Building Capacity of Teachers/Facilitators in Technology-Pedagogy Integration for Improved Teaching and Learning

Final Report

Experts' Meeting on Teachers/Facilitators Training in Technology-Pedagogy Integration
18-20 June 2003 · Bangkok, Thailand

UNESCO

Asia and Pacific Regional Bureau for Education
UNESCO Bangkok

UNESCO Implemented Project on Training and Professional Development of Teachers/Facilitators in the Effective Use of ICTs for Improved Teaching and Learning Supported by Japanese Funds-in-Trust Programmes

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Foreword

Throughout Asia and the Pacific, education is perceived to be the driving force behind national development and integral to the region's efforts to produce knowledge-based societies in the network age. New information and communication technologies (ICTs) have created unprecedented learning opportunities and become powerful tools for education and development. Meanwhile, these new technologies pose additional challenges to developing countries in the region, with a risk of further exacerbating the "digital divide", a divide that leads to greater inequality between the information-rich and information-poor among and within countries, and which inhibits the global development goal of equity and quality of education for all. Teachers and other facilitators, especially policymakers at all levels, are central forces in tapping the ICT-enhanced learning opportunities and bridging the digital divide, and their capacity-building for effective use of ICT is essential for harnessing the potential of new technology to reform education.

It is within the framework of the Japanese Funds-in-Trust (JFIT) Use of ICT in Education in Asia and Pacific Programme, that a project on "Training and Professional Development of Teachers/Facilitators in Using ICT for Improved Teaching-Learning" has been implemented by UNESCO Bangkok. UNESCO-APEID is indebted to the Government of Japan for its Funds in Trust for the Programme on the Use of ICT in Education, which has made the project possible, under the overall co-ordination of the Director of UNESCO Asia and Pacific Bureau for Education.

As an initial activity to launch the project and orient its implementation, an Experts' Meeting on Teachers/Facilitators Training in Technology-Pedagogy Integration was held in Bangkok, from 18 to 20 June 2003. Building on participating experts' contributions, this Final Report reflects on the diverse situations of ICT use in education in the region, elaborates on main issues in technology-pedagogy integration in country-specific conditions, and presents a conceptual and curriculum framework of ICT infusion in teacher education and training.

For the fruitful outcomes of the Experts' Meeting, UNESCO-APEID is grateful to all participants who made most meaningful contributions in their institutional or individual capacities. For the writing of the Final Report I would like to thank Professor Jonathan Anderson at Flinders University in South Australia and Professor Allen D Glenn at the University of Washington in Seattle, USA, who agreed to be Rapporteurs of the Meeting and presented the report in a coherent way, not only to reflect the outcomes of the Meeting but to develop a critical analysis of major issues in technology-pedagogy integration in regionally-relevant contexts. My sincere thanks also go to Mr Sheldon Shaeffer, Director of UNESCO Bangkok, for his overall co-ordination and orientation of the JFIT projects; to Professor Fumihiko Shinohara, Manager of the JFIT-supported ICT-in-Education Programme, for his extensive technical advice concerning technology applications in education; to Professor B K Passi, for the writing of the Introduction of the Report; to Ms Lucille Gregorio, Programme Specialist in Science-Technology Education, and Ms Tinsiri Siribodhi, Project Assistant, for their help in the organization of the Meeting; and to Ms Kraiwan and Ms Maleewan for their effective secretarial assistance.

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Introduction

The rapid advances in information and communication technology (ICT) have had a profound impact on educational policies, contents, structure and methods of delivery throughout the Asia-Pacific region. They have greatly expanded learning opportunities for all age groups and have displayed a powerful potential as tools for teachers. Meanwhile, they pose new challenges to education communities for capacity-building and policy change in achieving Education For All (EFA) goals in new technology-facilitated learning environments in the emerging information society.

In promoting the use of ICT in education, UNESCO Bangkok has launched a Programme on the Use of ICT in Education in Asia and the Pacific, with the generous financial support of Japanese Funds in Trust which aims at tapping technology-assisted learning opportunities and bridging the digital divide in education in Asia and the Pacific. The JFIT-supported project, Training and Professional Development of Teachers/Facilitators in the Effective Use of ICTs for Improved Teaching and Learning, focuses on the capacity-building of teachers in using ICTs to help them develop the necessary skills and knowledge of related pedagogies to enhance the teaching-learning process. The objectives of this project are:

1   to improve the competencies of teachers and facilitators, through both pre-service education and in-service training, in integrating/infusing ICTs as pedagogical tools and educational resources to facilitate active student learning;
2   to identify, create and disseminate country- and locally-specific ICT pedagogies and models of ICT use in different learning environments;
3   to develop and put into operation a regional online teacher resource base and offline network of teacher training institutions to share teacher-developed educational courseware and innovative practices.

The project will achieve these objectives through a variety of activities, including:

• developing regional guidelines on curriculum framework and standards of ICT infusion by teachers;
• creating prototype course materials for pre-service teacher education and training modules for in-service teacher training;
• designing templates of ICT-integrated e-lesson plans and evaluation tools for teachers to facilitate and assess their students' active learning;
• training teachers through "train the trainer" workshops at regional/subregional and national/local levels, who will in turn train much larger numbers of peer teachers in school-based training;
• developing and pilot testing country-specific models and pedagogies in ICT integration by teachers, school heads and education managers;
• cultivating an online teacher resource base to support teachers and school heads in integrating ICTs in classroom teaching and school-based management;
• creating an offline network of teacher training centres to share innovative practices;
• sharing products outside the pilot countries for feedback gathering, to identify and reward the most innovative e-lesson plans and ICT integration pedagogies, and for the inclusion of international resources.

The project has designed implementation strategies in view of the diversity and disparity between and within the Asia-Pacific countries. This project covers twelve countries from four subregions: Afghanistan, China, Fiji, India, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, Philippines, Thailand and Viet Nam.

The Experts' Meeting

In view of the project objectives, an Experts' Meeting on Teachers/Facilitators Training in Technology-Pedagogy Integration was held in Bangkok from 18 to 20 June 2003. The purpose of this meeting was to address major issues in the preparation of teachers in using and integrating ICT more effectively for improved teaching and learning. This initiative seeks to (i) create models for teacher training to integrate ICT in various learning environments; (ii) establish a means for teachers to communicate and collaborate with each other through ICTs; and (iii) examine and create policies that will enhance regional co-operation on ICT issues. Participants were chosen from different countries/organizations, with respective expertise and experiences in ICT in education projects, technology-infused training, educational technology standards development, multimedia materials production, and ICT provision for educational purposes.

Working methods of the Meeting

The working strategy of this Meeting was formed around (a) presenting the papers in the plenary sessions, (b) brainstorming the issues in specified groups, (c) reporting the outcomes of the group work in further plenary sessions and (d) arriving at conclusions and follow-up action plans through discussion and mutual consultation. This working strategy was agreed upon by the organizers, the resource persons, and the invited experts. The synergetic relationship amongst the resource persons, the expert participants, the organizers and the supporting groups have helped to achieve the objectives of this meeting.

The proceedings

The opening session of the Meeting started with a message from the Director of UNESCO Bangkok, which was followed by presentations that provided background information on the project. An overview of the JFIT-Supported Teacher Training Project was presented by the project officer to set the stage for deliberations by experts. These presentations also highlighted the disparities between and within countries in the region, focused upon the challenges of using ICT in education, summarized the existing projects of ICT in Asia and the Pacific, and delineated the other parameters of the project that might influence the processes of project planning and implementation.

In all other plenary sessions, the experts presented their papers and offered comments on diverse issues in using ICT in teacher education. This input from the experts formed the basis of a few open-ended frameworks that were presented for the consideration of UNESCO and participating countries.

The presentations and peer feedback aimed at developing a holistic curriculum framework that might guide teachers' professional development in ICT integration for enhanced teaching and learning. The discussion was steered to accommodate ongoing stages of ICT developments in any country. The usefulness of possible models for developing a curriculum framework for infusing ICT in the initial training and professional development of teachers was at the centre of the discussions.

It was acknowledged that districts or provinces within any country in the region may be at different stages of development from one another. Similarly, individual schools within a country may differ greatly from each other in terms of their level of ICT readiness. In developing this framework, therefore, the experts were particularly conscious of the needs of those countries that are in the early stages of establishing ICT infrastructure in their educational systems.

Outcome: a framework

The framework that was to be developed must take into account recent research into learning patterns and behaviour, the limited access of teachers to ICT resources in local communities in many of the project countries, and the social, cultural and educational contexts that have a bearing on ICT applications in developing countries in this region.

The threefold tenets of the framework that were agreed upon were: (a) that teacher education operates within a particular context and culture; (b) that teachers' professional development is a continuous process and therefore there is a need for lifelong learning; and (c) that within these contextual dimensions are core competencies to be developed in a curriculum for teacher training and their continued professional development.

A teacher education framework was designed that comprises core teacher competencies grouped under the headings *pedagogy* and *technology*.

Action plans

Having established a curriculum framework, an action plan in terms of subsequent projects/steps of implementation was proposed and discussed. Major activities will include the following:

- developing *regional guidelines* for teacher training in the use of ICT, based on project country experiences;
- preparing competency-based *teacher standards* to guide integration of ICT in teaching-learning processes;
- developing/adapting selective training modules for teachers in integrating technology with good pedagogy;
- producing a *database of exemplary practices* in ICT across the curriculum for use in teacher education programmes in the region;
- designing prototype course units/modules for initial teacher education;
- developing online teacher resources and offline networks in ICT integration;
- identifying and disseminating creative pedagogical approaches or models in ICT integration for improved teaching and learning;
- promoting the exchange of information and innovative practices by establishing a *website* to strengthen regional co-operation in the use of ICT in teacher education.

The Final Report draws together and outlines the deliberations of the Experts' Meeting. It provides a global view of ICT and Education (Chapter One), describes the current status of ICT in Asia and the Pacific (Chapter Two), outlines major issues and challenges in integrating ICT in teacher education (Chapter Three), presents a curriculum framework for the infusion of ICT in teacher education (Chapter Four), and concludes with a proposed action plan (Chapter Five). Selected papers by participating experts for the meeting are listed in the appendix and included in a CD-ROM.

1

ICT and education: a global view

It is through education, both formal and informal, that the individual is able to become a productive citizen and acquire the knowledge and skills needed to adapt to an ever-changing political, social and economic environment. The nations throughout the Asia-Pacific region understand the importance of education and are seeking to enhance the teaching and learning environments in all areas of their education systems through ICT.

As these nations look to the future, policymakers understand that if citizens are to meet the challenges of the twenty-first century, they must be able to communicate, access information, and learn to use emerging technologies. Therefore, the ability to utilize the power of ICT[1] must be an integral part of teaching and learning.

If future citizens are to maximize the power of ICT, teachers, the curriculum and the school are critical elements because it is the school's responsibility to teach students the essentials of the accepted content knowledge, essential skills to utilize ICT and the attitude and abilities to become life-long learners. Teachers, as well as other educators, must have the knowledge and skills needed to integrate ICT effectively into the learning environment. If not, students will not be exposed to the wealth of information resources available and will be prevented from learning to use ICT effectively themselves.

Because UNESCO believes that education is a fundamental right, a number of important goals have been identified to this end. UNESCO seeks to improve the quality of education, to foster innovation and information sharing, and to foster policy dialogue. To promote these goals a number of UNESCO conferences have been held and a series of background materials prepared outlining the essential elements of the role of ICT in education. Of particular note are the following:

* *Using ICT for Quality Teaching, Learning, and Effective Management: Report of the Seventh UNESCO-APEID International Conference on Education*. Bangkok, Thailand, 11-14 December, 2001. Bangkok: UNESCO Asia and Pacific Regional Bureau for Education (2002).
* *Information and Communication Technology in Education: A Curriculum for Schools and Programme of Teacher Development*. Bangkok: UNESCO Asia and Pacific Regional Bureau for Education (2002).
* *Information and Communication Technologies in Teacher Education: A Planning Guide*. Paris: UNESCO Press (2002).

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[1] ICT relates to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information (Toomey 2002, cited in Anderson): "Integrating ICT and Other Technologies in Teacher Education: Trends, Issues and Guiding Principles (with a focus on the Asia-Pacific Region)". Background Paper for Experts' Meeting on Technology-Pedagogy Integration, Bangkok, Thailand, 18-20 June, 2003.

These documents provide the background and rationale for ICT integration into education. The Planning Guide is most relevant for issues related to teacher education, the preparation of teachers, and the continuing professional development of classroom teachers. Eight chapters are devoted to ICT and teacher education, and in Chapter Six an organizational plan for the future is outlined. As a consequence of this prior planning and as a result of the recent conference held in Bangkok, Thailand, from 18 to 20 June, 2003, UNESCO is positioned to move forward with an initiative to address how teachers may be prepared to utilize ICT more effectively as an integral part of teaching and learning.

Therefore, UNESCO's current initiatives seek to (i) create models for teacher training to integrate ICT into the learning environment; (ii) establish a means for teachers to communicate and collaborate with each other; and (iii) examine and create policies that will enhance regional co-operation on ICT issues. Specifically the project "aims at building national capacity in effective use of ICT in education through training and professional development of teachers/facilitators in integrating/infusing ICTs and effecting ICT-enabled student-centred interactive/independent learning to achieve educational goals in varied national contexts, cultures and learning environments."

Timeliness of the project

It is most appropriate for UNESCO to undertake these initiatives at this particular time. Conditions and the knowledge base are such that immediate progress may be made towards achieving the goals. Four particular conditions are of merit.

More knowledge about the use of ICT
Educators are more knowledgeable about how teachers should be prepared to use ICT. During the past thirty years, there has been considerable progress in integrating ICT into the classroom. Computers have evolved from complex machines needing sophisticated skills to operate them to simple tools that may be used by young children. Over this same period, access to ICT has become more widespread, more educational software is available, and teachers and students have gained confidence and skills in using the technologies. ICT has also moved from the computer lab to the classroom, and is now appearing in more and more homes.

Teacher educators have responded to this ever-changing ICT environment. As the power and accessibility of ICT has expanded, teacher educators have focused on two broad areas. The first relates to what may be called "learning-to-use" technology. Educators are taught the necessary skills to use ICT across a variety of personal and professional levels. The second area, "using-to-learn", focuses on how ICT can be integrated into the total teaching and learning process and how by using ICT effectively basic knowledge and skills can be learned.

During the last several years, teacher educators have been guided in their efforts by the creation of standards related to both teacher and student technology skills. In the United States, the International Society for Technology in Education (ISTE) has been the dominant voice for teacher education, classroom teachers, and students. The standards are performance-based and have served as the major standards for the National Council for the Accreditation of Teacher Education (NCATE). In Europe and the Asia-Pacific region, many countries have formulated specific standards and indicators for ICT and teacher preparation[2].

[2] Resta, P. (Ed.). 2002. *Information and Communication Technologies in Teacher Education: A Planning Guide*. UNESCO, Paris. See Chapter 3 "ICTs in Teacher Education: Curriculum Planning and Developing" pp. 49-57.

As a consequence, as UNESCO prepares to move forward with its initiatives, considerable research and literature have been made available to guide the activities, assessments and policy development.

Research on characteristics of effective schools

Research by teacher educators has provided significant insights into the characteristics of effective schools. In the United States, for example, studies on learning summarized by the National Academy of Sciences, as reported by the National Commission on Teaching and America's Future (2003), suggest that effective learning environments are those that are organized around a common set of characteristics. First, effective schools use the knowledge, skills, beliefs and background of each child and maintain high expectations for them. These schools are learner-centred. Second, educators in these schools use well-designed assessment tools to measure student learning, they carry out assessments to provide continuous feedback to learners, and data from the assessments are used to revise learning activities. These schools also focus on core knowledge from the field and have standards for mastery. In addition, they also draw upon the resources of the local community.

