The Internet and teacher education: Traversing between the digitized world and schools

Ching Sing Chai [a], Cher Ping Lim [b],*

[a] National Institute of Education, Nanyang Technological University, 1 Nanyang Walk, Singapore 637616, Singapore
[b] Hong Kong Institute of Education, 10 Lo Ping Road, Tai Po, New Territories, Hong Kong

ARTICLE INFO

ABSTRACT

In the face of rapid technological and economic developments globally, pre-service teacher education programs in the Asia-Pacific region are challenged to prepare teachers who are open to new ideas, new practices and information and communication technologies (ICT), to learn how to learn, unlearn and relearn, and to understand and accept the need for change. Extending Popper's (1978) framework of the three worlds — the physical world as World 1, the mental world as World 2, and the world of products of human ideas as World 3 — this paper examines how teachers may assume agency to mediate the tensions and opportunities between these worlds in order to chart possible developmental trajectories that may provide future directions for pre-service teacher education. With respect to the use of ICT for teaching and learning, pre-service teacher education programs are then expected to move pre-service teachers away from learning specific ICT application and towards learning how to learn, and more important, moving towards a commitment to constructivist-oriented teaching and learning practices.

© 2010 Elsevier Inc. All rights reserved.

The rapid development of information and communication technologies (ICT), in particular web-based technologies and the Internet, has enabled more and more people to live in an increasingly interconnected world. The connection is more than just social in nature. More importantly, knowledge, ideas, and expertise are now easily linked and spanned to form new ideas and practices. The rate at which new ideas and consequently new products are created is faster than any individuals can handle. This key characteristic of the purported knowledge society inevitably challenges traditional notion of schooling. Many education researchers have argued that the premises of schooling have shifted and schools should be remodeled to fit the knowledge society (Bereiter & Scardamalia, 2006; Greenhow, Robelia, & Hughes, 2009; Jonassen, Howland, Marra, & Crismond, 2008; Sawyer, 2006). While the calls from these researchers have informed policymakers in many countries to equip schools with ICT and to provide teachers and school leaders with professional development, the shift towards constructivist-oriented pedagogies is still not a salient feature in school (Laurillard, 2008; Lim & Chai, 2008; Selwyn, 2008). Many teachers are still using ICT to support traditional teaching or are generally doubtful about the effectiveness of ICT to mediate teaching and learning practices.

Researchers have identified several interacting factors that may explain why ICT has not brought about pedagogical changes as envisioned by policymakers. They may be categorized into exogenous/contextual or endogenous/personal factors. Assessment system, curricular structure, school policies and resources availability are common contextual factors, and teachers' skills, values, knowledge and beliefs are some personal factors that may encourage or hinder teachers' use of ICT in the classroom (Hew & Brush, 2007). Therefore, more effort has to be made to build the capacity of teachers and to support them to assume the role of change agents in the school context.

Drawing upon Popper's (1978) framework of the three worlds, this paper first identifies and examines the key competencies that beginning teachers need to take up the affordances of ICT to facilitate students' development of 21st century skills. The identification of these key competencies would then generate the implications for the design of pre-service teacher education programs. Popper's idea of the three worlds comprises the physical world as World 1, the mental world as World 2, and the world of products of human ideas as World 3. Analyzing the dilemmas that he faces from the tensions arising between these three evolving worlds, Teo (2009), an experienced teacher from Singapore reflects upon his identity in the demanding tides of reforms in the society vis-à-vis the school. Extending his work and that of Bereiter (1994), this paper examines how teachers may assume agency to mediate the tensions and opportunities among these worlds so as to chart some possible developmental trajectories that may provide future directions for pre-service teacher education. Fig. 1 is a visual representation of the adapted framework that guides the discussion for the rest of this paper.

In the following sections, we first describe World 1 where teachers operate in and World 3 where researchers and other knowledge

