate ICT after they completed a course related to ICT pedagogy and their practices in ICT integration during their practicum attachments.

## Background

The student teachers in this study were enrolled in the Diploma in Education programme. This programme was designed for those who have graduated from high schools or Polytechnics. During their two-year study, all student teachers are required to complete an ICT pedagogy course. There are two practicum attachments in this programme. After completing their first year of course works, the student teachers are sent to different schools for their five-week Teaching Assistantship (TA) attachment. During the TA attachment, the student teachers observe their cooperating teachers (CTs) for two weeks and begin to co-teach with their CTs in the last three weeks. At the end of their teacher education programme, they have to complete a ten-week Teaching Practice (TP) attachment where they have to plan and teach lessons independently.

## Methodology

The purpose of this study is to investigate the development of student teachers' intentions and practices in integrating Information and Communication Technology (ICT) into student teaching during their teacher education programme. There are four data collection points in this study. The student teachers' intentions were measured before and after they completed the required ICT pedagogy course. Their practices during practicum attachments were measured at the end of their two practicum attachments, namely the five-week Teaching Assistantship (TA) and the ten-week final Teaching Practice (TP).

The research questions are:

1. What are the student teachers' intentions to integrate ICT in their future teaching?
2. What are the student teachers' practices to integrate ICT in their practicum attachments?
3. What are the changes in their intentions and practices?
4. What is their overall attitude towards ICT integration in teaching?

The participants of this study were student teachers who were enrolled in the two-year Diploma in Education programme at the National Institute of Education, Singapore. Ninety-one out of 327 participants were included in the data analysis, indicating a return rate of 27.8%. Missing data was replaced with means score and surveys with substantial missing data were omitted for analyses. The average age was 24.5 years (Std. Dev. = 4.9) and 56% were female participants. Although the response rate is low, we believed that it is acceptable as it took two years to complete the data collection.

The survey instrument used in this study was adopted from a previous study (Choy et al., 2009). As the objective of this study was to investigate the intentions and practices of the student teachers during their school attachments, only 22 out of the 38 items were adapted from the existing instrument. The survey used a 4-point

Likert scale, which ranged from 4 = “*all the time*” to 1 = “*never*” to measure intentions and practices. In addition, seven items were added to the survey to assess student teachers’ overall attitude towards integration of ICT in teaching. The items in the survey were the same throughout the four data collection points. However, slight changes were made to the wording of the items to measure the intentions and the practices of the student teachers at different data points.

## Data Analysis and Results

Exploratory factor analysis was conducted to analyse the data collected. Using SPSS 18.0, factor analysis with Varimax rotation showed three factors that carried eigenvalues higher than 1.5. The factors were labelled as: ICT as administrative tool; ICT as teaching support tool; and ICT as student learning tool. Each factor had five to seven items. The reliability for the whole survey was high (0.98) and the reliability coefficient for all three factors ranged from 0.77 to 0.90, which showed that the instrument was reliable.

In order to compare the means of the student teachers’ intentions and practices from before their ICT course to the end of their TP attachment, multiple analyses of variance (MANOVA) for repeated measures were used to analyse the data. MANOVA results showed that there were significant differences in all three factors when comparing the means across the four data collection points (see Table 1). In addition to MANOVA, t-tests for repeated measures were used to compare the changes at different stages.

**Table 1: Student teachers’ change in perceptions and practices in technology integration**

| Factors                      | Before ICT intentions<br>(std dev) | End of ICT intentions<br>(std dev) | End of TA practices<br>(std dev) | End of TP practices<br>(std dev) | Wilks’ Lambda |
|------------------------------|------------------------------------|------------------------------------|----------------------------------|----------------------------------|---------------|
| ICT as administrative tool   | 2.83 (.54)                         | 3.00 (.58)                         | 2.29 (.67)                       | 2.63 (.69)                       | 25.93**       |
| ICT as teaching support tool | 3.05 (.50)                         | 3.11 (.56)                         | 3.29 (.50)                       | 3.40 (.50)                       | 11.16**       |
| ICT as student learning tool | 2.74 (.57)                         | 2.91 (.58)                         | 1.72 (.71)                       | 2.17 (.81)                       | 65.50**       |