Such schools do not just happen. They have strong leadership and are based on a clear vision for the school within the community. The teachers at these schools are highly qualified, which is reflected both in the content they teach and in their knowledge of relevant pedagogy. In other words, they know how to create a learner-centred environment and to engage students actively in the learning process. Furthermore, teachers and learners utilize modern technologies as an integral part of teaching and learning.

These aforementioned characteristics are consistent with UNESCO's overall educational strategy, and with *Information and Communication Technologies in Teacher Education: A Planning Guide* that has served as an overall framework for UNESCO's programme planning.

Better understanding of learning

Researchers are developing a deeper understanding of learning and the strategies that enhance it, and it is evident that new technologies are challenging traditional pedagogies. For much of educational history, the teacher has been the centre of the classroom. Research and pedagogy focused on teacher behaviour and specific pedagogical strategies that primarily utilized a "transmission" model of presenting information to students and asking them to recall that information. While in some cases a more direct instruction model may be an effective way of enabling students to learn foundational knowledge and skills, newer educational theories seek to shift the focus from teaching to learning and, thereby, from the teacher to the learner. Emerging models seek to make learning less passive and more interactive and to engage the learner as a solver of real-world problems.

Throughout the Asia-Pacific region, educators are examining how these emerging theories of learning can be incorporated into teacher education. While countries differ in their approaches to teaching and learning, all are interested in how best to engage students actively in the learning process, how to prepare them to become life-long learners, and how to provide the learning experiences that will enable students to solve real-world problems. To these ends it will be particularly helpful to draw upon recent research and theory in learning with ICT.

New technologies complement existing technologies

New technologies are becoming more widely available, and there are many interesting cases of ICT being used to complement existing technologies. Within the past ten years rapid advances in technology have continued to add potential to the use of ICT as an integral part of teaching and learning. Computers have become more plentiful, laptops have added portability, and wireless connectivity has enabled more teachers and students to have access to the Internet. Digital cameras are changing the manner

in which photos may be used as part of instruction, and telecommunication satellites are enabling more schools to access information, receive instruction, and collaborate with others. CDs and DVDs are providing databases previously unavailable to teachers and learners. The cumulative effect is that these new technologies are expanding the potential learning power of existing technologies such as video players, television, and tape recorders, and providing more options for teachers and students.

While the Asia-Pacific region represents enormous geographic diversity with broad availability of technologies, all countries are moving forward with the preparation for the integration of ICT into schools. Differences both within and among countries are striking and must be considered in any effort to prepare teachers; however, it would be short-sighted not to create models and policies that continue to take advantage of the learning potential of all available technologies.

Defining key terms

It is important in this opening chapter to define certain key terms. We have already used the term *information and communication technology,* or ICT. Other terms like *educational technologies*, *integrating ICT* and even *teacher education* also need to be defined.

Information and communication technology (ICT)

The term *information and communication technology* (ICT), as applied to education, grew out of previous terms like *information technology (IT)* and *the new technologies*. Anderson and Baskin (2002 online) comment:

> the addition of *communication* to previous terms such as *information technology (IT)* emphasizes the growing importance attributed to the communication aspects of *new technologies*.

A definition of ICT for teaching and learning that emphasizes both information technologies and communication technologies is offered by Toomey (2002 online):

> Information and communication technology (ICT) generally relates to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information. The technologies could include hardware (e.g. computers and other devices); software applications; and connectivity (e.g. access to the Internet, local networking infrastructure, and videoconferencing).

Moursund (2003 online) accepts this definition of ICT but details more comprehensively the range of technologies embraced by ICT:

> ICT includes the full range of computer hardware, computer software, and telecommunications facilities. Thus it includes computing devices ranging from $4 handheld calculators to multimillion-dollar super computers. It includes the full range of display and projection devices used to view computer output. It includes the local area networks and wide area networks that allow computer systems and people to communicate with each other. It includes digital cameras, computer games, CDs, DVDs, cell telephones, telecommunication satellites, and fiber optics. It includes computerized machinery, and computerized robots.

Educational technology

In some countries, the term *educational technology* is used more or less synonymously with ICT. However, it is a broader term and it is useful therefore to make the distinction that Downes et al. (2003) make in a report for SEAMEO[3]:

> The term *educational technology* frequently includes many other forms of accessing, presenting or communicating information, such as projector equipment and video and audio technologies including distance education formats such as radio and television. (Downes et al. 2003, p. 13)

Teacher Education

Teacher education programmes offered by universities, teacher colleges or equivalent institutions may be directed to the initial education and training of student teachers (commonly called pre-service education) or to the continuing professional development of existing teachers (commonly called in-service education or teacher professional development).

When we use the term *teacher education*, it includes both initial education along with the training of existing teachers and teacher professional development.

Integrating ICT

According to a UNESCO publication on teacher education through distance learning (Perraton et al. 2001), integrating ICT in teacher education refers to two sets of activities or roles:

> One is training teachers to learn about ICT and its use in teaching as computers are introduced to schools.… The other role of ICT is as a means of providing teacher education, either as a core or main component of a programme, or playing a supplementary role within it. (Perraton et al. 2001, pp. 33-34)

Besides the term *integrating ICT*, other terms in use are *embedding ICT* in the curriculum or *infusing ICT* across the curriculum. In this book, we use the terms *integrating* and *infusing* synonymously.

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[3] Southeast Asian Ministers of Education Organization

2

ICT use by teachers in Asia and the Pacific: a regional perspective

In this chapter, we move to the principal focus of this book, which is the Asia-Pacific region, an enormous area comprising many countries and cultures and a vast expanse of ocean. In the seven sections of this chapter, we touch first on the diversity of the Asia-Pacific region, disparities within the region, and how this diversity and disparity impact on ICT. The next section lists a range of educational technologies other than ICT encountered in teacher education across the region. The third section looks at national educational policies and curriculum reforms in selected project countries, while the next two sections examine ICT use in teacher education and ICT content in teacher training programmes. The sixth section consists of a series of brief case studies that detail some innovative practices in ICT use and other technologies in the region. The final section draws together certain threads in teacher education and use of technology across the Asia-Pacific region.

Regional and within-country diversity and disparity

The Asia-Pacific region has enormous geographic diversity: it contains some of the world's largest land areas like China and Australia, and some of the smallest like Bhutan, the Maldives, and the Pacific Island states. The Pacific Island nations are spread over 30 million square miles of ocean representing more than the entire world's land area combined.

In terms of population, the Asia-Pacific region contains five of the world's most populous nations (Bangladesh, China, India, Indonesia and Pakistan) and also some of the least populated and most remote (including most Pacific Island nations). Table 2.1 records population and other indicators in four countries in the region.

Socio-economic characteristics across the Asia-Pacific region vary widely. In terms of economic development (gross domestic product, or GDP), the region includes countries with among the lowest GDP in the world, as well as highly industrialized nations. The proportion of public expenditure as a percentage of GDP varies across countries, as seen in Table 2.1.

Consider, for instance, Indonesia spread over more than 12,000 habitable islands where 60 per cent of the villages are remote, with many lacking regular power supply or without any phone connections. Population and high birth rates make the task of teacher education enormous: there are 1.6 million primary and secondary teachers and more than 40 million students of school age. In China, where teachers number more than 10 million, the task of professional development is even more staggering.

Among Pacific Island nations, national ICT infrastructures, while developing rapidly, nevertheless lag well behind other countries in the region and the world, as illustrated in the ICT indicators shown in Table 2.2.

Table 2.1 Selected demographic and educational indicators for four countries in the Asia-Pacific region

Indicator	Indonesia	Malaysia	Singapore	Thailand	World
Population in millions (2000)	200	21	3	61	
Adult literacy rate (1999)	83.8%	83.5%	91.1%	93.8%	77.4%
Public expenditure on education as % of GDP (1998)	1.4	5.3	3.0	4.2	4.9
Enrolment in higher education as % of school-age population (1998)	11%	11%	34%	20%	

Sources: UNESCO, UNDP, World Bank

Table 2.2 ICT indicators in seven Pacific Island countries (adapted from Prasad 2003)

Country inhabitants	Telephones per 100 inhabitants	Computers per 100 inhabitants	Internet users per 100 inhabitants
Fiji	12.37	9.76	0.93
Kiribati	n/a	3.82	1.21
Marshall	9.09	10.85	0.80
Samoa	7.08	1.21	0.28
Solomon	1.80	7.64	0.69
Tonga	n/a	1.53	1.01
Vanuatu	3.77	0.10	1.61

Source: UNESCO

A key factor influencing access to the Internet, even where adequate infrastructure is in place, is the cost of connections. Costs in the Pacific region, for instance, are the highest in the world, according to Prasad (2003), estimated at between 25 and 50 per cent of the average annual GDP per capita, that is, five to 20 times higher than in APEC[4] developing countries.

A survey conducted for SEAPREAMS[5] across eleven countries, many of them islands in the Pacific, aimed to identify those factors that facilitated or worked against the take-up of computer-based technologies in schools. The five main barriers to implementing information technology programmes in schools were reported to be physical obstacles, like remoteness and an unreliable electricity supply, scarcity of funds, lack of staff development, insufficient and inappropriate software, and the speed of technological development (Anderson 1997).

The UNESCO JFIT[6] teacher training project implemented by APEID[7]on Training and Professional Development of Teachers/Facilitators in the Effective Use of ICT for Improved Teaching and Learning preliminarily includes Afghanistan, China, Fiji, India, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, Philippines, Thailand and Viet Nam. These project countries are drawn from four subregions.

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[4] Asia-Pacific Economic Cooperation

[5] South East Asia and Pacific Region Educational Administrators' and Managers' Symposium

[6] Japanese Funds in Trust

[7] Asia and the Pacific Programme of Educational Innovation for Development

As we note in this section, the 12 project countries reflect great diversity in cultures, languages, social systems, educational systems and learning environments. The project countries also reflect great disparities in economic and technological development, educational attainment, average teacher competencies, infrastructures and environment.

ICT and other technology uses in teacher education

The definition we give of ICT in Chapter One lists a range of computer hardware, software, and telecommunications facilities used in teacher education. In the Asia-Pacific region, many other technologies are used besides, or in conjunction with, ICT, either for delivery of programmes or for teaching and learning. The list includes: print, radio, interactive radio, audio-cassettes, television, video-cassettes, video use in micro-teaching, audio tele-conferencing, and video-conferencing.

A useful UNESCO publication, *Teacher Education Guidelines: Using Open and Distance Learning* (Perraton et al. 2002), identifies strengths and weaknesses of many of these educational technologies. The same publication also includes guidelines for choosing between the various technology options. In the final analysis, technology choice is determined by such considerations as cost, effectiveness and convenience for learners, and what is culturally appropriate for a given country.

National educational policies and curriculum reforms

The use of ICT and other technologies in the education and professional development of teachers is influenced in large part by two sets of factors: national policies on education, and policies relating to curriculum development. These two sets of factors are illustrated with reference to three countries within the Asia-Pacific region – Malaysia, Thailand and Viet Nam.

National educational policies
As might be expected from the diversity and disparity within the Asia-Pacific region, countries are at different stages in adopting national policies relating to ICT in education (Sadiman 2003). Countries also have different levels of resources to devote to such policies. Three country reports included in a SEAMEO publication (Downes et al. 2003) on pre-service teacher training and professional development in the use of ICT illustrate differences among them in the formulation and implementation of national policies on ICT in education.

In Malaysia, the Prime Minister announced his Vision 2020 for the nation more than a decade ago. Two years later in 1994 he unveiled a plan for an industrial hub – a Multimedia Super Corridor extending 50 kilometres from the nation's capital – which involved the development of Smart Schools. The first of these Smart Schools came online within three years, with the aim that by 2010 all schools in Malaysia would be Smart Schools. An Outline Perspective Plan for the decade 2001-2010 aims to:

- develop a quality workforce, knowledgeable and with highly-tuned thinking skills, which is able to use technology and new resources optimally, to combine creativity and innovation effectively and demonstrate a diversity of skills in the use of ICT;
- produce students who are knowledgeable and ICT literate and able to use technology for the betterment of themselves, their communities and their nation.
  (Downes et al. 2003, p. C5)

In Thailand, an ambitious education reform bill, the National Education Act, was passed in 1999 mandating that ICT play a key role in education. A major goal of the Education Act is "to promote, develop, and support the use of technologies in education". More specifically, the Act stipulates that:

> [T]he reform of learning will lead to lifelong learning, and bring about the realization of the emerging pedagogical paradigm via the use of ICT. (Downes et al. 2003, p. D7)

In Viet Nam a national statement about ICT in education was issued in 2001, with a Master Plan for implementation in 2002-2005. The target is to increase ICT use in teaching to between 5 and 10 per cent of the total time devoted to each subject.

The situation with regard to ICT in the education and professional development of teachers in Malaysia, Thailand and Viet Nam reflects the different stages at which national policies for ICT in education were adopted, and the countries' varying goals with regard to implementing these policies depending on national resources. How ICT is integrated in teacher education programmes is influenced by these national policies and goals.

Curriculum development within countries
The second set of factors influencing the integration of ICT in teacher education is the country's stage of curriculum development. Again, the SEAMEO report (Downes et al. 2003, p. 30) describes curriculum development in Malaysia, Thailand and Viet Nam.

Following the 1999 Education Act in Thailand, national reforms are underway across the whole school curriculum. Similarly, the launching of national policy in Viet Nam resulted in the implementation of a revised curriculum in primary and lower secondary schools from the 2002-2003 school year, and the projection for upper secondary schools from 2004-2005.

With respect to the use of ICT in schools, curriculum documents in Malaysia explicitly require the use of ICT; in Thailand ICT use is encouraged; while in Viet Nam the new curriculum emphasizes the need to use ICT.

Despite differences in curriculum approach among South-East Asian countries, Pennington and Chaisri (1999) observe three common threads:

> First, these countries recognize the need for a quantum leap in basic education and skills standards in order for the labour force to regain competitiveness. Second, rote learning is giving way to a new call for creative thinking. Finally, in Thailand and Indonesia, authority over curricula and spending is being decentralized to make education more responsive to local needs. (Pennington and Chaisri 1999, online)

The recognition by Asia-Pacific countries that curriculum reform in schools is required if countries are to remain competitive economically is a precursor to the integration of ICT in teacher education programmes, and it is to this topic that we now turn.

ICT use in teacher education

The driving force for new national education policies for schools and the impetus for curriculum reform to introduce ICT into education, which we touched on in the previous section, nearly always

come from business and industry representatives in the private sector. Corresponding curriculum reform in teacher education programmes to keep up with the changing situation in schools often lags well behind. This is the case in those parts of the world that are comparatively well advanced along the road to ICT integration: it also applies more generally across the Asia-Pacific region.

Yelland (2003), in her presentation to the June 2003 Experts' Meeting, drew on the Australian experience, noting how the role of ICT in effective teaching and learning is clearly recognized there, with particular implications for teacher education programmes. She cited the Queensland State Education 2010 vision statement, which identifies certain key principles:

> Key principles underlying the effective use of computers in learning include curriculum integration, continuity of learning, empowerment, equitable access and participation, supportive environment, teacher education (pre-service and in-service), and resource management. (Queensland State Education 2003, online)

Passi (2003) reports that, in other parts of the Asia-Pacific region, there is an enormous shortage of teachers with adequate ICT skills, suggesting there are possibly millions of professional teaching staff in the region who lack adequate knowledge of ICT. Since teachers cannot obviously be withdrawn from classrooms for long periods in order to update their skills, Passi suggests that an online training model would be useful which would then allow professional development to be conducted in parallel with regular teaching.

