

# Teachers' Use of Information and Communications Technology (ICT)

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## INTRODUCTION

In the developed world, multimedia technologies, networks, and online services continue to pervade our everyday lives. Alongside the advancements in multimedia and networking technologies, it is essential for the stakeholders (e.g., business policy personnel and technology designers) to ensure that the end users are adequately informed and skilled to exploit such technologies for the betterment of their lives for example, work and study. A large proportion of multimedia technologies users come from the educational institutions. Within the educational context, tools such as multimedia technologies, networks, and online services are commonly referred to as information and communications technology (ICT).

Over the last two decades, research findings have provided evidence to suggest that the use of ICT has resulted in positive effects on students' learning (Blok, Oostdam, Otter, & Overmaat, 2002; Boster, Meyer, Roberto, & Inge, 2002; Kulik, 2003). As a change agent in many educational activities, the teacher in the developed world plays a key role in ICT integration in schools (McCannon & Crews, 2000). Research has found many factors to be influential in explaining teachers' use of the computer, and these are commonly grouped into personal, school, and technical factors, although often factors from more than one group determine use. Personal factors relate to the teacher per se, and might include their experience, confidence, motivation, and commitment to using ICT, and so forth (Bitner & Bitner, 2002; Zhao, Pugh, Sheldon & Byers, 2002). School environment factors pertain to organizational and environmental issues, for example, time and support given by the school administration to ICT (Conlon & Simpson; 2003; Guha, 2003; Vannatta, 2000). Finally, technical factors relate to the ICT

itself, and issues relating to the hardware/software and peripheral devices such as keyboards and mice, printers, and scanners. This article focuses on these factors and draws comparisons between highly technologically developed countries from Europe and North America, and less developed countries from Asia.

In Europe and North America, research relating to teachers' use of ICT tends to be older. For example, studies by Rosen and Weil (1995) and Hadley and Sheingold (1993) found that factors that influence the teacher's use of the computer include teaching experience with ICT, on-site technology support, availability of computers, and financial support. Robertson et al. (1996) examined teachers of Grade 8 students (14 year olds) and found their computer use to be related to organizational change, time, and support from administration, perceptions of computer, and other personal and psychological factors. In the UK, Cox, Preston, and Cox (1999) used a questionnaire to collect evidence relating to teachers' ICT experiences, expertise, and attitude toward ICT for teaching and learning. Factors important to ICT use were the extent to which ICT was perceived to have made learning to be more interesting, easier, and fun for students and teachers. Other factors such as using ICT to improve presentation of materials and accessibility to the computers for personal use and making administration more efficient were also cited as influential. Hence, it can be seen that school and technical factors have important roles to play in affecting teachers' use of ICT.

Some research, however, points to personal factors having the key role in ICT use. Veen (1993) studied Dutch teachers and found personal factors to be stronger than school factors in explaining teachers' use of computers. There was evidence to suggest that the teachers' beliefs about the curriculum (content) and way it should be taught (pedagogy) were a stronger determinant than

the teachers' ability to handle computer hardware and software. In these studies, personal attributes appeared to be the dominant factor.

This has also been found in North American studies. In a nationwide survey of teachers of Grade 4 and 12 students (ages 9 and 18) in America, Sheingold and Hadley (1990) found three major factors that were responsible for successful teacher use of computers. These were teacher motivation and commitment to students' learning and own professional development, support from schools, and access to sufficient quantities of technology. The "successful" teachers were described as working in schools where hardware and access to resources were twice the average of the other schools. They were comfortable with technology and used computers for many purposes; they perceived their teaching to be more student-centered and believed that technology integration would result in gains in learning. Of the factors that were identified to be instrumental in ensuring preservice teachers' use of ICT, Dawson and Nonis (2000) listed: (1) confidence in technology-related abilities; (2) recognition of the value of technology in the teaching and learning process; (3) knowledge about content-specific uses of technology, and (4) identification of classroom management issues. On the other hand, Cuban (2001) believed that among the reasons why teachers do not use ICT were that computers are hard to master, hard to use, and often break down. Thus, they were viewed as a time-consuming activity. In a study by Franklin, Duran, and Kariuki (2001) pre-service teachers supported this as they reported common barriers to technology use as vision (understanding of curricular use of ICT in teaching), access, time, assessment (evaluating learning using ICT), and professional development (access to training for ICT mastery).

From the literature, it is apparent that a large quantity of research has been carried out in North America and Europe. While this has been instrumental in driving the research in teacher and ICT use, it is not representative of the global picture on this issue. In recent years, developing economies have been involved in harnessing ICT in their own education systems.

The following section reviews selected studies on the use of ICT by teachers (including trainee teachers) in different Asian countries. Generally, the selected countries have been known to make progress in their investment and capacity-building efforts in the use of ICT for education within the last two decades. The

main goal is to provide indicators of the factors that contribute to the usage of ICT, and as such, this article does not claim to be comprehensive in its coverage.

## **SINGAPORE**

Using a case study approach, Lim and Khine (2006) studied two primary schools and two junior colleges (equivalent to senior high schools in America). As part of the data collection, they interviewed the teachers and heads of departments, and observed lessons from different subjects that used ICT as the main tools for instruction. From the study, Lim and Khine identified different barriers to ICT use by teachers. These barriers were grouped into two types: first-order and second-order, as proposed by Ertmer (1999). First-order barriers to ICT use are defined as those factors that are extrinsic to the teachers, such as lack of access to ICT, insufficient time for planning, and inadequate technical support. Using the three-factor model, these would include the school and technical factors. Second-order barriers, on the other hand, refer to factors intrinsic to the teacher such as the teacher's belief about ICT integration into the curriculum and beliefs about teaching and learning, that is, the personal factors. Ertmer (1999) suggested that second-order barriers are more difficult to deal with, as they are not apparent, personal, and deeply ingrained.

The first-order barriers that were identified to have caused teachers' to minimize the use of ICT in Singapore were:

1. difficulty of completing an ICT-mediated lesson within a fixed time period;
2. large amount of time was needed to plan and prepare ICT-mediated lessons; and
3. working with outdated computers and limited numbers of computers in the classroom.

Lim and Khine (2006) found that most teachers were able to complete the traditional chalk-and-talk lesson compared to the ICT-mediated lesson within a fixed period in the timetable. This was partly due to the fact that in a traditional lesson, teachers were able to control the instructional time as opposed to an ICT lesson where students tend to work on assigned tasks at their own pace. The issue of too much time being spent to prepare for an ICT-mediated lesson is

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