

**BUILDING THE CAPACITY OF TEACHER EDUCATION  
INSTITUTIONS/AGENCIES TO SUPPORT THE USE OF ICT FOR TEACHING,  
LEARNING AND ADMINISTRATION IN SCHOOLS:  
A TOOLKIT FOR THE ASIA-PACIFIC REGION**

*Why ICT in Education Competencies for Pre-Service Teachers?*

The rapid advancement of information and communication technology (ICT) and its pervasive use in work and daily life have dramatically changed the way we live and the way businesses are conducted. To remain competitive in this ICT-enabled world, it is becoming inconceivable for any individual or society to be ill-equipped with ICT skills. Furthermore, ICT has also changed the way knowledge is constructed, distributed, challenged and improved upon and greatly enhanced the efficiency for these knowledge-based activities. It has become the tool of knowledge workers, which include all kind of researchers and learners. Privileged information that was once hard to access is now becoming easily available on the Internet. The speed and the ease of computation with statistical software such as SPSS or spreadsheet like Excel have made the manipulation of data accessible to school students. Many guarded terrain that was once controlled by experts are now opened to the general public. Technologies such as Windows Live Spaces have changed the notion of authorship and the relations between readers and writers in a fundamental way. Literacy has been redefined to accommodate digital literacies (Mills, 2008; Myers, 2006). These and many other affordances of ICT could be employed to promote independent, flexible, collaborative, iterative, active and meaningful learning among learners (Jonassen, Howland, Marra, & Crismond, 2008). Consequently, these ICT-driven developments challenge many assumptions of what students should learn in schools and how education should be delivered. It has been suggested by many educators that many features of modern education, which were based primarily on notion of knowledge transmission from the have to the have-not, have to be reexamined (for example, see Angeli & Valanides, 2009; Bereiter & Scardamalia, 2006; Fullan, Hill, & Crévola, 2006; Jacobsen & Lock, 2004; Jonassen, et al., 2008; Punie, 2007; Sawyer, 2006). These researchers strongly advocate that in the current information-age, learners have to be able to solve complex problems; think creatively and critically; communicate and collaborate with others from diverse backgrounds; with the aid of various ICT tools. Inevitably, the duty of cultivating such learners falls on the teachers, who have to first possess these skills and dispositions.

While research studies have shown that ICT facilitates the development of higher order cognitive skills of evaluating arguments, analyzing problems and applying what is learnt, the teacher is not to be excluded from the ICT-based activities. Martin (2000, 8) highlights the importance of the role of teachers in integrating ICT effectively by emphasizing that:

Without the input and acceptance of teachers, the developments of useful educational technology projects are hindered. Not only are teachers the gatekeepers of the classroom, they are the greatest source of information about curriculum design and educational content.

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Teachers in the ICT-mediated learning environments have to take on the more demanding role of a mediator and a knowledge broker: to provide guidance, strategic support, and assistance to help students at all levels to assume increasing responsibilities for their own learning. Inevitably, these questions have serious implication on how school teachers should be educated (Jonassen, et al., 2008; Kirschner & Selinger, 2003; Lock, 2007; UNESCO, 2008). The challenge then for teacher education institutions (TEIs), ministries of education and schools is to prepare teachers who are open to new ideas, new practices and ICT, to learn how to learn, unlearn and relearn, and to understand and accept the need for change. However, changing teachers' beliefs about teaching and learning and their use of ICT in the classroom is always a challenge. Many teachers have been taught and have been teaching in traditional learning environments, and hence, are likely to hold on to traditional beliefs of teaching and learning. They tend to perceive teaching as disseminating information and learning as a passive activity, with students doing minimal task management or holding little responsibility for their own learning. This is contrasted with constructivist pedagogical beliefs where learning is perceived as an active construction and reconstruction of knowledge, and teaching as a process of guiding and facilitating students in the process of knowledge construction; the latter beliefs being more relevant in our knowledge societies and economies where students are expected to be active seekers and constructors of knowledge, and their learning involves the discovery and transformation of complex information.

Therefore, to prepare teachers to integrate ICT into the school curriculum, there is a need for professional development programmes to create a meaningful context that allows teachers to critically examine their own pedagogical beliefs and explore the application of ICT in a more constructivist learning environment; teachers are then more likely to adopt more constructivist approaches in ICT-mediated teaching and learning. It should be noted that traditional and constructivist are not to be treated as a dichotomy; the stance of this book is to promote more constructivist approaches that encompass not only meaning making of concepts and theories but also self-regulated learning and personal agency.