Again, we comment on the timeliness of the APEID project to develop models for teacher education to integrate ICT into the learning environment. However, in addition to the general shortage of teachers with adequate ICT skills, there was reference at the June 2003 Experts' Meeting to negative attitudes towards ICT use by most teachers in the region. Teachers need to have a clear understanding of why ICT is useful and, most of all, they need time to explore general applications software (like word processing, databases and spreadsheets) in order that they may feel comfortable with ICT applications.

Negative attitudes towards ICT on the part of many teachers may well result from feelings of insecurity when confronting something new, particularly when some of their students are gaining familiarity with ICT at home and in the community. The authority of the teacher becomes threatened. These feelings are quite understandable and are part of the philosophical shift that teachers need to come to terms with in using ICT in the classroom. These particular issues and other challenges in integrating ICT in teacher education are discussed more fully in Chapter Three.

ICT content in teacher education programmes

UNESCO's Asia and Pacific Regional Bureau for Education presents a useful synthesis of teacher training on ICT use in education (UNESCO Information Programmes and Services 2003). This report is based on many sources of information gathered from several of the 12 project countries, as well as from other countries in the region such as Australia, Singapore and the Republic of Korea.

Three stages in teacher training programmes in terms of ICT content are noted:

1 basic computer literacy;
2 the use of ICT hardware and software for teaching/learning activities;
3 pedagogy-based ICT use, the integrated use of ICT in subject curricula and classroom teaching and management, and online collaboration and networking.

Basic computer literacy

Course content for the first stage, *basic computer literacy*, consists of:

a basic computer parts and functions;
b computer operating systems;
c general software applications like Microsoft Office, not necessarily linked to teaching and learning.

ICT use in teaching and learning

At the second stage, namely *the use of ICT hardware and software for teaching and learning activities*, content is similar to that covered at the first stage, but now it is linked more closely to teaching and learning. Examples and practicum exercises are used to demonstrate how general applications software can be used for various teaching and learning activities, and content typically includes the following:

a using spreadsheets to create class lists for assessment and record keeping;
b using PowerPoint for presentations in the classroom for a variety of curriculum areas;
c using publishing software to create a class or teacher newsletter;
d sing WebQuests, that is, online problem-solving tasks, in instructional settings.

Integrated use of ICT

The third stage is more advanced in terms of integrating ICT across the curriculum. Content at this stage of teacher training, offered in a few countries such as Singapore, includes, for example:

a integrating ICT into teaching specific subjects like science, mathematics, language arts or social studies;
b using online communication tools like e-mail to join a collaborative project online or the Internet to research real world problems;
c linking schools with local communities.

Innovative practices in the use of ICT and other technologies

In this section, we include brief snapshots of case studies from countries in the region demonstrating the innovative use of ICT, in addition to other educational technologies. These case studies include the use of technologies in pre-service education programmes and in the continuing professional development of teachers at both the primary and secondary level, and, with the exception of the first example, were presented at the Experts' Meeting in June, 2003.

Reorienting teachers to new teaching approaches

The first case study, from Mongolia, one of the project countries, was conducted by UNESCO (Perraton et al. 2001). The authors report that the last decade has been a time of rapid change as the country has moved from a single-party socialist state to a multiparty democracy and market economy. New education laws and policies have impacted on the education system resulting in new curricula and teaching approaches. At the same time, funding available for education has needed to be reduced, a not-uncommon phenomenon in the difficult economic climate of recent years.

The authors of the case study describe a project that, though new to the country, utilized distance education "as an affordable means of reaching more teachers more quickly more often than traditional provision, to reorient them to new teaching approaches and curricula" (Perraton et al. 2001, p. 17). Radio and audio-cassettes were selected as the most appropriate technologies to help primary teachers

adapt to changes in curriculum, pedagogy and management of learning strategies. The approach in schools changed to integrated subject-teaching and active learning methods. The authors conclude:

> What the project demonstrated was a new way of using limited resources. Whereas the traditional model spent 85 per cent of its budget on travel costs and accommodation, the distance education approach spent a much greater proportion on the provision of learning resources and workshop activities. (Perraton et al. 2001, p. 18)

ICT use in teacher education

The second case study comes from Japan. At the June 2003 Experts' Meeting, Hayashi reported that ICT is utilized in all faculties at Yamaguchi University to improve communication between academic staff and students in a number of diverse ways, including:

- providing online courses from the campus network;
- recording student attendance at lectures;
- holding joint lectures with a neighbouring university using video-conference facilities and utilising satellite or ISDN;
- offering distance learning using CD-ROM and web-based multimedia instructional materials;
- holding joint lectures with a neighbouring university using video-conference facilities and utilising satellite or ISDN;
- offering distance learning using CD-ROM and web-based multimedia instructional materials;
- improving lecturers' instructional skills and evaluation abilities; and
- equipping lecture theatres with new media, such as computers, Internet access, and electronic boards.

Building on the practice implemented across Yamaguchi University, the in-service and pre-service teacher training programmes similarly make use of the full range of ICT equipment, including video-conferencing with satellite or ISDN, CD-ROM and web-based materials, computers and electronic boards.

With the use of ICT, emphasis is placed on practical activities and learning by active participation, with good communication maintained between lecturers and learners. Through an integrated approach that utilizes traditional instructional media like textbooks and overhead projectors together with ICT, students learn about theory and practise communication skills.

An integrated approach to pre-service education

The third case study that we report here was presented at the Experts' Meeting in June, 2003, and comes from China. Zhu reported how East China Normal University in Shanghai has developed a strong pre-service teacher education programme that focuses on educational uses of ICT and meaningfully integrates theory, pedagogical practice and technology. This integrated curriculum approach comprising these three components is illustrated in Table 2.3 (adapted from Zhu 2002) where pedagogy is seen to occupy a central position facilitating the convergence of theory and ICT tools.

The key to the integrated curriculum approach at East China Normal University is, first, integrating on-campus training in ICT with field practice; second, integrating theoretical learning with pedagogical practice; and, third, integrating hands-on activities with minds-on activities – that is, learning by doing in combination with mental activities such as peer evaluation and self-reflection.

Table 2.3 **Integration of theory, pedagogy and technology in the pre-service teacher education curriculum at East China Normal University, China**

Theory (Lectures)	Pedagogy (Activities)	Technology (Tools)
• Learning theories • Instructional process • Evaluating technology • Discussing pedagogical issues • Self/peer evaluation • Internet Explorer • Bulletin boards • Desktop publishing	• Media and instruction • Instructional design • Studying theories • Designing lesson plans • Communicating/publishing • Search engines • Chat rooms	• Learning resources • ICT and instructional innovations • Searching for information • Creating e-works • PowerPoint • E-mail • Word processing

The integrated approach adopted in pre-service programmes derives from an adaptation of the Intel Teach-to-the-Future teacher training curriculum for in-service professional development, which has graduated more than 150,000 K-12 teachers drawn from 18 provinces in the past two years. The programme, which is to be extended to graduate half a million teachers in the next three years, is considered the most successful teacher training project in China.

School-based teacher development
A final case study, also presented at the June 2003 Experts' Meeting, comes from Thailand and reports a school-based project of teacher professional development. Starting in 1998 with a single pilot school in Bangkok to improve the quality of life of underprivileged people through the use of ICT, this school-based project has since expanded to 12 schools across Thailand (Siribodhi 2003). The teacher development and information technology project[8] under Her Royal Highness Princess Sirindhorn has industry support from the Thai Federation of Information Technology and the National Electronics and Computer Technology Centre. The purpose of the project is to apply the use of ICT to enhance quality of life through education and increased work opportunities of underprivileged groups such as children with disabilities, the sick, and, with its expansion to the provinces, rural school children.

The project involves training teachers in the schools where they teach. Award-winning educational software is selected and teachers are shown how to utilize these software programmes in school subjects like maths, sciences and language arts. Important features underlying this effective school-based approach to teacher education in Thailand include the following:

- teachers in schools work as a team with teacher trainers or facilitators;
- a teacher in each school acts as a co-ordinator with responsibility to help colleagues with any technical problems that arise;
- a supportive environment allows teachers to become familiar with, and feel comfortable about, using computers in the curriculum;
- teachers learn about hardware and software using the same computer facilities they have access to in their schools;
- the school-based training helps teachers realize the need for continuing professional development;
- training sessions are in small groups with hands-on experience allowing the trainer/facilitator to take account of individual needs.

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[8] The title of the project is *The Integration of Educational Software with Elementary School Students*.

This project in Thailand takes as its starting point the level of teachers' ICT knowledge and develops pedagogy-integration in an environment that is familiar to them. Training is flexible and teachers can immediately put into practice what they learn in the subjects they teach. By working in small groups, teachers have opportunities to develop innovative and creative lesson plans and learn from their peers through discussion and sharing ideas.

Teacher education and ICT

In preceding sections of this chapter, we outlined the enormous diversity in the Asia-Pacific region, the disparities within countries, and how geographic, demographic, economic, social and cultural factors all impact on the use of ICT. Nevertheless, new national educational policies are in force and major curriculum reforms are underway in many of the 12 project countries, and this JFIT project for training teachers in ICT use is thus a particularly timely one.

The four case studies presented in this chapter give a glimpse, though all too briefly, of some of the innovative approaches being introduced. The use of radio and audio-cassettes, for example, in Mongolia to reach teachers and help them adapt to changes in curriculum and pedagogy demonstrates well that selecting appropriate technologies for particular circumstances operating at a given time is the most critical factor of all.

The relatively small-scale school-based teacher training project in Thailand contrasts with the large education programmes in Japan and China. The Thai project has the goal of helping teachers in the system to integrate the use of ICT in their regular teaching whereas the programme in China is directed at preparing teachers about to embark on their new career. Together, the three programmes provide what seem to be highly successful models of in-service and pre-service teacher education.

In Chapter Three, we turn to major issues and challenges facing teacher educators in integrating ICT in teacher education programmes that arise, in part, from the diversity and disparities within the Asia-Pacific region that have been the focus of this chapter.

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3

Issues and challenges in integrating ICT into teacher education

In this chapter we discuss three major issues and their concomitant challenges that must be addressed as nations seek to integrate ICT into teacher education and to enhance the learning of all students. The first section entails further discussion of the diversity within Asia and the Pacific, and examines what this diversity means for the integration of ICT. The comments draw upon the data presented in Chapter Two. The second section looks at current educational practices and discusses how changes to these practices must be approached thoughtfully. The final section focuses on capacity-building in the region and the issues that must be considered if the UNESCO goals are to have an impact on countries in Asia and the Pacific. Of course, these issues do not exist in isolation, and they should be considered in relation to one another.

Diversity of the Asia-Pacific region

In Chapter Two the general characteristics of the region are described. Geographic, demographic, economic and cultural issues are presented to demonstrate the diversity and disparities across the region. The differences were also noted by participants at the June 2003 Experts' Meeting. Key challenges included limited human and institutional resources, lack of basic telecommunications infrastructure, and the migration of skilled ICT professionals from rural areas to urban centres and overseas. Participants also cited the remoteness of some nations and schools, unreliable electrical supplies in some areas, and the scarcity of funds to support ICT and teacher education. These issues often mean that far too many schools lack emerging technologies, access to the Internet, and teachers with expertise to integrate ICT into instruction.

As UNESCO looks to develop a regional project to address the above challenges, it is also important to acknowledge that support for ICT use in schools comes not only from state governments but also from individual school communities, and community beliefs and economic status will shape members' views of what is appropriate. Urban communities differ from rural communities; societies with ample resources differ from those with scarce resources. Some communities seek to take advantage of ICT (especially computer-enhanced technologies) to move rapidly into the 21st Century. There is also a wide variety of technologies currently being used in the Asia-Pacific region, including radio, television, video-cassettes, and video and audio teleconferencing. This means that any initiative must not limit the definition of ICT to only computers and the Internet.

Underlying these many characteristics is the overwhelming number of teachers and students who must be trained, supported and taught to think of ICT as an integral part of both teaching and learning. For example, between 1999 and 2002 China provided 190 hours of ICT in-service training for 10 million teachers (Zhu 2003). Indonesia has over 40 million students of school age (Anderson 2003). No initiative related to ICT can ignore these numbers.

It would be inappropriate to conclude that the diversity of the Asia-Pacific region presents only challenges, as it is this very diversity that provides such a source of innovative ideas, alternative models, and lessons that can be applied to the less economically developed member countries. For example, many of the nations have been engaged in teacher education initiatives related to ICT. Others at an earlier stage of teacher education in the use of ICT may indeed learn from these efforts. The recent Experts' Meeting brought together specialists from and beyond the Asia-Pacific region; these and other national scholars can provide significant resources to UNESCO Bangkok's teacher training project. Therefore, the heterogeneity of the Asia-Pacific region provides both significant challenges as well as opportunities to overcome them.

Current educational practices

Each nation in the Asia-Pacific region has an established educational system with a set of policies and practices that govern teacher training, determine how schools and curriculum are organized, and shape teaching practices. To change the educational system therefore policy makers must address a number of issues. Of particular importance are issues related to the process by which systems, teaching practices, curricula and infrastructure are to undergo the necessary transformation.

With the advent of newer ICTs, teachers' roles have been changing accordingly, in terms of objectives, organization of curricular contents, modes of delivery, management of learning situations, and even systems of evaluation.

Changing the system

Systems are designed to resist, adapt to and accept changes that are introduced by internal and external factors. Systems seek to maintain as much of the status quo as possible; therefore, they are conservative by nature, and education systems are no exception. Every nation has a long and deeply ingrained tradition which determines how schools should be organized, how teachers should teach, how students should act and learn, and what should be taught. These education systems represent the unique cultures and political systems of each Asia-Pacific nation, and while they have changed to a degree over the decades, on the whole most appear stable and pretty much like they were in the 1980s.

As pointed out in previous chapters, ICT initiatives are leading to an overhaul in all areas of the educational system, with advocates calling for changes to the preparation of teachers, pedagogy, curricula and student learning environments. All of these proposed upheavals call for moving away from the current system towards a new model not yet fully understood.

The work of Bridges (1991) is useful in understanding change and the issues that need to be considered. Bridges contends that a system goes through three different stages during the introduction of changes (see Figure 3.1). In the first stage, "Ending", actions or policies are introduced that ask individuals working in the system to leave an old situation and move to a new one. For example, a new administrator may be assigned to a school replacing someone who had served for an extended period of time. There is the "end" of a former administration and the beginning of a new one. Teachers and staff then enter into a "Neutral Zone", in which old rules may no longer apply, but new rules are as yet undefined, and it is not clear what the school will be like in the future. Each stage brings both uncertainty and excitement.

It is also important to realize that change does not occur in clearly defined stages, as people are notoriously unpredictable. For example, some individuals involved in the change process do not leave

the "Ending" period, but remain there for an extended period before they adapt to the new environment. Others may not seek to adopt the changes at all but remain in the system. Still others withhold judgement for an extended period and take a "wait-and-see" attitude before deciding whether to adopt the new system. Then again, there are those who are energized by new ideas and quickly adopt the recommended changes. Educational literature is replete with discussions of "early adopters" versus "late adopters".