(\*p-value < 0.05; \*\*p-value < 0.01)

As seen from Table 1, the means of the three factors showed different changes in the student teachers’ intentions and practices in integrating ICT in their teaching. Before the ICT course, their intentions to use ICT as an administrative tool, a teaching support tool and a student learning tool were generally quite positive. After they completed the ICT course, their intentions to use ICT further increased. For ICT as an administrative tool, the means increased from 2.83 to 3.00. For ICT as a teaching support tool, it increased from 3.05 to 3.11. For ICT as a student learning tool, the means increased from 2.74 to 2.91 out of the 4-point Likert scale. T-test analysis showed that the increases in ICT as an administrative tool ( $t = -2.60$ ,  $p\text{-value} < 0.01$ ) and student learning tool ( $t = -2.52$ ,  $p\text{-value} < 0.01$ ) were statistically significant (see Table 2).

**Table 2: T-tests comparisons for preservice teachers' change in perceptions and practices**

| Factors                      | Before ICT vs. | End of ICT vs. | End of TA vs. |
|------------------------------|----------------|----------------|---------------|
|                              | End of ICT     | End of TA      | End of TP     |
| ICT as administrative tool   | -2.60**        | 8.39**         | -3.51**       |
| ICT as teaching support tool | -0.88          | -2.93**        | -1.97*        |
| ICT as student learning tool | -2.52**        | 13.18**        | -4.92**       |

(\*p-value < 0.05; \*\*p-value < 0.01)

At the end of their five-week Teaching Assistantship (TA) attachment, their practices changed when compared to their intentions at the end of the ICT course. For ICT as a teaching support tool, it significantly increased to 3.29 at the end of TA ( $t = -2.93$ ,  $p\text{-value} < 0.01$ ). On the other hand, their practices to use ICT as an administrative tool and student learning tool decreased significantly. The means for ICT as an administrative tool decreased from 3.11 to 2.29 ( $t = 8.39$ ,  $p\text{-value} < 0.01$ ) and for student learning tool from 2.91 to 1.72 ( $t = 13.18$ ,  $p\text{-value} < 0.01$ ).

At the end of the ten-week final Teaching Practice (TP) attachment, their practices increased significantly for all three factors when compared with their practices during their TA attachment. Use of ICT as an administrative tool increased from 2.29 to 2.63 ( $t = -3.51$ ,  $p\text{-value} < 0.01$ ) as a teaching support tool from 3.29 to 3.40 ( $t = -1.97$ ,  $p\text{-value} < 0.05$ ) and as a student learning tool from 1.72 to 2.17 ( $t = -4.92$ ,  $p\text{-value} < 0.01$ ). The results showed that the student teachers had more opportunities to practise ICT integration during their TP as compared to during their TA attachment.

At the end of each survey, seven items were included to ascertain information about the student teachers' overall attitude towards ICT integration to compare if there were any changes in their attitude before and after the ICT course, at the end of TA and TP attachments. As can be seen from Table 3, the overall attitude towards the integration of ICT in teaching was very positive. The means ranged from 3.20 to 3.30 at all four data collection points on the 4-point Likert scale. Even though there were significant decreases in their practices in integrating ICT as an administrative tool and student learning tool during their TA attachment, their attitude towards ICT integration in teaching remained positive. MANOVA results also showed that there were no significant changes in their attitude from before the ICT course to the end of the TP attachment.