* Corresponding author. Tel.: +65 98635742.
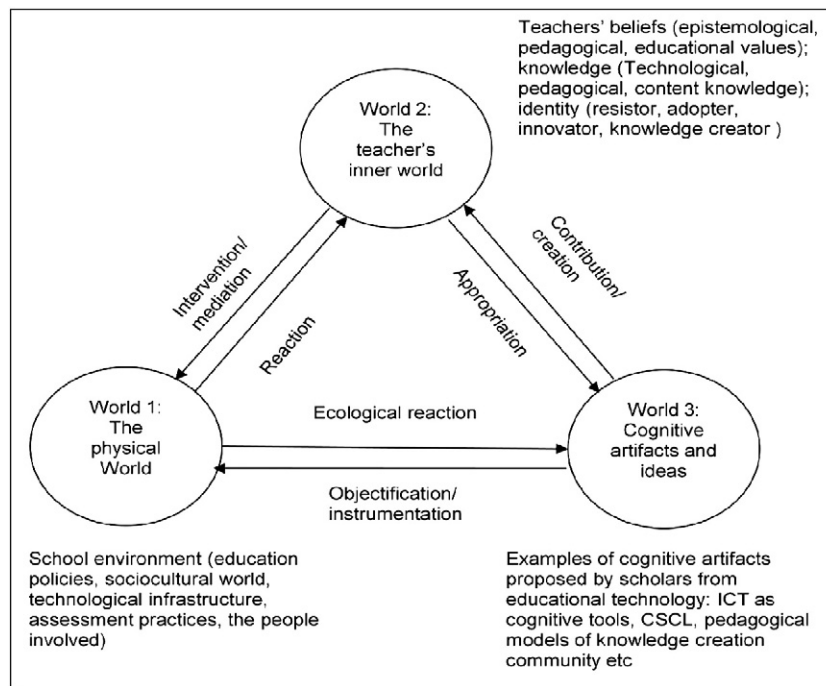 E-mail addresses: Chingsing.chai@nie.edu.sg (C.S. Chai), cherping_lim@hotmail.com (C.P. Lim).

Fig. 1. The three interacting worlds of teachers.

creators generate ideas to change the "reality". This is followed by the conceptualization of teachers' World 2 and our conjecture of how teachers may foster generative relations between these worlds. We then review current practices of pre-service teacher education for ICT use in the classroom and propose key principles of preparing pre-service teachers for the life-long process of professional development for ICT in education.

1. World 1: the physical world out there

The physical world in which the teachers work in is a multidimensional one. It includes people (for example, students, colleagues, school leaders, and parents), the sociocultural environment (education policies and assessment practices), and the rapid changing ICT environment; the latter has become the most salient feature of World 1 for today teachers. Most children and young people in Asia-Pacific countries, especially in the major cities, live, work, play, learn and communicate over the Internet. The speed and the ease of computation with spreadsheet applications such as Excel have made the manipulation of data accessible to school students. Digital recording media such as video camera, sound recorder and data loggers have made data collection easier and more reliable. Privileged information that was once hard to access is now becoming easily available over the Internet. Abstract concepts and phenomenon are made more accessible to children through visualization and animation. Young children may even be taught to create interactive models of natural/social phenomenon. These and many other affordances of ICT may be employed to support independent, flexible, collaborative, iterative and meaningful learning (Jonassen et al., 2008). These changes have also prompted many educators to reconsider key epistemological and pedagogical questions such as what knowledge is, what it means to know, how knowing may be measured/captured and how it should be nurtured. These questions have serious implications for the types of key competencies that teachers need and hence, on teacher education (Kirschner & Selinger, 2003; Lock, 2007).

Among the technological advancement, the Internet has been regarded as one of the most influential and transformative technology for teaching and learning (Leu, O'Byrne, Zawlinski, McVerry, & Everett-Cacopardo, 2009; Lee & Tsai, 2010). The continuous evolution of Internet-based technology and its accompanying effects on all aspects of modern life has changed what students should learn, how learning should happen, where and when learning can happen. For example, the emergence of Web 2.0 technology has altered the notion of authorship and the relations between readers and writers in a fundamental way. Literacy has to be redefined to accommodate digital literacies (Leu et al., 2009; Mills, 2008; Myers, 2006). Authoring for the purpose of connecting with people, shaping and maintaining online identities, and sharing knowledge are becoming part of a digital native's way of life and they exert subtle influences on a learner's holistic development (Greenhow, Robelia, & Hughes). Enabled by online forum or conferencing applications, students may interact with experts who are working at the cutting edge of specific discipline who may be miles away from the students. Discussions may extend beyond classroom walls and curriculum time with possibilities of many-to-many communication mode. This challenges the traditional discourse structure of one teacher to many students, typically in the form of teacher initiates, students respond, and teacher evaluates (Chai & Tan, 2010). Pedagogically, ICT has made the construction of "knowledge" a viable approach of developing the creative ability of students. As existing knowledge is constantly challenged and recreated, ICT has made revisions of digitize cognitive artifacts a less tedious process, encouraging users to examine and explore ideas and create as many versions and variation as they choose to.

In short, the networked environment changes the teacher's World 1 significantly. Teachers in schools are charged with the professional responsibilities of facilitating the development of students so that the latter may be prepared to live and work in the fast changing society. As such, teachers cannot ignore these drastic and fundamental changes in World 1. Instead, they have to formulate responses that are congruent with their professional obligation. In the next section, we trace the rapid changes currently occurring to their roots.

2. World 3: the ideological world up somewhere

World 3, as conceptualized by Popper (1978), consists of the products of human minds. Popper includes airplane and the American Constitution as examples of World 3 objects. We have delimited World 3 object to cognitive artifacts and intangible ideas (Bereiter,