Ending

Neutral Zone

New Beginning
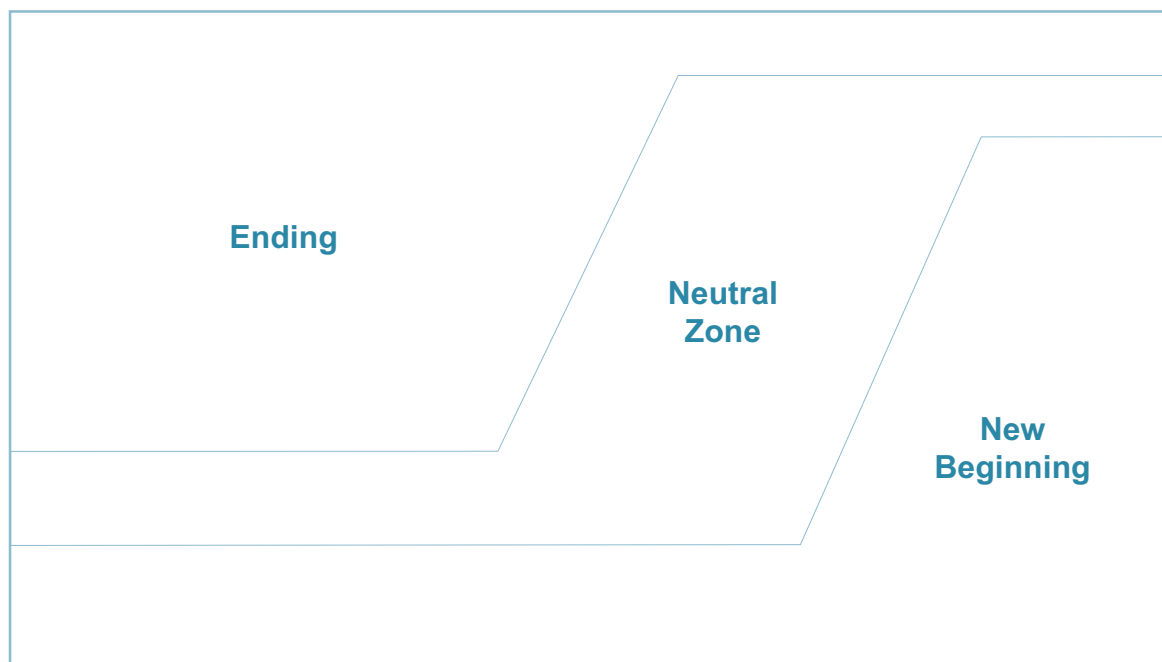
Figure 3.1 Transitions during the introduction of changes to a system

As Figure 3.1 illustrates, even at the stage when most people have adopted the changes and have created a new system, there still will be those who are withholding active involvement, and some who still do not want to participate in the new system at all. The goal is to have a critical mass of individuals who have joined the "New Beginning" and are ready to create a new vision.

As policy makers and advocates seek to introduce ICT integration into teacher education and schools, an understanding of these stages of change and transition are essential. For example, some administrators and teachers have witnessed many calls to reform during their tenure. Consequently, they approach any new ICT clarion call with caution. Others see emerging technologies as a means to change the system and to alter the current distribution of status and power. Why? Because in any new system there is a shift in the balance of power, and some people end up feeling uncertain as to their role. Administrators and teachers in positions of authority and status in a current educational system may believe that they will lose much of their power in the new system. Therefore they may be reluctant to adopt new ICT strategies. Others may view the advent of ICT as a much needed innovation, and hope that it will bring it opportunities for career advancement and greater authority. Consequently, as ICT is introduced into the educational system, interpersonal tensions may arise. Programme developers and administrators must be prepared to handle these tensions and consider them as a normal part of any systemic change.

It is important therefore to remember that it is *people* who have to carry out any transition, and transition is a psychological process individuals must go through to come to terms with any new situation. This psychological process is made more difficult by the fact that the "new beginning" may not yet be clearly understood.

Second, as Figure 3.1 illustrates, systems do not "End" one set of practices and move to new ones automatically. The call to leave the old system behind and move toward a "New Beginning" takes time and involves a period in which the organization is in a "Neutral Zone", characterized by the retaining of some features of the old system alongside some of the new. It is a period of uncertainty about how the new system will look, but it is also a time in which innovative ideas may be explored and adapted.

As administrators, teachers, students and community members begin to adopt ICT into instruction and change the manner in which students learn, there will be a period in which everyone will be in a "Neutral Zone". Old ways of organizing and teaching will be evident as will quite different classrooms in which ICT has transformed the teaching and learning. It will be a period of uncertainty with a tendency by some to fall back on more well-known traditions. Community members may also be uncertain about what is happening to the schools. While local communities want the best for the children who attend their schools, their memories of their own school days and/or what they believe the role of the school should be will shape their commitment to the upheaval they see around them. To attempt to introduce major educational changes into a school must include a concerted effort to work closely with the community members whose children will be affected. A wider use of ICT by families and local communities will help communication between teachers, parents and students.

To continue the overhaul of the system, leaders advocating change must provide: information and examples of what is expected once the changes are implemented; appropriate training and professional development; and a psychological safety net allowing individuals to express their concerns and uncertainties about what is to happen. It is also important that community members feel comfortable that students will continue to learn the subjects and skills that are important. Sadiman (2003) provides the following advice if ICT is to impact in a positive way on student learning and teacher training. He contends that professional development activities need to:

1 be connected to and derived from teacher's work with their students (classroom based);
2 be sustained, ongoing and intensive, supported by peers and school leaders;
3 include collective problem solving around specific problems of practices;
4 be integrated into the larger framework of teacher career regulations and incentives; and
5 be responsive to social and educational priorities at both the national and local level.

Why such strategies? Because teachers resist ICT innovations that do not match the context in which they work, and tend to integrate technology when it addresses real classroom problems, situations and learning goals. Teachers adopt change when they are able to set the goals, have opportunities to acquire the needed skills, and reflect on their learning. We say more about these issues in the remainder of this chapter.

Thirdly, given the diversity of the Asia-Pacific region, change strategies must be adapted to the individual social, political and economic environments. While educators throughout the region share many common goals and beliefs about education, they come from different cultures. These cultures dictate that calls for the higher integration of ICT into education be sensitive to these cultural differences. Change will not occur in the same manner in each nation or within different locations in any one nation.

Finally, the rapid advances in technology are also impacting upon the change process within the educational system. Since many teachers' careers began, ICT has changed dramatically. The power of large computers is now available in a laptop. Film projectors are now DVD players, reel-to-reel tape recorders have been replaced by small recorders that fit in the palm of the hand, and then there is the Internet, which now links classrooms to the rest of the world.

While access to ICT varies widely across the Asia-Pacific region, both teachers and students are aware of what is available. For the teacher, all these new technologies pose what may seem like an endless need to continue to learn new technical skills. Just when a teacher becomes familiar with one technology, a new version is introduced with accompanying revised software, and time and energy must be extended to learn the new features. In addition, these skills must be learned while continuing to teach classes filled with demanding students.

Rapidly changing technology also means associated costs. Pre-computer ICT had a longer user lifespan than computer technologies. While it is true that the cost of computing power has continued to decline, it is of little consequence to schools constrained by tight financial budgets. Rapidly changing technologies also means that educational systems must continue to allocate scarce resources to buying more and newer ICTs. Furthermore, as teachers and students become more adept at taking advantage of ICT, demand will increase.

As noted above, educational systems are complex human organizations steeped in history and tradition. Introducing change into a system is relatively easy; ensuring that change flows from policy to the classroom is a formidable challenge. Two additional factors need to be considered.

Teaching practices
Practising teachers soon develop a teaching style that blends their own philosophy of teaching and learning into the general philosophy of the school in which they teach, also taking in the characteristics of their students. Effective teachers realize that teaching is a work-in-progress and that one never quite knows everything. Teachers, therefore, draw upon a wide range of instructional strategies, including content knowledge, pedagogical understanding and, in the case of ICT, specific technical skills.

In addition, considerable research has documented the various stages in integrating ICT into the school community and in learning about ICT, as well as the principles for effective use of ICT in teacher education. Figure 3.2 summarizes these stages of ICT development[9].

Emerging	Applying	Infusing	Transforming

Figure 3.2 Stages of ICT development

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[9] A more detailed discussion may be found in Section II "Modelling ICT Development" in Anderson and van Weert (Eds) (2002) *Information and Communication Technology in Education: A Curriculum for Schools and Programme of Teacher Development*. UNESCO, Paris.

The following definitions clarify the stages in Figure 3.2. *Emerging* means that administrators and teachers are beginning to explore the potential of ICT. *Applying* means that teachers may be using computers for word processing, databases and to explore subject-specific software. *Infusing* means that a variety of ICT tools are being used and ICT is becoming integrated into the curriculum. *Transforming* involves a major reconstruction of the classroom into one that is learning-centred and where ICT is used to explore a variety of real-world problems. A transformed classroom is an inquiry-oriented learning environment.

What Figure 3.2 suggests is that the school as a whole and teachers individually move through a series of developmental stages beginning with limited use, and on to a stage where ICT becomes an integral part of teaching and learning. Any efforts to introduce new teaching strategies therefore must consider these stages and other critical pedagogical issues.

First, no acquisition of new skills is linear in nature, nor is it similar for each technology. Learning to use word processing, for example, may indeed move quickly, as Anderson and van Weert (2002) note, from discovery, to learning how to use word processors, to understanding how and when to use word processing as a part of instruction. However, when learning to access the Internet, the learning curve may be quite different and pose problems not encountered in other technologies. Therefore, as one seeks to introduce ICT into teaching and learning, it is important to recognize differences among ICT applications and the time and skills needed to learn to use them, and to understand their potential in the classroom.

It is also critical to remember that teachers, like all learners, learn new skills most readily when there is a need to do so. They most generally resist technology innovations that do not match the context in which they work, and when these technologies do not address real classroom problems, situations and learning goals. Consequently, it is important to provide real tasks for teachers, allow them to set individual goals, acquire the skills to meet these goals and have opportunities to reflect on their learning experiences (Glenn 2003).

Second, we know that the curriculum mind-set (fundamental beliefs about teaching and learning) that a teacher brings to the educational process influences how that teacher regards the use of technology (Cuban 1986). In other words, at some point the use of ICT as an integral part of teaching and learning brings the teacher to a stage where he or she is confronted with basic philosophical issues about teaching and learning, the teacher's role, students' role and curricular content. Emerging ICT technologies such as the computer and the World Wide Web change how information is presented, how knowledge is structured, and how students interact with the media, as well through the media with the teacher and other students. The scope and sequence of the curriculum are altered, as are the teacher and student roles. For example, for a teacher who prefers to use instructional strategies that are more teacher-centred and expository in nature, introducing ICT may create a tension as it moves more to the "inquiry" mode or learning. New ICT technologies may also prove unpopular among students who are most comfortable being told what they need to know and presented with the information in a more straightforward approach of reading, recitation, lectures, assignments and examinations.

Therefore, as ICT is introduced into the classroom, there are two critical events taking place; both teachers and students are learning new skills related to ICT. The acquisition of these skills takes time and resources that impact on what happens in the school and in the individual classroom. Making decisions about when skills will be learned involves the whole school community, impacts on the school curriculum, and consumes scarce resources. It is evident, however, that most nations are committed to the integration of ICT into schools, with China being the most dramatic example in the

region. As cited above, between 1999 and 2002, 190 hours of overall training was given to 10 million K-12 teachers (Zhu, 2003).

As teachers and students move from "learning how to use" the technology to "using the technology to learn", at some point teachers and students must confront philosophical issues touching on teaching and learning, their individual roles, and the changing curriculum. Figure 3.3 illustrates this point.

Emerging	Applying	Infusing	Transforming

Philosophical Decisions
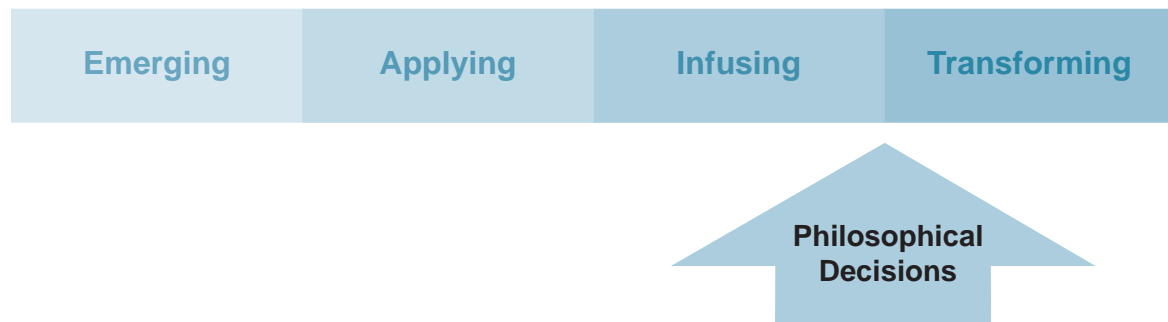
Figure 3.3 Teachers need to make critical philosophical decisions in moving from the infusing to the transforming stage

As the teacher moves from infusing ICT into teaching and learning and embedding ICT into the curriculum, towards the transforming stage where the curriculum centres on learning rather than on teaching, the teacher must make critical philosophical decisions. Let's look at an example based on the levels of computer use in the classroom (Zhou Nan-Zhao 2003).

> Teacher A has become very skilled in using presentation software such as Microsoft PowerPoint. PowerPoint is used by the teacher to present information in an interesting manner and is also being used to teach students specific factual knowledge. Teacher A has also taught students to use PowerPoint to make presentations to the other members of the class. Teacher A has also used the World Wide Web to gather information for his presentations and has taught the students to use the WWW to find information for their reports.
>
> As the teacher and students become more skilled in using a wide range of ICT, opportunities arise for more independent learning, for learning from peers as well as from the teacher, and for engaging in problem-solving generated by student interest. Teacher A now confronts not a technology problem, but a philosophical problem – should Teacher A move away from a teacher-centred classroom and a restricted curriculum or continue to explore interesting and engaging ways to present information with ICT? To move ahead means exploring new roles and different curricular organization.

What occurs during these teaching incidents is that the teacher re-conceptualizes his or her role from "teacher-as-presenter" to that of a "problem-poser", to a "co-learner" with students in a problem-centred classroom. Some teachers will make this shift in roles and classroom organization with ease and minimal effort. These are often those early adopters and ones who have most recently been prepared in their teacher education programmes to assume such roles. Others will do so with technical training, continued professional development, and support from colleagues. Still others will find the challenge to transform their classroom too difficult, not necessarily because of technological issues, but because of basic philosophical differences.

These philosophical issues shape how administrators and teachers respond to the impact of ICT on teaching and learning. However, today's schools are also being shaped by the emergence of standards that define what is to be learned, assessments that measure learning, and ICT-enhanced materials that reorient the curriculum.

Curriculum and standards

Each nation in the Asia-Pacific region has national policies regarding what should be taught and at what grade levels. This selecting and defining, what Gregorio (2003) calls "legitimate knowledge", is a highly politicized activity involving a wide spectrum of special interests and is replete with tensions between national policy makers and local communities. Policy makers want the curriculum implemented in the classrooms across the nation. Local communities want to be sure that what is being taught in the classroom not only is the best content but also represents local values and beliefs. As a consequence, national standards often appear to be quite different once implemented in the local classroom.

In an attempt to bring uniformity to the curriculum and what is to be expected of all students, educators and policy makers have created educational standards for the content and skills to be learned in schools. These standards, developed by experts in the field, are used to organize the curriculum, select appropriate content, and guide classroom instruction. They also serve as the fundamental building blocks for national, state and local assessments of student learning.

Standards provide a framework for all educators. Curriculum materials are created to provide the knowledge and skills needed. Professional development takes place to prepare teachers to abide by the standards in a variety of ways. And students are prepared for assessment on whether or not they can meet the standards in a given area. Administrators and educational policy makers collect data regarding the success of all students in order to make additional policies and allocate resources. Standards are powerful shapers of educational practice.

ICT standards have been developed by a number of countries and regions, for both teachers and students. Those developed by the International Society for Technology in Education (ISTE) have had significant worldwide influence and guide education systems in the United States (see Glenn 2002), while others have also been created by European countries. These standards identify a wide range of competencies expected of both classroom teachers and students, and range from operational concerns to social and ethical issues.