**Table 3: Student teachers' attitude towards ICT integration in teaching**

| Factors                          | Before ICT | End of ICT | End of TA | End of TP | Wilks' Lambda |
|----------------------------------|------------|------------|-----------|-----------|---------------|
| Attitude towards ICT integration | 3.30       | 3.20       | 3.27      | 3.27      | 1.12          |

## Discussions and Conclusion

The purpose of this study is to investigate the development of student teachers' intentions to integrate ICT in their future teaching before and after their ICT course and their practices in integrating ICT during their five-week TA and ten-week TP attachments. Exploratory factor analysis showed that the 22-item survey was categorized into three main factors: ICT as administrative tool, ICT as teaching support tool, and ICT as student learning tool.

### **Changes in student teachers' intentions before and after the ICT course**

The student teachers' intentions to use ICT as an administrative tool and as a student learning tool increased significantly after they completed the ICT course. The increases may be because they gained more pedagogical knowledge about how to use ICT in the classrooms from the course. The student teachers were exposed to student-centred pedagogies such as problem based learning and collaborative learning, and also how to integrate ICT tools to promote such pedagogies in their teaching. They gained hands-on experience in using ICT tools such as WebQuest, Web 2.0 tools, and Interactive Whiteboards during the course. They were also required to design student-centred learning activities and integrate ICT tools into those activities. These learning experiences could have resulted in the increase in their intentions to use ICT as a student learning tool at the end of the course. Student teachers were not taught how to use ICT as an administrative tool. However, they were exposed to the use of ICT tools to support administration through their course instructors. For example, the instructors used a Learning Management System and email to communicate with the students on a regular basis. As a result, the student teachers were able to learn from what the instructors practised during the course (Wang, Ertmer, & Newby, 2004).

For the use of ICT as a teaching support tool, the increase at the end of the ICT course was not significant. This could be because the emphasis of the ICT course was not to use ICT as a teaching support tool. The new generation of student teachers tend to feel comfortable using ICT and their ICT skills level was already high to begin with (Markauskaite, 2006). As the participants of this study were relatively young, many of them would have seen their teachers using technology to support teaching when they were students. As a result, it is not surprising that the student teachers' already intended to use ICT as teaching support tool before their ICT course, and thus their intention remained high after the ICT course, resulting in no significant increase in their intention to use it as a teaching support tool.

### **Changes in student teachers' intentions after the ICT course and practices after the five-week TA attachment**

There was a significant increase in their practices in using ICT as teaching support tool, which showed that during the five-week TA, the student teachers were able to use ICT to present complex information, support their explanations of concepts and capture students' attention. On the other hand, their practices in using ICT as an administrative tool and a student learning tool decreased significantly. One of the reasons for the decreases could be because of the limited time for teaching. During the five weeks TA attachment, student teachers started to co-teach with their cooperating teachers only in the last three weeks. As a result, they did not need to handle much of the administrative work. When they started to teach, they may not feel comfortable to use ICT to conduct collaborative learning activities as they were only getting to know their students. Studies have shown that beginning teachers focused more on their own needs (e.g., completing the syllabi) rather than on the students at the beginning years of teaching (Gilles, Cramer, & Hwang, 2001). Therefore, it is not surprising that the student teachers shied away from integrating ICT into more student-centred learning activities during the TA attachment.

## Changes in student teachers' practices between the end of TA and the end of TP

The student teachers' practices significantly increased in all three factors during the ten-week TP attachment when compared to their practices during the five-week TA. As the TP was longer than the TA attachment and student teachers were responsible for teaching 20 – 24 lessons per week independently, they had more opportunities to interact with their students and integrate ICT into their teaching in various ways.

The results of the study showed that student teachers' intentions to integrate technology remained high before and after their ICT course. Their practices in using ICT during their five-week TA decreased significantly, which could be because of the lack of time and opportunities to use ICT and to interact with their students. As they gained more autonomy in the classrooms and had more time to explore ICT resources and to interact with students during their TP attachment, their practices in using ICT as teaching support tool, student learning tool and administrative tool increased significantly. Some qualitative information was collected from selected participants through focus group interviews to find out the reasons for the student teachers' changes in intentions and practices. This information is being analysed and findings will be shared during the presentation at the conference.

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