

## ICT Experiences and Competencies of Pre-service Teachers in the Digital Age

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**THIS STUDY EXAMINED** the information and communications technology (ICT) ownership, usage and competencies of the new generation of Singapore pre-service teachers who were born and had grown up in the Digital Age, roughly after 1980. This project surveyed pre-service teachers at the National Institute of Education and interviewed volunteers who were also asked to keep a journal reflecting their ICT-related activities and thinking to provide further insight. Data analysis shows that they had good access to mainstream ICT devices such as computers and mobile phones. The lack of homogeneity with regard to ICT experiences, competencies and improvement was identified. The majority of pre-service teachers were found competent in using the core applications, including email, chatting, searching for information online and frequently for entertainment, using productivity tools, communication and socialization rather than for study and work. And they remained passive consumers instead of active creators of digital content.

### INTRODUCTION

As part of the research project on the impact of ubiquitous computing since the National Institute of Education (NIE) launched one-to-one laptop initiative for pre-service teachers in 2009, this study examines information and communications technology (ICT) experiences and competencies of the new generation of pre-service teachers who were born after 1980. This is to better understand the possibilities and challenges of the ubiquitous computing environment aimed at achieving

### KEY IMPLICATIONS

- On top of basic ICT tools, we need to engage pre-service teachers to improve their usage and competency in emerging devices and applications.
- We need to transform pre-service teachers from passive recipients of information to active contributors and creators of contents in the digital world.

multiple dimensional learning goals. Finding out how this specific group of pre-service teachers as *digital natives* (Prensky, 2001) use technology for learning and teaching informs NIE's professional development programme.

## RESEARCH DESIGN

For this study, explanatory mixed methods of longitudinal survey, digital log files of pre-service teachers' laptop, journaling and focus group interviews were adopted. The pre-service teachers who borrowed a laptop during their study under NIE's one-to-one laptop scheme were invited to participate in the study on a voluntary basis. The final sample was participants who were born roughly after 1980 and grew up in the Digital Age. The main research questions we enquired through survey and qualitative methods are: what is the overall profile of pre-service teachers' experiences with ICT; what are the pre-service teachers' competencies towards ICT for daily use, learning and teaching; and what is the improvement in ICT competencies of pre-service teachers after undergoing the NIE training programme.

Survey data collection was conducted among pre-service teachers at different stages of the NIE teacher preparation programme. The implemented online surveys included four baseline and four post-programme surveys. The questionnaire included questions about the ICT devices they owned, their time spent on ICT devices; how much of ICT tools or activities they engaged in; skills with an array of established and emerging technologies and tools; and their attitudes towards ICT for teaching and learning.

We monitored the laptop-usage patterns of the targeted pre-service teachers via a logging software called *ManicTime*. Journal writing was done by 24 pre-service teachers on a fortnightly basis. A journal template was designed by the researchers with an open-response section and a table for recording ICT-usage patterns in terms of time, place, devices, application used and purpose.

Periodic interview sessions were held with the focus group. A semi-structured interview was employed at

each session as this offered a more flexible way to approach different participants while still focusing on the same area of data collection. The main questions asked about the pre-service teachers' ICT-based activity, and how and why they used a tool for learning, and teaching practice or why not. In total, 15 focus group interviews were conducted, each interview was about 1 hour long, and were recorded and transcribed.

## KEY FINDINGS

Data from the pre-programme survey shows that this new generation of pre-service teachers who were born and had grown up in the Digital Age had easy access to mainstream ICT devices. The vast majority ( $n=1336$ , 86%) had laptops before studying at NIE, and more than half had desktops ( $n=875$ ). Additional analysis shows that 43% ( $n=667$ ) owned both a desktop and a laptop. While the access to mobile phones was universal, less than half ( $n=665$ , 43%) owned smartphones. Half of them had portable multimedia players ( $n=795$ , 51%).

However, they did not have universal and uniform technology experiences and competencies. Not all of them were digital natives with a sophisticated knowledge and understanding of ICT. In particular, the patterns of access or ownership, and the use of and competency with a range of emerging and more advanced ICT applications show considerable variation. There is a more complex mix of technology experiences and skills among them. The study results highlight the lack of homogeneity in young pre-service teachers that they do not have uniform technology experiences and competencies.