Today's classroom teacher, therefore, is directed by two sets of standards in the classroom. The first set defines what should be taught and when; the second focuses on responsibilities for integrating ICT into the teaching learning process, responsibilities that also involve acquiring new technical skills and knowledge, as well as re-examining the way students learn. For some teachers, the two sets of standards merge into a cohesive plan "to facilitate pupils' self-directed, active learning capabilities, to practise information skills and to discover collaborative and interdisciplinary learning" (Zhou Nan-Zhao, 2003). Others see the new ICT standards as an imposition of additional requirements on both them and the curriculum they teach.

Once again, as educators seek to integrate ICT into the classrooms of the Asia-Pacific region, special attention must be paid to standards relating to the overall curriculum and to ICT. One set of standards cannot be considered without the other. Administrators and teachers must understand how ICT can assist them in meeting the standards established for the curriculum. Without this understanding, educators will find that they focus on curriculum issues alone, and ICT will only be used to a limited degree.

Building capacity

The final section of this chapter focuses on capacity-building in the region. How does one provide professional development to millions of teachers? How does an institution ensure that policies established at higher levels are implemented in the classroom? How can access to ICT be made more widely available to all schools regardless of their location? How does an organization or state educational agency build capacity? These and other questions pose serious challenges to any initiative aiming to integrate ICT into the classroom, and provide professional training for teachers to enable them to continue to develop new pedagogical and technical skills.

While the vastness of the Asia-Pacific region is indeed daunting, there has been, and continues to be, significant progress in capacity-building. UNESCO's prior planning has provided a foundation for future activities for the region and is outlined in Chapter Five of this report. Whatever the initiatives undertaken, key essential elements must be present.

One key element is to always remember teachers' needs. As we have already noted, teachers are focused on their classrooms and their students and resist technology innovations that do not address what they believe are real classroom problems. Professional development should help teachers find their own way and needs to be ongoing – it takes time to change behaviour patterns instilled over many years. Some other important elements were identified, including:

Match the goal with the technology
Is the goal to "learn-to-use" the technology or to "use-to-learn" from the technology? Being clear about objectives increases the probability that the desired outcome will be achieved.

Include technology as one piece of the puzzle
Teachers use a variety of instructional strategies throughout the course of the year depending on the instructional objectives. They use technology as one piece of their teaching strategy, which means that ICT needs to fit into the larger curricular framework. We also noted that change is a complex phenomenon, and ICT integration must be part of a broader series of school reforms and renewal efforts.

Provide adequate and appropriate professional development
This may be the most widely discussed aspect of effective practice advocated in educational literature, and yet it is too seldom implemented. Far too much professional development is short-term in nature and not followed up. The most important features should be plenty of opportunities to try the technologies, reflect on experiences, and collaborate with peers on authentic learning tasks (Sandoltz et al. 1997, p. 6).

Change teacher beliefs about learning and teaching
We have discussed above the importance of teachers' beliefs as far as their decisions about using technology are concerned. It is important to remember that the introduction of ICT may not initially change teacher behaviour; however, with appropriate support and access to relevant technologies, behaviours will change over time. The opportunity to observe colleagues using ICT in new and innovative ways may be instrumental in changing teachers' attitudes.

Provide sufficient equipment, access to ICT and technical and instructional support
Research findings are clear – the better the access to ICT, the more it will be used for instructional purposes, and the better the student learning outcomes. This is a challenge across the Asia-Pacific

region because of the diversity of schools and the differences in resources. However, as educators plan for the future, they must explore options that will provide ready access to ICT for both teachers and students. Special attention should be given to providing access to computers and the Internet for community members. The digital divide between communities and families must be addressed.

Administrators and teachers are busy. They have little time to figure out why ICT is not working, and many may have limited troubleshooting skills. In the beginning, teachers need technical support; however, as they become more proficient and begin to move toward infusion and transformation, the type of support and professional development they require becomes related to instructional issues. That is why educational systems must plan for the long term.

Plan for the long term
Research clearly shows that in order to generate major changes in teaching practice, professional development must be ongoing and long-term (Orrill 2001). If educators are to acquire the necessary skills, have opportunities to reflect on the changes needed in their classrooms, and move toward a more learning-centred classroom, educational agencies must have professional development plans that provide appropriate training and support on a continuing basis.

Building capacity is critical for schools to provide optimum learning environments for students in the 21st Century. While the number of teachers to be prepared and provided with continuing professional education appears to be overwhelming, significant advances are being made. Planning and the careful use of resources are essential, as is a commitment from policy makers, educators and local communities to continue to move forward.

Chapter overview

We have examined some of the major challenges that must be addressed if we are to succeed in integrating ICT seamlessly into teaching and learning, and transform the educational system into a learning-centred environment for all students. While these challenges are indeed formidable, they are not insurmountable. Changes begin with small steps that have been carefully considered, and need to continue in spite of the difficulties and challenges that arise. The goal to provide the best education possible for our children is worth our concerted effort.

4 *A curriculum framework of ICT infusion in teacher education*

The previous chapter focuses on certain key issues and resulting challenges that must be addressed as countries in Asia and the Pacific move to integrate ICT into teacher education. This chapter moves on to what was a major objective of the June 2003 Experts' Meeting in Bangkok – to develop a holistic curriculum framework that might guide teachers' professional development in technology integration or infusion.

Our discussion in this chapter revolves around four sections. The first section extends the discussion of teaching practices in Chapter Three and presents a model of ICT development that describes the stages that institutions and educational systems pass through in the adoption and use of ICT. A second model of ICT uses is presented in the following section. The third part discusses the usefulness of models and frameworks, while the fourth describes a curriculum framework put forward in a recent UNESCO publication on ICT in teacher education (Resta 2002). Building on this initial curriculum framework, the final section advances a conceptual framework that might be even more useful. Together, the two models and the conceptual curriculum framework should prove of considerable help to countries in Asia and the Pacific planning to infuse ICT in the initial training and professional development of teachers.

A model of ICT development

Countries in the Asia-Pacific region are at different stages of ICT development, as described in Chapter Two.

In a recent UNESCO publication on an ICT curriculum and programme of teacher development (Anderson and van Weert 2002), hereafter referred to as *A Programme of Teacher Development*, a model is presented that can be useful in determining the stage of ICT development reached by a country, a district or even an individual school. This model derives from international and national studies of ICT development that have identified a series of broad stages that educational systems and schools typically proceed through in the adoption and use of ICT.

Sometimes the number of stages identified by studies varies though there is general consensus that the introduction and use of ICT in education proceeds in broad stages that may be conceived as a spectrum or series of steps. These steps, termed *Emerging*, *Applying*, *Infusing*, and *Transforming*, noted briefly in Chapter Three, are represented in a slightly different form in Figure 4.1.
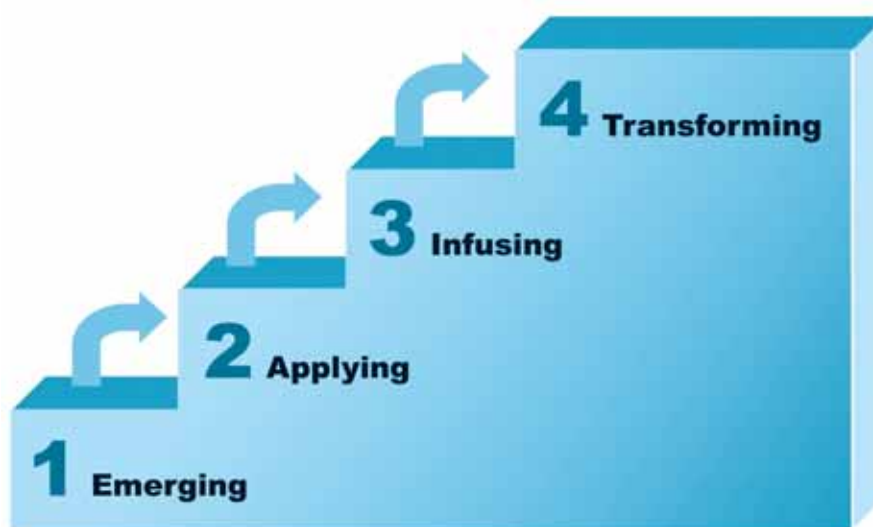
Figure 4.1 Stages of ICT development that educational systems and schools pass through in the use and adoption of ICT

Based on the descriptions of the four stages in Figure 4.1, no distinction is made between pre-service and in-service teacher education programmes, though in practice such programmes differ markedly in the content and approaches adopted, as well as in the mode and place of learning. Student teachers in teacher education programmes and those in schools are both referred to below as *teachers*; *classrooms* refers both to lecture or seminar rooms in tertiary institutions and to classrooms in schools; and *schools* refers to tertiary institutions, as well as to primary and secondary schools.

Emerging stage
Schools at the emerging stage are taking initial steps towards ICT development. Perhaps a computer has been donated to the school, or the school might have purchased one or two computers itself. While the principal and teachers begin to explore how best to make use of their new tools, the school may be regarded at the emerging stage.

At this early stage, teachers begin to become acquainted with ICT and develop ICT literacy skills. As *A Programme of Teacher Development* (p. 45) puts it:

> The emphasis is on training in a range of tools and applications, and increasing their awareness of the opportunities to apply ICT to their teaching in the future.

The major aim at the emerging stage of ICT development is that teachers should feel comfortable and at ease with the new technology, and confident in its use.

Applying stage
Once teachers feel reasonably confident with using computers and with basic concepts of ICT and general applications software (word processing, databases, spreadsheets, and communications), they move to the next step where ICT tools are applied in their particular subject areas – languages, natural sciences, mathematics, health sciences, music or art, for example. *A Programme of Teacher Development* lists examples of general teaching competencies at the applying stage, which include the following:

Ability to decide why, when, where, and how ICT tools will contribute to teaching objectives, and how to choose from among a range of ICT tools those that are most appropriate to stimulate pupils' learning.

Ability to decide when whole class or group multimedia presentations will be useful.

Ability to assist students to find, compare, and analyse information from the Internet, and from other sources specific to a subject area. *(A Programme of Teacher Development, pp. 50-51)*

Often at the applying stage, school administrators and the school library are also using computers for management tasks.

Infusing stage

In advancing from applying to infusing ICT, teachers incorporate (that is, infuse) ICT into all aspects of their teaching, their preparation and management, to improve not only their own learning but especially the learning of their students. At this stage, according to *A Programme of Teacher Development:*

ICT enables teachers to become active and creative, able to stimulate and manage the learning of students, as they infuse a range of preferred learning styles and uses of ICT in achieving their educational goals. The infusing approach often involves teachers integrating different knowledge and skills from other subjects into project-based curricula. They use multimedia themselves, or make it available to their students to present what they have learned. *(A Programme of Teacher Development, p. 44)*

Transforming stage

At the furthest end of the spectrum of ICT development, ICT tools become such an integral part of teaching and learning, by teachers and students alike, that the whole school experience becomes transformed. As we noted in Chapter Three, evolving to the transforming stage brings teachers and students face-to-face with basic philosophical issues about teaching and learning, about teachers' and students' roles, and about curriculum design.

As ICT is slowly infused into every aspect of teaching and learning, across every school subject and into all aspects of school and classroom management, the traditional teacher-centred approach to classroom activities gradually becomes replaced by a more learner-centred one. The teacher ceases to be the foremost authority and repository of knowledge. Rather, teachers become guides, assisting their students to construct knowledge themselves, in the way the newer theories of learning describe, as noted in Chapter One and further elaborated in Chapter Three.

At the same time, the boundaries between subjects become more flexible. Students work collaboratively in groups on real-life problems, communicating with other learning groups, and accessing resources on the Internet to research assignments. Student assessments are also being redesigned in order to reflect the new styles of learning.

A model of ICT uses

In her presentation to the June 2003 Experts' Meeting, Gunn described a three-dimensional model that may be useful in defining which ICT uses might expand the learning potential of students, and under what teaching situations. Developed by the North Central Regional Educational Laboratory (NCREL) in the United States, the three axes of the model shown in Figure 4.2 (Range of Use graph) may be used to answer three important questions:

X   What instructional approaches work most effectively with various ICT applications?
     The X-axis in Figure 4.2, or *Complexity in Learning*, ranges from didactic (what we have been calling teacher-directed) to constructivist (what we have been calling learner-focused);

Y   What types of ICT use support thinking and learning?
     The Y-axis in Figure 4.2, or *Instructional Approaches to Learning*, ranges from simple (Basic Skills) to complex (Higher-Order Thinking);

Z   Which ICT applications can be a springboard for student learning in a real-world context?
     The Z-axis in Figure 4.2, or *Authenticity of Learning*, ranges from Artificial to Real-World problem solving.
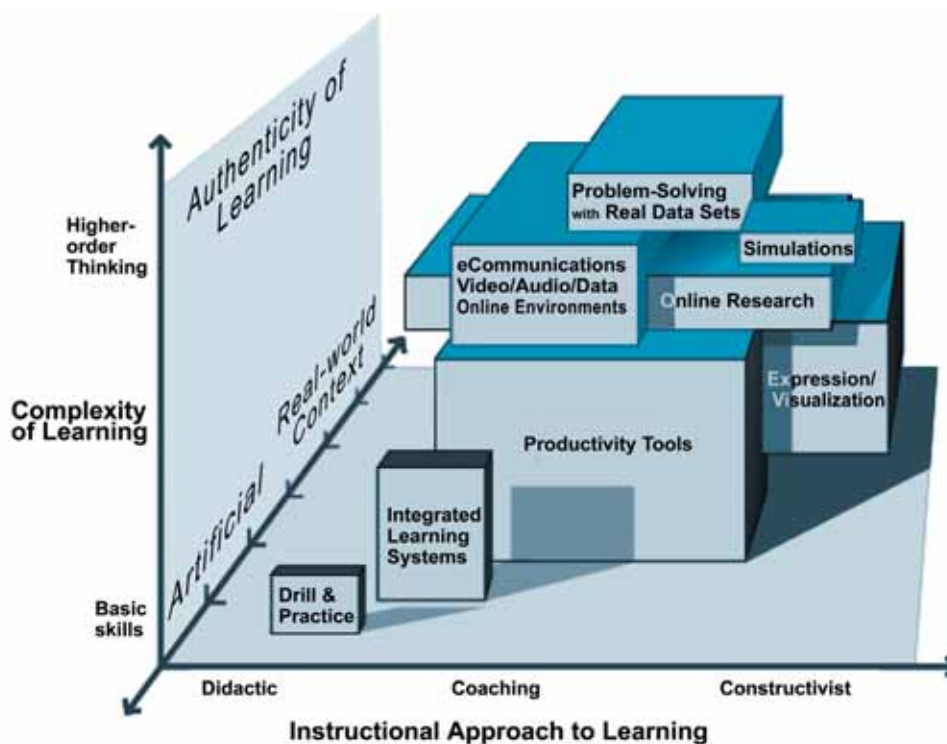
Figure 4.2 A model for gauging which instructional approaches with ICT (X-axis) might support students' thinking (Y-axis) in authentic learning situations (Z-axis) (from NCREL, 2003)

Usefulness of models and frameworks

In developing a curriculum for teacher education, a framework can be useful in portraying, usually in visual form, the different components that are operating and the interrelationship between these components within a total system. A framework, then, is a kind of scaffold or architect's blueprint that curriculum developers take as a starting point in determining content, sequencing, and pedagogical process.

Frameworks, like models, do not have the property of being true or false. Rather, they may be more or less useful, or perhaps not useful at all, for particular purposes.

The models presented in Figure 4.1 do seem useful in determining at what stage schools have reached in their ICT development, and which instructional approaches support students' thinking in authentic learning situations. The next two sections seek to develop a curriculum framework for teacher education.