While teacher educators generally agree that integrating ICT into teaching and learning is important, actual use of ICT in classroom are either low or they are confined to use of ICT for productivity purposes (Becta, 2007; Valcke, Rots, Verbeke, & van Braak, 2007). There are still multiple gaps in curriculum design and delivery for the development of pre-service teachers' competencies in ICT integration (Becta, 2007; Haydn & Barton, 2007; Lawless & Pellegrino, 2007). Many teacher education colleges offer single technology course as a form of teacher preparation (Hsu & Sharma, 2006), which are usually deemed as insufficient for teachers to be adequately prepared for the complexities involved in integrating ICT (Lawless & Pellegrino, 2007). Furthermore, research indicates that instructional use of computer among faculty members in colleges of education can be below expectation (Drent & Meelissen, 2008; Sahin & Thompson, 2006; Zhou & Xu, 2007). Many issues pertaining to digital equity, cyber wellness and social justice are also emerging from the pervasive use of ICT and they need to be adequately addressed in teacher education (Futurelab, 2008; Kirschner & Selinger, 2003; Selwyn, 2008). In addition, studies on how teachers' learn is connected to students' learning are relatively rare (Fishman & Davis, 2006).

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The conceptualization, design, development, delivery and evaluation of teacher preparation courses for ICT integration is therefore a key area for teacher educators and researchers that warrants sustained and committed research and development (Angeli & Valanides, 2009). Kirschner and Selinger further argued that a framework of action should extend beyond teachers, teacher educators and researchers to include students, industrial partners, government and society in general (see also Hsu & Sharma, 2006). Current research and reports on pre-service teacher's preparation for the use of ICT in education has several problems such as unclear documentation of contexts and courses, poor data collection, small sample size etc (Kay, 2006). In order for teacher education to move forward and beyond the current status of affairs, many more rigorous research/design and development activities are needed (Fisher, Higgins, Loveless, 2006; Haydn & Barton, 2007; Lawless & Pellegrino, 2007; Kay, 2007).

### ***What are the ICT in Education Competencies for Pre-Service Teachers?***

In most developed countries and some developing countries, the use of ICT is pervasive and it encompasses a range of activities that teachers have to perform. These ICT-facilitated activities of teachers include administration such as updating students' profile and preparing students' progress report; communication with multiple parties including parents and colleagues; resource design/development, lesson planning, out-of-school/classroom activities, students' independent learning, assessment of students' learning, and teachers' professional development. It is obvious that these activities require a range of competencies to fulfil. In this book, we focus mostly on developing teachers' competencies in the pedagogical use of technology. Other competencies, such as ICT-based administration and communication may be better addressed during the in-service induction period.

Defining the pedagogical competencies that a pre-service teacher needs to possess is not a simple task as the competencies involved are complex in nature. Fortunately, many organizations have published documents that can provide good references. For example, the National Educational Technology Standards (2008) (NETS) published by Information Society for Technology in Education (ISTE) and the ICT Competency Standards for Teachers published by UNESCO (2008). These documents clearly recognize the complex skill sets that teachers have to develop for the meaningful integration of ICT into classroom teaching and learning. For example, the UNESCO document portrays that teachers need to develop ICT literacy skills in stages of mastering basic tools, complex tools and then pervasive tools. The meaningful use of these tools is dependent on teachers' pedagogical competencies (instructional planning processes, pedagogical knowledge, content knowledge, pedagogical content knowledge, classroom management, knowledge of students), and dispositions (reflection, willingness to innovate, values, beliefs and interpersonal relationships). Using a presentation tool (Powerpoint) as an example, Table 1 below illustrates the possible development trajectories of a teacher in using it.