Overall, the pre-service teachers were comfortable and capable with the mainstream ICT-based applications (e.g., email, chatting online, searching for information online, using productivity tools). Emerging devices (e.g., smartphones) and applications (e.g., participating in virtual multi-user environments) were less incorporated. These pre-service teachers remained passive recipients of information rather than active contributors and creators of contents in the digital world.

With regard to content creation such as creating *Wikipedia* pages, most participants reported that

they were less comfortable and competent, and the usage levels were significantly lower. The range of applications explored and the time spent on content creation applications were restricted. Less than one third had ever created or edited a *Wikipedia* page, designed websites, created graphics, or produced digital videos. Only a minority was competent in using these advanced ICT tools.

We also observed the discrepancies in the use of laptops and ICT applications for work-related or educational purposes and for leisure or non-educational purposes. The pre-service teachers spent more time using ICT such as online chatting and surfing social networking websites. ICT adoption for non-educational purposes was much higher than for learning and teaching. For them, ICT is more for entertainment, communication and socialization, rather than for study and work. The qualitative data shows that for learning, most of them would only do activities on laptops if told to and use resources that they had been specifically directed to. Only a couple of them would explore new ICT devices and applications on their own.

Analysis from the pre- and post-programme surveys collected indicated that the pre-service teachers improved their competencies in using various ICT tools for teaching significantly after going through the NIE training. However, not all pre-service teachers improved their competencies in using emerging and more advanced ICT tools for teaching at the same level—some pre-service teachers improved a lot whereas others improved slightly or remained at the same level. This poses the challenge of finding a way to effectively engage more pre-service teachers to improve their ICT competencies for teaching.

Post-surveys show that their competencies in using basic tools for teaching (e.g., using email, presentation software and online resources, creating online assessments, creating lessons using digital videos, and creating a learning environment using Web 2.0 tools) was higher than using emerging and advanced ICT tools (e.g., using “live” conferencing platforms, creating lessons using podcasts, incorporating online games in lessons, using Virtual Learning Environment, using storyboarding or comic creation tools, and creating digital portfolios).

## IMPLICATIONS

### *For Policy*

The new generation pre-service teachers have a high level of usage of the core set of ICT applications, which could be attributed to the technology emphasis given to them at various stages of their education even before enrolling in the teacher training programme. They may have benefited from the goals of the IT Masterplans in ways that may have shaped their ICT competency positively, but would have benefited more if greater support from policymakers and school authorities to sustain and expand ICT-supported teaching and learning practices were given.

### *For Teacher Training*

The limited range of ICT devices and applications used and the restricted scope of ICT-related activities carried out by these pre-service teachers could be ascribed to the lack of exposure to these newly developed technology and technology-augmented practices. But it is more likely that it was because these pre-service teachers could not comprehend the needs and methods to integrate ICT to innovate and transform existing practices that caused the compromised ICT usage. This is particularly the case for adoption of ICT in educational settings.

Given the diversity within the new generation of pre-service teachers with regards to ICT experiences and competencies, the challenge is how to cater for the broad range in students’ levels of access, usage and familiarity with different ICT devices and applications, particularly when it comes to using the emerging and more advanced technology tools in teaching. For teacher education, on top of the basic ICT tools, we need to find a way to effectively engage more pre-service teachers to improve their ICT competencies for teaching, especially, those “laggards”, the last group to adopt innovation (Rogers, 2003).

The dissonance was found between pre-service teachers’ everyday ICT competency and that for teaching and learning calls for further improvement of teacher training programmes to help equip pre-service teachers with the skills of integrating ICT tools into teaching. In the education community, there is increasing awareness to equip future

teachers with Technological Pedagogical Content Knowledge (TPACK; Mishra & Koehler, 2006), which is the unique teaching knowledge of the intertwined technology, pedagogy and content knowledge bodies, to support the design and enactment of effective pedagogical practices in ICT-enhanced learning environments. This can be considered for integration in the NIE training programme, to further increase ICT competency of pre-service teachers.

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