An initial curriculum framework

It is fortunate that a further UNESCO publication that we have referred to in previous chapters (Resta 2002) has made a good start in developing a curriculum framework for teacher education. Section II of *A Planning Guide*, as the publication is commonly referred to, details both a rationale and a framework for ICT in teacher education. In developing this framework, the authors were particularly conscious of the needs of countries in the early stages of ICT development. The framework that was developed, then, is likely to be applicable to the Asia-Pacific region in so far as it takes into account recent research into the nature of learning, acknowledges that access to ICT resources may be limited, and recognizes that teacher education operates within a social, cultural and educational context.

The main components of the curriculum framework for teacher education are depicted in Figure 4.3. What is most important to note about the framework is that its layers encompass an entity that comprises interlocking components, thereby emphasising the holistic nature of a curriculum for teacher education. In other words, teacher education needs to be considered, for instance, within a particular context and culture. It is essential, therefore, to consider *all* the components encompassed within the layers, and not just selected parts.
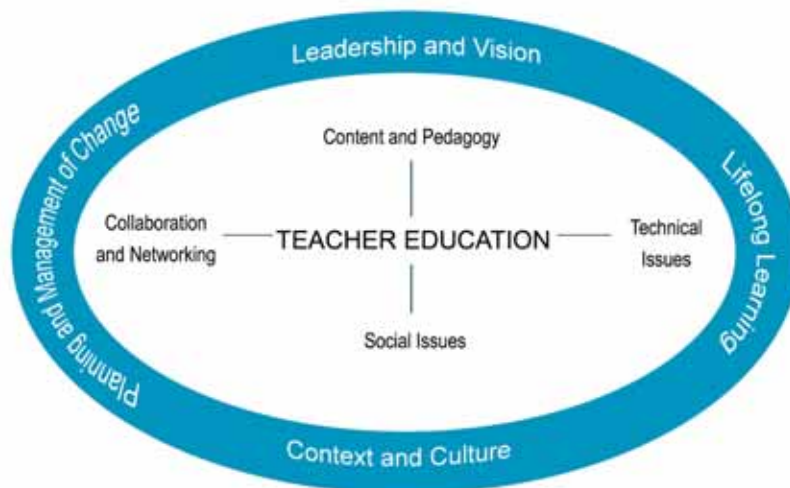
Figure 4.3 **A framework for ICT in teacher education (from *A Planning Guide* 2002, p. 41)**

The curriculum framework shown in Figure 4.3 has two layers. Within the inner layer or core are four clusters of competencies. The outer layer encircling these competencies contains what *A Planning Guide* terms as four supporting themes that serve to bind the curriculum into a single cohesive whole.

A more useful curriculum framework

As noted above, a framework is neither true nor false; but a framework may be modified to make it more useful. When the curriculum framework detailed in *A Planning Guide* was considered at the June 2003 Experts' Meeting in Bangkok, there was general agreement on major aspects of the framework. It was readily agreed, for instance, that teacher education operates within a particular context and culture; that training is a continuous process and therefore there is a need for lifelong learning; and that within these contextual dimensions are core competencies to be developed in a curriculum for teacher training and for continued professional development.

At the same time, certain reservations were expressed and questions were raised, particularly about the phrasing of some of the competencies shown in the inner layer of Figure 4.3. The following comments typify those made at the Meeting:

- Pedagogy is clearly a key competency and to a large extent subsumes content. It would be better if the primary focus were placed on how students learn, and then on content second.
- *Social issues* are not really a teacher competency. The term was understood to include safety concerns, moral aspects, and questions of ethics relating to the use of ICT, all of which might more properly be included under technology competency, it was argued.
- Similarly, the phrase *technical issues* might better be expressed as *technological competency*.
- In the outer layer, leadership and vision were acknowledged as key factors in implementing change, and therefore might be considered under planning and management of change.

Arising from these discussions and reflections, a more useful curriculum framework, but still based on the same rationale as that in *A Planning Guide*, can be portrayed as in Figure 4.4. The outer layer of this pyramid-shaped curriculum framework consists of *contextual factors* within which a particular teacher education curriculum operates. The inner layer or core of the pyramid comprises *teacher competencies* that the curriculum aims to develop.

The curriculum framework shown in Figure 4.4, like the pyramids of Egypt or Mexico, is best thought of as a unified structure. The essential competencies of pedagogy and technology are encased within an environment (the context) that is characterized by change and the need to continue to learn throughout life. Curriculum planners need to take account of all the components in the pyramidal curriculum framework. Let us now consider these different components in more detail.
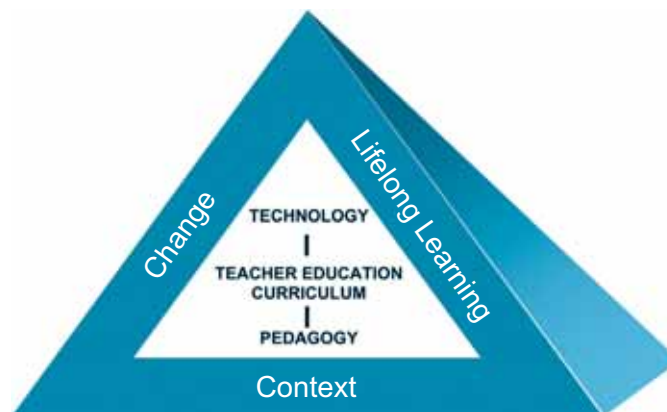
Figure 4.4 A curriculum framework for infusing ICT in teacher education

Contextual factors

No curriculum operates in a vacuum. Put another way, every curriculum is a product of the environment in which it is positioned. This environment, here referred to as contextual factors, includes three interrelated aspects: context, change, and lifelong learning.

1 Context

The most obvious factor within which any teacher education curriculum is planned is context. Context has a spatial dimension by which is understood that it includes all physical or environmental conditions about which curriculum planners need to be aware. These include the factors discussed in Chapter Two, such as the economic conditions within a country, and the quality of the telecommunications infrastructure in place. Included as well are cultural and linguistic factors that arise, for instance whether particular software is appropriate or not. Cultural factors related to pedagogy, according to Gunn (2003, p. 3), also include "student discipline, assessments, forms of communication, group work versus individual work, notions of duty and responsibility, [and] amount of structuring of educational experiences". Gunn continues:

> Local contexts range from rural to urban, many languages to English, non-ICT environments to ICT-rich environments, agricultural to commercial/industrial, low literacy to high literacy, educational goals from minimal education to university graduates, less funding to more funding, few PD [professional development] to many PD opportunities, and, finally, more localized schooling to more centralized or nationalized schooling.

By locating curriculum within context, curriculum planners need therefore to take account of diversity (such as between countries) and disparity within countries (such as the local contexts noted by Gunn).

But context also has a temporal dimension, by which is understood that a particular curriculum is a product of its time. As times change, for instance with changing political structures or demands in the workplace for new kinds of skills, so the context changes which, in turn, needs to be taken into account by curriculum planners.

2 Change

Change, and increasingly rapid change, characterizes modern societies. Driven by the revolution in ICT, new skills are required by the needs for an increasingly skilled workforce. This societal change, in turn, demands curriculum reform in education systems around the world, which Chapter Two touches on in countries of the Asia-Pacific region. It is these kinds of change that the Report of the International Commission on Education for the Twenty-first Century to UNESCO (Delors 1996) identifies as creating tension between tradition and modernity. Change, then, is a key contextual factor in developing teacher education curricula.

Clearly, leadership and vision are essential in planning and managing change, as is consideration of key stakeholders. In developing and implementing a curriculum to infuse ICT in teacher education, the main stakeholders, according to *A Planning Guide* (pp. 155-6), are:

- the dean or professor with responsibility for teacher education;
- teaching staff in the programme;
- senior administrators in the institution;
- student teachers wishing to acquire ICT skills;
- teachers and principals in schools who collaborate in organizing field experiences for teachers in training;
- governmental agencies that set policies for teacher professional development; and
- business and industry, which have an interest in the overall quality of graduates.

All stakeholders need to share a common vision with respect to ICT and the need to modify the curriculum in teacher education, which, in turn, requires a focus on making technology and sufficient resources available.

3 Lifelong learning
Lifelong learning, and indeed life-wide learning, are other contextual factors since it is now recognized that learning does not stop after formal education ends. Again, the Delors Report (1996) recognized that learning throughout life is the only means to manage the tension between the extraordinary expansion of knowledge and human beings' capacity to assimilate it.

The nature of ICT is one of such constant and rapid change that curriculum planners need to build into teacher education curricula the capacity, motivation and skills for student teachers to continue their learning after graduating from the institution.

Teacher competencies
The inner core of the teacher education curriculum pyramid shown in Figure 4.3 comprises core teacher competencies, which are grouped into two major clusters: *Pedagogy* and *Technology*. These two clusters of teacher competencies, although discussed separately below, are not independent of each other in a curriculum where ICT is infused in pedagogical practice.

1 Pedagogy
A Planning Guide nominates pedagogy, along with content, as "the most important aspect of infusing technology in the curriculum" (p. 41). Infusion of ICT begins with teachers' mastery of the content of the subjects. As they begin to incorporate ICT in their teaching, they develop new ways of doing things, gradually changing the focus of classroom activities from an emphasis on teaching to an emphasis on learning, as we discussed more fully in Chapter Three.

The adoption of ICT in the classroom generally proceeds in stages as depicted in the model of ICT development (Figure 4.1). At first, teachers discover ICT tools such as, for example, presentation software. They then begin applying ICT tools in place of previous instructional activities, such as preparing a PowerPoint presentation in place of a lecture. As teachers become more familiar with ICT in the subjects they teach, they explore new ways of using ICT, and so how they previously taught begins to change. In time their classroom practice becomes transformed as the focus of the classroom becomes learner-centred and students use ICT to solve real-world problems that cut across traditional subject boundaries.

Pedagogy includes much more. It includes theoretical knowledge and pedagogical skills. The theoretical and practical components of pedagogy included in the teacher education curriculum at East China Normal University, China, as reported by Zhu (2003) and noted in Table 2.3, are worth replicating in Table 4.4. Examination of Table 4.4 shows the wide view taken of pedagogy: it includes, for instance, knowledge of learning theories and instructional process and design, it includes assessment and evaluation strategies, and it includes planning and designing lesson plans. To these might be added selection and presentation skills.

Table 4.4 Theory and pedagogy in the teacher education curriculum at East China Normal University, China

Theory (Lectures)	Pedagogy (Activities)
• Learning theories	• Media and instruction
• Instructional process	• Instructional design
• Evaluating technology	• Studying theories
• Discussing pedagogical issues	• Designing lesson plans
• Self/peer evaluation	• Communicating/publishing
• Internet Explorer	• Search engines
• Bulletin boards	• Chat rooms
• Desktop publishing	

Collaboration and networking are other aspects of pedagogy. The real power of ICT comes from new ways of communicating beyond the four walls of the classroom and by locating information from worldwide sources wherever these may be located. The implications for teachers as they assist their students in collaborating with other learning groups and using networks to research assignment topics is that they cease to be the main source of knowledge in the classroom. Instead, teachers' roles change from being "a sage on the stage" to becoming "a guide on the side". Teachers need to accommodate a philosophical shift in their approach to teaching. *A Planning Guide* asserts that the development of teachers' competencies in collaboration and networking is essential to infusing ICT in the curriculum:

> Through collaboration and networking, professional teachers promote democratic learning within the classroom and draw upon expertise both locally and globally. (*A Planning Guide,* p. 43)

2 Technology

Whole books have been written about the ICT competencies required by teachers in the classrooms of today and tomorrow. At the emerging stage (see Figure 4.1) when teachers discover and learn about ICT tools, they need to go through a process similar to that of their students in schools. These competencies, often termed ICT literacy, include knowledge of ICT concepts and operations. Anderson and van Weert (2002), for example, include under ICT literacy the following:

Basic concepts of ICT
Using computers and managing files
Word processing
Working with spreadsheets
Working with databases
Composing documents and presentations
Information and communication

Besides the kinds of ICT competencies relating to concepts and operations, there are many social, health, legal and ethical issues associated with the use of ICT about which teachers need to know. The facility, for instance, to access information easily from remote sources, download it to a personal computer, and then utilize the information in a classroom assignment brings with it a host of social, legal, and ethical issues[10] relating to copyright, evaluation of information sources, and appropriate forms of acknowledging electronic information. Health issues arising from extensive use of ICT include considerations of correct posture, placement of hands and wrists on keyboards, avoidance of eyestrain, as well as safety issues concerning power supplies and care of equipment.

At the next stage beyond the emerging stage, described as the applying stage in Figure 4.1, teachers need to learn how to use ICT tools in different subject areas in which they teach. And from this stage, teachers need to advance to an understanding of how and when to use ICT tools for particular purposes, in teaching as well as for professional and management tasks. Teachers need to have a clear understanding of why ICT is useful to themselves and their students.

Allied to the contextual factors of change and lifelong learning, further technology competencies required of teachers are the need to update constantly their skills with hardware and to familiarize themselves with new generation software.

Technological competencies have an attitudinal dimension also: as Cabanatan (2003) reported, among the ICT competencies required of teachers are a positive attitude toward ICT, along with a clear understanding of the education potential of ICT.

Towards a teacher education curriculum

This chapter has twin aims. The first is to describe a model of ICT development and a model of ICT uses. Since the first of these models, which shows the stages that educational institutions normally pass through in the adoption and use of ICT, derives from research studies in many parts of the world, it is likely to apply also in the Asia-Pacific region. The second model should be equally applicable.

The second aim is to develop a curriculum framework for teacher education. Starting with one presented in *A Planning Guide* and modifying it to make it more useful, a curriculum framework for teacher education is developed that shows more clearly the competencies in pedagogy and technology required by teachers to fuse ICT with teaching. The framework outlined above shows the curriculum located within contextual factors of context, change and lifelong learning, thereby helping to ensure a better fit with a given country's needs.

Having established a curriculum framework, a subsequent step is to begin the task of changing the curriculum. In embarking on such a task, it is useful to note the comments of Gregorio (2003) about the process of managing curriculum renewal and how modifying curricula in teacher education can be a tool for educational change. She reminds us[11] that the term curriculum as described in the UNESCO-IBE Training Guide for Curriculum Specialists, 2003:

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[10] Ethical issues associated with Internet use are considered so important that recommendations have been developed (Ess and the Association of Internet Researchers 2002), of which teachers and teacher educators should be aware.

[11] Gregorio, L.C. 2003. Presentation to Experts' Meeting on Teachers/Facilitators Training in Technology-Pedagogy Integration, Bangkok, Thailand. June 18-20, quoting from the UNESCO IBE Training Guide to be developed for the JFIT Project *Managing Curriculum Renewal in Basic Education: Building Capacities to Respond to Change*.

- refers to a contract between society, the State, and educational professionals with regard to educational experiences that learners should undergo during certain phases of their lives;
- answers the why, what, when, where, how and with whom the learning is to take place; and
- defines the foundations and content of education, and their sequencing in relation to the amount of time available for the learning experiences planned, in terms of: 1. methods to be used; 2. resources for learning and teaching, such as textbooks and new technologies; and 3. evaluation.

A framework is not just a theoretical concept: it is a highly practical blueprint for action. The next chapter looks more directly at the planned JFIT-Teacher Training Project on training teachers for effective use of ICT in improving teaching and learning. Among action projects under the umbrella of the larger JFIT-Teacher Training Project that are advanced in Chapter Five is to design prototype course units and modules for a teacher education curriculum. The curriculum framework put forward in this chapter will help to locate such course units and modules in terms of the teacher competencies that each is designed to develop.

One other application of the teacher education curriculum framework with its focus on teacher competencies is to serve as a base for developing standards for teachers. A further project advanced in Chapter Five is to prepare teacher standards for competencies in ICT integration to guide implementation of ICT in teacher education in the region. Again, the curriculum framework advanced in this chapter should prove useful.