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**Table 1:** A Matrix of the interaction between teachers' ICT literacy, pedagogical competencies and dispositions

<b>Levels of competencies</b>	<b>Basic</b>	<b>Intermediate</b>	<b>Advanced</b>
Model of use	Preparation and use of Powerpoint for presentation in teaching (multimedia, text, slide transition)	Preparation and implementation of student-centred learning package using Powerpoint as tool	Facilitation of students' construction of multimedia presentation
Technical	Basic features of Powerpoint	Advanced features of Powerpoint	Just-in-time teaching of Powerpoint competencies and basic troubleshooting
Pedagogical	Explain and pose questions	Plan and implement meaningful activities to engage students	Empower and facilitate/manage students' knowledge construction
Dispositions	Willingness to learn and use ICT	Willingness to change pedagogical practices & beliefs	Willingness to experiment & innovate

The above three developmental positions are roughly in agreement with UNESCO recommendation of using ICT first for technology literacy, then for knowledge deepening and finally for knowledge creation. In facilitating teachers' development for the increasing sophistication of ICT use in education, it seems clear that it would be impossible to expect the highest stage of development for most pre-service teachers in most countries. It is also clear that a single course approach is insufficient to facilitate such complex development. Depending on the current status of ICT and pedagogic readiness of a country, TEIs may need to craft different teacher education programs. Emerging countries such as Laos, Cambodia, Sri Lanka may need to aim to achieve the Basic. Countries like Singapore, which has embarked on ICT-based educational reforms for more than a decade may need to craft their programs to push their teachers towards advanced pedagogical use of ICT. In the next section, we suggest strategic planning processes that TEIs could embark on to facilitate the development of these ICT in education competencies among pre-service teachers.

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## ***How can these ICT in Education Competencies be Developed among Pre-service Teachers?***

In order for TEIs to move forward in equipping pre-service teachers, Jacobsen and Lock (2004) articulated the following series of actions:

- (a) implement a vision and values driven technology integration plan,
- (b) encourage education faculty members to infuse and model effective technology use across the curriculum,
- (c) provide authentic learning opportunities for student teachers to integrate technology in campus and field experiences,
- (d) foster greater campus and K-12 school partnerships that cultivate and nurture technology integration,
- (e) provide ubiquitous access to a more than adequate technology infrastructure, and
- (f) disseminate research on effective use of technology for learning. (p. 82)

Based on their recommendations and the aforementioned literature, this toolkit proposed a framework of strategic planning processes that encompasses six strategic dimensions that TEIs need to focus on:

- (1) Vision and Philosophy
- (2) Program: Curriculum, Assessment, and Practicum
- (3) Professional Learning of Deans, Teacher Educators and Support Staff
- (4) ICT Plan, Infrastructure, Resources and Support
- (5) Internal and External Communication and Partnerships
- (6) Research and Evaluation

We argue that by attending to these strategic dimensions, TEIs should be able to generate coherent internal and external processes that would enhanced their capacity in building pre-service teachers' competencies for innovative use of technology. To facilitate the strategic planning processes, this toolkit has attempted to provide a succinct write up on each of the dimension based on the relevant literature and other relevant sources of materials. We have also derived further strategic foci for each strategic dimension. For example, in the chapter on Strategic Dimension 2: Curriculum, Assessment, and Practicum, curriculum designs of the various ICT courses employ by TEIs all over the world has been summarized. This toolkit has identified 11 strategic foci for the three components of Strategic Dimension 2. The strategic foci in each dimension have been written with some depth. By employing the toolkit as an initial source of reference, leaders of TEIs should be able to at least kick start their strategic planning processes and begin their discussion of formulating strategic plans for their respective TEIs. In other words, leaders of TEIs could initiate their strategic planning process by distributing this toolkit and get their selected members of the strategic planning committee to browse through this document. A beginning point of discussion could be if the strategic dimensions and foci make sense and what more is needed or what should be left out.