With the development of standards, curriculum materials may be developed, which then leads on to training in use of the new resources. A curriculum framework for teacher education thus serves as a necessary base for a whole range of curriculum activities.

5

An action-oriented project and expected outcomes

This chapter focuses on the JFIT-Teacher Training Project on Training and Professional Development of Teachers/Facilitators in the Effective Use of ICTs for Improved Teaching and Learning (Zhou Nan-Zhao 2003), and the outcomes of the discussion during the Experts' Meeting.

Threads drawn from preceding chapters are woven together in this chapter, which proposes an action programme of seminars, workshops, expert meetings, conferences, and other activities aimed at building national capacity in the effective use of ICT in teacher training and professional development in the region.

The project has been woven by using the global perspectives of UNESCO and the local needs of the Asia-Pacific countries. The local aspect of the project is reflected through using local contents and contexts, giving importance to community support, particularly parents' involvement, and the expert opinions for this region.

This project meshes well with the global vision of UNESCO to build more equitable and just societies. The key role of education is clearly recognized by UNESCO, as is the importance of teacher education and ICT. UNESCO has long played an active advocacy role with regard to having mechanisms in place to ensure that national curricula are more relevant and responsive to changing circumstances, and that the benefits of the new technologies should be available to all. It has done this, for example, by:

• promoting universal basic education (The World Conference on *Education for All* held in Jomtien, Thailand, in 1990, and the World Education Forum, in Dakar, Senegal, February 2000);
• stimulating debate on curriculum reform and innovation through building on the "four pillars of learning" – learning to know, learning to do, learning to be, and learning to live together (The Delors Report 1996);
• advocating the reorientation of education systems based on the principle of lifelong learning; and
• supporting the integration of ICT in the education process.

Our main focus in this chapter is to advance a number of specific projects and development activities discussed at the Experts' Meeting held in Bangkok in June 2003, based on the aims and objectives of the JFIT-Teacher Training Project which aims for capacity-building. Other sections take up the issue of evaluation, monitoring and project development. There is need for situation analyses in countries participating in the project, and other UNESCO programmes can support this capacity-building project. It is useful to establish partnerships with organizations in the region that share similar philosophies and goals. The final section presents an overview of this project.

Project aims and objectives

The major goal of the JFIT-Teacher Training Project is to build national capacity in the effective use of ICT in education through initial training of teachers and professional development of existing teachers and facilitators. This goal is to be achieved by effectively utilizing and fully infusing ICT in all aspects of the educational process, thereby effecting a paradigm shift from teacher-centred teaching to ICT-enabled student-centred interactive and independent learning.

The immediate objectives of the JFIT-Teacher Training Project are:

* to improve teachers' competence and confidence, through both pre-service education and in-service training, in order to fully integrate or infuse ICT in all aspects of the educational process and to transform the classroom from teacher-centred teaching to ICT-assisted interactive and independent learning;
* to identify, create, and disseminate regional, locally-specific pedagogies and models of technology utilization and technology-pedagogy integration in diversified instructional environments; and
* to develop and put into operation a regional online teacher resource base and a regional offline network of centres of excellence in order to share innovative practices and resources and to help in ongoing professional development using ICT for educational purposes.

In view of the diversity and disparity among these countries, the project has formulated strategies which aim to balance regional and country activities: for cost-effectiveness, when products will be shared by more than the pilot countries; to ensure high standards, by the accumulative feedback from the different countries; and for the inclusion of international resources. The JFIT-Teacher Training Project is to be conducted in the 12 countries noted in Chapter One, namely, Afghanistan, China, Fiji, India, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, Philippines, Thailand and Viet Nam.

Situation analyses of national curricula

A necessary and prior step before embarking on a project to build national capacity in the effective use of ICT in education is, according to Gregorio (2003), to conduct a *situation analysis* of the education curricula in the project countries. This kind of analysis normally includes gathering information on aspects such as the following:

* the background to the national curriculum such as laws and policies relating to curriculum, underlying philosophies, and goals and objectives of education;
* organizational structures and designs underpinning the national curriculum;
* how the national or localized curriculum is implemented, including the initial and in-service training of teachers;
* what mechanisms are in place for monitoring, reporting and evaluating how the curriculum is being implemented;
* recent or ongoing curriculum reforms; and
* frameworks for revising or updating the national curriculum to take account of, for instance, new learning areas such as advances in science and technology, developments in ICT, preventive and health education, and the need for new literacy skills.

As a result of a joint UNESCO and IBE[12] initiative, a situation analysis of the national curriculum has already been completed for a majority of the 12 project countries, and is available on CD-ROM (UNESCO IBE and UNESCO Bangkok 2003). These situation analyses will be useful in an action plan for the training and development of teachers in infusing ICT in the educational system and in teacher education programmes.

Supporting programmes

Closely allied to the situation analysis of national curricula are several other complementary programmes initiated by the UNESCO Asia and Pacific Regional Bureau for Education that can support this JFIT-Teacher Training Project for national capacity-building in ICT in teacher education. Three such programmes, described in *Using ICTs to Upgrade the Quality and Reach of Education in Asia and the Pacific* (UNESCO 2003), are particularly pertinent:

- *Meta-Survey of the Asia-Pacific Programme on Promoting the Effective Use of Information and Communication Technologies in Education*. Insofar as this programme maps and analyses existing ICT initiatives in education in order to obtain an accurate picture of the current state of ICT use in education in countries of the region, it is useful in determining where countries are at in terms of ICT at the start of the JFIT-Teacher Training Project.
- *Performance Indicators on ICT Use in Education*. This programme aims to develop a set of indicators to measure ICT in education in order to provide a basis for policy planning and programme improvement. Such indicators will be useful in determining if and how ICT is effective in improving teaching and learning.
- *Regional Clearing House on ICT in Education for Asia and the Pacific.* This regional clearing house will play a key role in disseminating information generated from the JFIT-Teacher Training Project and other related projects.

Proposed activities

Let us now turn to a number of specific projects and activities that might be mounted under the umbrella of the wider JFIT-Teacher Training Project on ICT integration in teacher education. For the most part, each of the projects advanced below results in a particular product like a CD-ROM, resource kit, or publication. Within the development and dissemination stages of some of these products there are regional workshops and international conferences where prototype products are refined or adapted for local contexts.

Besides these projects that have clearly defined product outcomes, there is clearly place, too, for other training activities in regional or subregional workshops, designed to achieve a multiplier effect to reach ever-increasing numbers of teachers. While such training activities are valuable, they are not further elaborated here.

Table 5.1 lists seven separate activities, each leading to the development of a specific product. Alongside each listed project is detailed certain strategies in the development of the product and its subsequent dissemination to the 12 project countries.

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[12] UNESCO International Bureau of Education, Geneva

Table 5.1 Outline of activities and dissemination strategies

Activities	Strategies
1 Compile *regional handbook* on teacher education and use of ICT based on project country experiences.	• Engage consultant to compile and assemble materials. • Publish *regional handbook*. Translate *regional handbook*. • Promote *regional handbook*.
2 Develop *resource kit* for ICT in teacher education for use in the region.	• Gather videos, audio interviews, lesson plans. • Assemble *resource kit* in convenient package form. • Promote *resource kit*.
3 Assemble set of *e-resources* for teacher educators.	• Engage consultant to assemble *e-resources*. • Produce CD-ROM for *e-resources*. • Distribute CD-ROM.
4 Prepare *teacher standards* for competencies in ICT to guide implementation of ICT in teacher education in the region.	• Engage consultant to review *teacher standards*. • Refine *teacher standards* at regional workshops. • Adapt *teacher standards* for local contexts.
5 Produce a *database of exemplary practice* in ICT across the curriculum for use in teacher education programmes in the region.	• Engage consultant to collect and review instructional materials. • Conduct regional workshops. • Produce and distribute learning materials on CD-ROM.
6 Design *prototype course units and modules*.	• Engage consultant to review available materials for pre-service and in-service programmes. • Conduct workshops to refine and adapt units and modules. • Produce and distribute prototype units and modules on CD-ROM.
7 Progress exchange of information and networking by establishing a *website* to strengthen regional co-operation in use of ICT in teacher education.	• Establish a *website* for this project. • Promote the *website* as a means of communication between project countries.

Expected outcomes

The outcomes for each of the seven activities listed in Table 5.1 are expressed in the left-hand column in terms of specific products that the project is expected to produce:

1   *a regional handbook* on teacher education and use of ICT;
2   *a resource kit* for ICT in teacher education;
3   *a set of e-resources* for teacher educators;
4   *teacher standards* for competencies in ICT;
5   *a database of exemplary practic*e in ICT across the curriculum for use in teacher education programmes;
6   *prototype course units and modules;*
7   *a website* to exchange information and strengthen regional co-operation in use of ICT in teacher education.

The development of the guidelines and standards for competencies in ICT and modules are conducted by using a team approach. A group of teacher training experts are contracted to develop guidelines and standards for competencies in ICT and modules.

Project objectives

When planning each project, the objectives should have the following SMART characteristics:

Specific
Measurable
Attainable
Realistic
Timely

In other words, each project should aim for specific outcomes with clear measurable criteria; outcomes should be attainable within a reasonable timeframe and budgetary constraints; and outcomes need to be realistic and timely, that is, appropriate for the region.

Implementation strategies

General strategies that might be adopted in each project to obtain the desired specified outcomes were suggested by Gunn at the June 2003 Experts' Meeting. Her suggested strategies involve four steps:

1

Survey targeted regions to identify educational contexts

• cultural factors
• systemic factors

2

Describe up to three generic contexts in terms related to:

• pedagogy
• instructional use of ICT

3

Adapt existing resources for those contexts from

• case studies
• lesson plans
• classroom resources
• teacher training materials
• assessments

4

Package the resources for use within generic contexts (local, national, regional)

Figure 5.2 Typical implementation strategy for each project

The projects in more detail

Further details about each of the seven projects follow, while how projects might be evaluated and monitored is considered in the next section.

The ordering of the projects does not imply any particular sequence or hierarchy, though some, like designing a set of standards to guide implementation of ICT in teacher education in the region, clearly follow others; nor is any time length indicated for projects. Certain projects will be of relatively short duration; others will take longer to complete and will continue in parallel with other activities.

1 Compile regional handbook

The *Regional Handbook* is envisaged as similar to UNESCO's *A Planning Guide* (Resta 2003) but shorter, more practically oriented, and containing experiences drawn from countries in the Asia-Pacific region. It might include examples of vision statements for ICT in education; sample curricula in use in pre-service and in-service teacher education programmes from the region; examples of ICT standards and competencies for teachers; case studies and vignettes of ICT use in teacher education programmes.

The consultant to be engaged should be a teacher educator with pedagogical and ICT expertise. Some visits to project countries to gather materials may be necessary. The *Regional Handbook* should be illustrated and published in the most readable form possible. Once compiled in a working language, the *Handbook* could be translated for wider use in other project countries. The *Handbook* would then be promoted at national and international meetings and through the Regional Clearing House on ICT in Education for Asia and the Pacific.

2 Develop resource kit

The *Resource Kit* is conceived as being a valuable collection comprising various media: videos of classroom practice, audio interviews with teachers on cassette, sample lesson plans and teaching modules on CD-ROM, and printed materials. Developed for the Asia-Pacific region and based on practices in the region, the *Resource Kit* will embrace diverse languages and cultures.

The diverse teaching and learning materials contained in the *Resource Kit* will be collected in-house and over a period of time, and assembled in a convenient package form for use by others. Since the collection of materials is an ongoing activity, it is not necessary to wait for its completion before promoting it as a resource for teacher educators. Such promotion can take place at regional workshops (where additional material can be gathered) and at international meetings in the region.

3 Assemble e-resources for teacher educators

UNESCO's *A Planning Guide* contains a description of *Learning Resources on CD-ROM for Teaching in Thailand* (Resta 2002, p. 159). Other resources on training and professional development of teachers are also available on CD-ROM (UNESCO Information Programmes and Services, Bangkok 2003). Building on these promising initiatives, *e-resources for teacher educators* might comprise a range of electronic materials specifically for teacher educators – policy documents, reports and databases, online educational journals, electronic books, online newspapers, glossaries and online tools.

CD-ROM is a better medium for distributing e-resources for teacher educators than the Internet since it can be accessed where the Internet is not available; it saves costs on download time; and CD-ROM drives come on all computers nowadays. CD-ROM is also inexpensive to produce and to distribute. *E-resources for teacher educators* would contain copyright-free resource materials, together with links to other freely available online resources so that, if an Internet connection were also available, teacher educators would enjoy access to a whole library of information that had been already evaluated, filtered and judged useful.

To assemble *e-resources for teacher educators*, a consultant would best be engaged who was a teacher educator with ICT expertise, and who was familiar with *Learning Resources on CD-ROM for Teaching in Thailand* and UNESCO's resources on teacher training on which this particular product is based. Once a master CD-ROM is pressed, copies could be inexpensively reproduced and distributed to every teacher education institution in the 12 project countries, with permission to make further copies for individual teacher educators. As with other products generated, *e-resources for teacher educators* could be promoted at regional workshops, international conferences, and through the Regional Clearing House on ICT in Education for Asia and the Pacific.

4 Prepare teacher standards for competencies in ICT
The design and development of a set of teacher standards to guide the implementation of ICT in teacher education is a large task. However, it is not necessary to reinvent the wheel since associations like ISTE[13] in the United States have developed such standards. Similar bodies in Europe and Australia have also developed standards expressed in terms of ICT competencies for teachers, as well as standards that take account of stages of ICT development. In addition, the SEAMEO INNOTECH Centre in the Philippines has begun to develop a set of desired ICT competencies for teachers, as Cabanatan (2003) reported.

To arrive at a set of standards that might be useful across the Asia-Pacific region, it would be best, first, to engage a consultant to review ICT standards for teacher education developed in other parts of the world. Such a consultant is likely to be a teacher educator and curriculum specialist who has a good working knowledge of developments of ICT standards in two or more continents. At the next stage, regional workshops could be organized to receive and consider the standards reviewed, and adapt them to different local contexts and cultures.

5 Produce database of exemplary practice
Teacher educators about to embark on, or new to, integrating ICT into their courses would find it extremely valuable to view examples of exemplary practice in ICT in different subjects across the curriculum. There is an abundance of such material around the world in colleges of education but it needs evaluating and compiling in a convenient and easily accessible form. A searchable CD-ROM with lesson segments or modules, organized by curriculum area and level of schooling, would provide easy access and, in addition, be inexpensive to produce and disseminate.

To compile a database of exemplary practice in ICT, a consultant should be engaged in the first instance to evaluate and collect examples from around the world. The consultant for such a task is likely to be engaged in teacher education, be familiar with a broad range of curriculum areas, and have expertise in pedagogy and ICT. The next stage would be to review these materials at regional workshops attended by curriculum specialists, and then to modify the materials as necessary to suit local contexts. Finally, a cross-section of curriculum materials could be pressed on CD-ROM, organized by curriculum area and level of education, for dissemination to every teacher education institution in the 12 project countries, with permission to freely copy for further distribution.

6 Design prototype course units and modules
For teacher education institutions yet to make a start on modifying curricula to integrate ICT, it is helpful to view course materials from elsewhere. Hence the aim of this project is to design prototype course units for pre-service teacher education programmes and other prototype modules for in-service teacher training. Like the design of teacher standards for competencies in ICT, this would be an

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[13] International Society for Technology in Education

enormous task if starting from scratch but, fortunately, such course material is already developed in other contexts upon which this project should build.