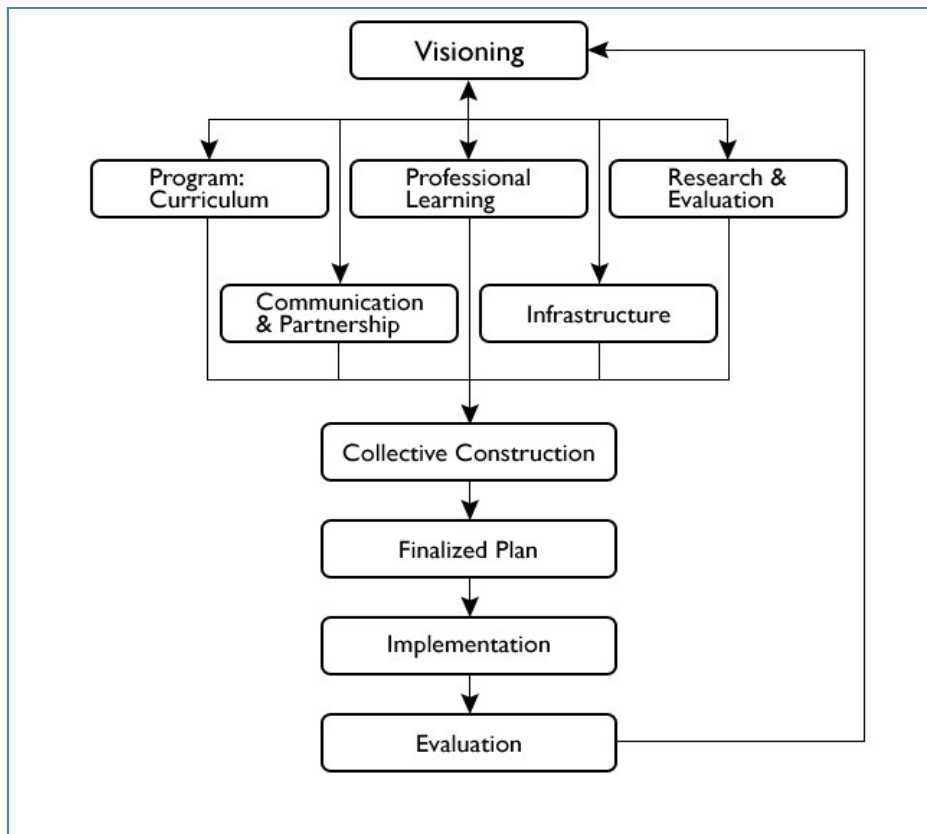
Figure 1 depicts a flowchart of our proposed strategic planning processes. It proposes that the strategic planning process to begin with the visioning exercise. Logically, this will set out the general direction and the mission/goal statements that will provide guidance for the organization. The vision and mission statements form the foundation of further strategic planning (Morphew & Hartle, 2006). This is followed by concurrent strategic planning by the

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various sub-groups which will develop the specific objectives and the strategies to achieve the goals of the respective strategic dimensions, leading to the realization of the vision and the achievements of the missions. At this point, the chapters written for the various dimensions can act as anchors for discussion and further developments. To help the TEIs in assessing their current status and in positioning their action plans, each strategic focus is further broken down to four levels. The levels include Undeveloped, Fundamental, Proficient and Innovative. Members of the sub-groups can perform internal evaluation using the rubrics provided in Appendix I. For instant, the discussants in the curriculum sub-groups may evaluate that the current status of the ICT curriculum to be undeveloped using the rubrics. They could identify certain curriculum practice reported in the curriculum chapter conducive for their TEI and locate the relevant literature to understand the curriculum further. They may then adapt the curriculum and put up their plans for considerations by the strategic planning committee.

Figure 1: Collective Strategic Planning Processes for TEIs



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After the initial plans are drawn up, numerous discussions and coordination between the various sub-groups will have to follow to align the plans such that they are coherent and mutually supportive. We label this process as collective strategic planning processes. It is essential that all stake holders are cognizant of what other sub-groups are working on so as to avoid misalignment of development, which could lead to much frustration. These processes are iterative in nature and it may lead to further modification of the vision and mission statements. The plans are then finalized, implemented and evaluated to form the basis of the next cycle of strategic planning.

The above paragraphs delineate the broad procedures for TEIs to move forward in arriving at action plans to equip pre-service teachers to teach with ICT. While we propose to begin the process with the visioning exercise, we can also imagine a scenario whereby the leaders of TEI feel that they would like to embark on professional learning first to experience themselves how technology can enhance learning. This could lead to a better and perhaps a more adventurous vision. The Classroom for the Future, set up by Microsoft within the vicinity of the National Institute of Education (Singapore), could be one place for the deans to visit. Other similar setup can be found world wide. In summary, strategic planning is a dynamic process that has to be contextualized rather than be prescribed. It should also be an ongoing process with appropriate feedback loops to engender continuous improvement of the TEIs to answer to the rapid advancements of the current age.

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