Again, in the first stage of development, a consultant might be engaged to review available materials for pre-service and in-service programmes. The consultant needs to have expertise in the integration of ICT in teacher education in both pre-service and in-service modes. The second stage of development involves refining and adapting units and modules for use in the region, which could be achieved by bringing together teacher educators from the region. The least expensive way to distribute prototype units and modules resulting from work groups is then on CD-ROM.

7 Exchange information in use of ICT in education

To foster communication among project countries on integrating ICT in teacher education, a website for this project should be established. This website should be interactive by including a discussion forum as well as a facility for users to upload materials – for instance, reports of innovative practice and lesson modules – to the central server. In this manner, communication becomes two-way.

The UNESCO Asia and Pacific Regional Bureau for Education in Bangkok already has the expertise to establish a website as described here for the exchange of information between project countries. To foster genuine communication and the free exchange of ideas, however, it would be better, in the first instance, for this website to be maintained separately as a closed network without any link to the current portal for ICT and teacher education that is accessible by a worldwide audience. At a later stage, after evaluation, certain materials from the project network could be transferred to the Internet for wider distribution.

Evaluation and monitoring

Built into the development activities for each suggested project above is a progressive refinement of the resulting products as these are modified and adapted for use in different local contexts by successive groups of experts. This progressive refinement and adaptation is akin to formative evaluation. It is useful also to maintain a continuing monitoring of each project to ensure that the specific objectives are addressed: in short, to ensure that the project stays on target. Such monitoring is commonly overseen by a steering committee, which we discuss in the next section.

As well as formative evaluation, funding bodies often require some kind of summative evaluation of projects. It is useful, then, to build such evaluation into each project at the beginning, and appoint an evaluation expert who is independent of the steering committee, but at the same time has background knowledge of the overall JFIT-Teacher Training Project, its aims and objectives, and some familiarity with teacher education in the Asia-Pacific region.

Project management

It is usual in projects of the kind suggested above to establish a steering committee for each designated project. The membership of each steering committee might comprise as few as three or four members. One or two of these would normally be permanent staff of UNESCO with responsibility for budget. Additionally, one or two external members might be co-opted because of particular expertise in the project proposed. The purpose of each steering committee is twofold: first, to ensure that the project is on track and completed in the specified time; and second, to be available as a sounding board for those who have the task of implementing the project.

A project steering committee usually also checks that other evaluation criteria are met, such as, for example, ensuring equitable access by all to quality education, suitability of resources and training materials for the needs of target groups, affordability to users, ease in implementing, and the potential of improving the quality of teaching and learning in teacher education institutions and ultimately in schools. As one instance of how these criteria might be addressed, Shinohara (2003) points out that special attention should be paid to how the use of ICT can promote greater participation and achievement of girls and women in education.

Establishing partnerships

Already, this JFIT-Teacher Training Project on ICT integration in teacher education has established links with other institutions and country initiatives. For instance, a country-based Joint Innovative Project (JIP) in China is to be affiliated to this larger project in order to harness the potential of ICT to reduce the digital divide in teaching-learning quality through capacity-building in disadvantaged areas.

Other close relationships are in place with organizations like SEAMEO INNOTECH[14] in Quezon City, the Philippines. Similar relationships could be extended to other SEAMEO Centres like RECSAM[15] in Penang, Malaysia; RELC [16] in Singapore; and SEAMOLEC [17] in Jakarta, Indonesia.

As a result of the June 2003 Experts' Meeting in Thailand, which was the public launching of this JFIT-Teacher Training Project on ICT integration in teacher education, further partnerships are being forged with such higher education organizations in the Asia-Pacific region as East China Normal University in Shanghai, China; Yamaguchi University in Yamaguchi, Japan; King Mongkut's University of Technology in Bangkok, Thailand; and Flinders University Institute of International Education in Adelaide, Australia.

Yet more partnerships might usefully be made with commercial information technology companies and corporations like Intel (especially the Intel-Teach-to-the-Future project), IBM, Sony, Hewlett-Packard, and others. The Thailand school-based teacher education project described in Chapter Two obtained industry support from the Thai Federation of Information Technology and the National Electronics and Computer Technology Center.

There are many networks operating in Asia and the Pacific and beyond, both formal and informal. The success of the project will be enhanced by utilizing as many of these networks of expertise as possible.

With a view to using local wisdom and knowledge, the project should explore the possibility of forging partnerships with local companies for the development of software and relevant media, and for organizing detailed training curricula. The relevant technologies will cover a wide range of possibilities including wireless and broadband capabilities.

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[14] SEAMEO Centre for Educational Innovation and Technology

[15] SEAMEO Regional Centre for Science and Mathematics

[16] SEAMEO Regional English Language Centre

[17] SEAMEO Regional Open Learning Centre

An overview of the JFIT-supported teacher training project

The major goal of the JFIT-Supported Teacher Training Project is to develop national capacity in 12 project countries in the effective use of ICT in education through initial training of teachers and continuing professional development of teachers and other facilitators. It is an ambitious project with funding from the Japanese Government under the Japanese Funds-in-Trust ICT programme to extend over at least three years.

An overview of the JFIT-Teacher Training Project was presented by the project officer (Zhou, 2003), with a schematic diagram (Zhu, 2003, Figure 5.3), and discussed at the Experts' Meeting in Bangkok in June 2003. The diagram shows various capacity stimulators that are an integral part of this capacity-building project and the expected outcomes, which are detailed above in this chapter.
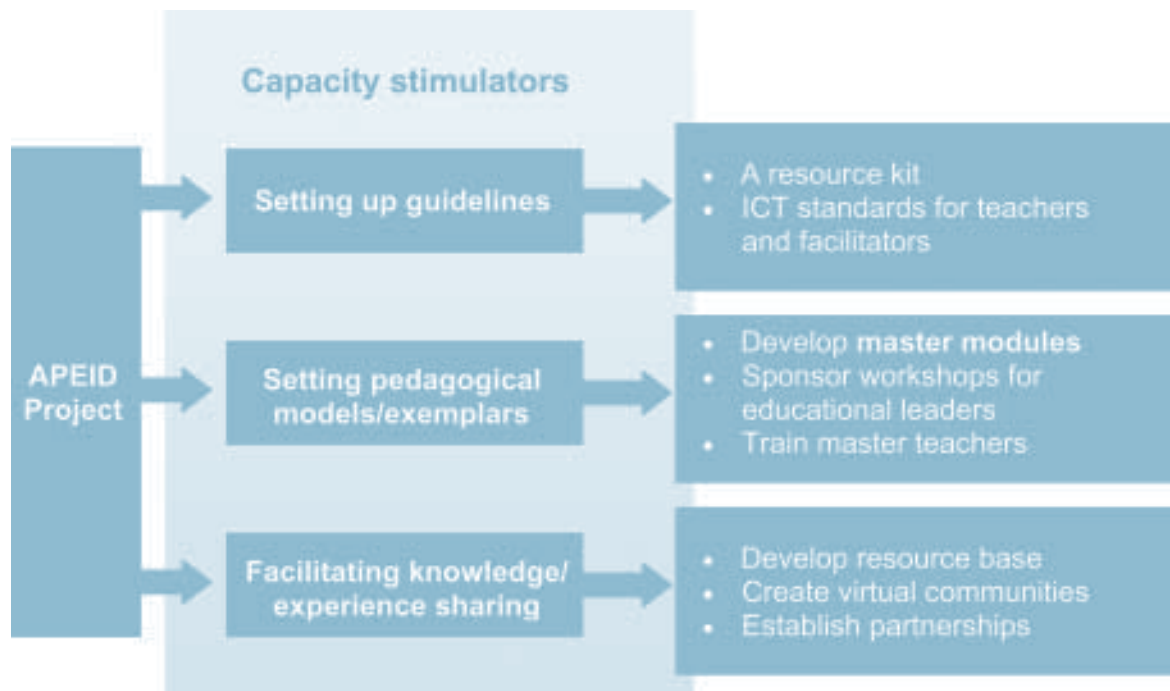
Figure 5.3 Overview of JFIT-Teacher Training Project

This report is the first outcome of the JFIT-Teacher Training Project, resulting from the Experts' Meeting, when 20 experts drawn from eight countries met together to plan the way forward. The outcomes of the detailed planning that preceded the Experts' Meeting, the concept papers prepared by each of the participants (some of which are included in the appendix), and the deliberations over three days of round-table discussions are broadly reflected in this publication.

The second chapter takes a global view of ICT and education, and outlines briefly the pervasiveness of information technology and communications in every aspect of modern societies. Also discussed is the timeliness of this JFIT-Teacher Training Project to integrate ICT in the training and professional development of teachers and the way it fits in with the goals of UNESCO. ICT use in education and

the changing focus in classrooms around the world from teacher-centred to learner-centred where more emphasis is placed on thinking than on rote learning is very much driven by new theories of the learning process, and in particular of constructivism. Chapter One outlines the background to this newer thinking and defines key terms for the purpose of the project.

The tension between global and local, identified by Delors in *Learning: The Treasure Within* (UNESCO 1996), is clearly illustrated in the second chapter. The Asia-Pacific region reflects enormous diversity on a range of indicators (demographic, economic, social, political and educational) that impact on ICT use. At the same time, major curriculum reforms are underway in many of the countries of the region coinciding with new directions in educational policies. Vignettes from selected countries are presented in Chapter Two, along with innovative practices in the use of ICT and other educational technologies in teacher education.

Issues and challenges in integrating ICT in teacher education abound, and these are the topic of the third chapter. A focus is on those issues that need to be considered for capacity-building in the region and how the findings of research can provide useful pointers to required action. The basic message of this chapter is that there are no simple solutions to integrating ICT in teacher education programmes.

One of the key aims of the Experts' Meeting was to develop a curriculum framework that might guide teachers' professional development in ICT integration or infusion. Chapter Four presents the development of such a framework for use in the region. Key contextual factors are identified within which any teacher education curriculum operates, as are key teacher competencies. Chapter Four also presents two further models: one to help identify the stage a country, school system, or school is at in terms of ICT development; and the second to help define how ICT may be used to expand the learning potential of students.

This final chapter looks to the future and proposes a number of specific projects and development activities for consideration under the umbrella of the wider national building capacity JFIT-Teacher Training Project.

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Glossary

Terms[18]

Active learning

The learner interacts with the teacher, author, or the learning programme to construct his/her own meaning. It is the child's individual or meta-cognitive act of observation, hypothesis generation and testing, and reflection.

Constructivism

The learner constructs knowledge; learning is a personal interpretation of experience; learning is active, collaborative, and situated in real-world contexts; and assessment of learning is integrated within the learning context itself.

Curriculum

A plan of instruction that details what students are to know, how they are to learn it, what the teacher's role is, and the context in which learning and teaching will take place.

Directed instruction

A teaching and learning model based on behavioural and cognitive theories; students receive information from teachers and follow teacher-directed activities.

Distance learning

Using some electronic means (e.g. modems, satellite transmissions) to make possible teaching and learning at separate sites.

Experiential learning

A learning situation is set up which presents a problem or a complex task for the learners to deal with. The learners are encouraged to draw general conclusions and establish general principles that may explain or predict outcomes across a range of similar situations.

Facilitators

Teachers, school heads, education policy makers and technologists.

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[18] The definitions were taken from Resta, P. and Semenov, A. (Eds). 2002. *Information and Communication Technologies in Teacher Education: A Planning Guide*. Paris: UNESCO.

Hardware
The computer equipment used to do the work (i.e., operate software programs). It consists of items you can touch, such as the computer case and the peripherals (e.g., monitor, keyboard and mouse) that are attached to the computer.

Instruction
Intentional facilitation of learning towards identified learning goals.

ICT
Information and communication technology (ICT) generally relates to those technologies that are used for accessing, gathering, manipulating and presenting or communicating information. The technologies could include hardware (e.g. computers and other devices); software applications; and connectivity (e.g. access to the Internet, local networking infrastructure, video-conferencing).

Learner-centred classroom
Students are encouraged to choose their own learning goals and/or projects based on the belief that people have a natural inclination to learn, and learn better when they work on authentic tasks; benefit from interacting with diverse groups of people; and thrive when teachers understand and value difference in how each student learns.

Pedagogy
The science or profession of teaching.

Pedagogical
Of, relating to, or befitting a teacher or education, especially with regard to a process of learning.

Software
Computer programs and applications, such as word processing or database packages, that can be run on a particular computer system.

Template
Something that serves as a master or pattern from which other similar things can be made.

WWW
World Wide Web. A system that allows access to information sites all over the world using a standard, common interface to organize and search for information. The WWW simplifies the location and retrieval of various forms of information including text, audio and video files.

Acronyms

APEID: Asia and the Pacific Programme of Educational Innovation for Development

EFA: Education For All

ICT: Information and Communication Technology

ISTE: International Society for Technology in Education

JFIT: Japanese Funds-in-Trust

NCATE: National Council for the Accreditation of Teacher Education

NCREL: North Central Regional Educational Laboratory

SEAMEO: Southeast Asian Ministers of Education Organization

SEAPREAMS: South-East Asia and Pacific Region Educational Administrators' and Managers' Symposium

Annexes

I. UNESCO Bangkok Director's message at the opening
Sheldon Shaeffer,
Director, UNESCO Asia and Pacific Regional Bureau for Education

In my capacity as Director of the UNESCO Asia and Pacific Regional Bureau for Education and as Co-ordinator of the Japanese Funds-in-Trust supported Programme on ICT in Education for Asia and the Pacific, I take great pleasure in welcoming you to this Experts' Meeting on Technology-Pedagogy Integration in Bangkok.

UNESCO defines the role of ICTs as a cross-cutting theme in its Medium-Term Strategy and Programme (2002-2007) as contributing to the development of education, science, culture and communication, and for education, to help achieve its strategic objectives of promoting education as a fundamental right, improving quality of education and promoting experimentation, innovation and information sharing as well as policy dialogue.

In view of current global and regional development challenges, UNESCO Bangkok has developed an education strategy to harness ICT to expand learning opportunities and reduce the digital divide in education in the region.

With the support of Japanese Funds-in-Trust, UNESCO Bangkok has been implementing a Programme on ICT in Education in Asia and the Pacific.

Teachers are key forces in tapping ICT-facilities' learning opportunities. They are at the heart of education, and likewise they are at the core of the UNESCO-implemented Programme on the Use of ICT in Education for Asia and the Pacific.

Within this Programme there are four projects focusing primarily on skills development of teachers in integrating ICT in education. While three projects pinpoint the training needs of teachers in specific disadvantaged countries or regions, UNESCO-APEID's project on Training and Professional Development of Teachers/Facilitators in the Effective Use of ICTs is a project for the whole region, involving all four subregions of Central Asia, East and South-East Asia, the Pacific and South Asia. These teacher training projects will also be supported by the Project on Strengthening ICT in Schools and ASEAN SchoolNet.

Though these are UNESCO-implemented projects, they will not be successful in achieving their objectives without support and co-operation of UNESCO partners in the member countries in and beyond the region. This is why most project teams have sought professional advice from experts of

diversified backgrounds in developing coherent frameworks, strategies and master plans prior to actual project implementation.

As Co-ordinator of all projects under the UNESCO Programme on the Use of ICT in Education in Asia and the Pacific, I extend sincere thanks and deep appreciation to all experts for your active participation and meaningful contribution to this meeting.

At the 7th UNESCO-ACEID International Conference on Using ICT for Quality Teaching, Learning and Effective Management, I made comments on:

- **Complexity** – to reflect on the need for thinking in ever-more creative and synergistic ways about the relation between education and technology;

- **Collaboration** – to require reduction of duplication and confusing competition, to ensure complementarities in efforts, and to link innovations around/beyond the region;

- **Coverage** – to indicate the need for ICTs to be used in the education of the widest range of target groups, especially those most disadvantaged and to ensure the greater use of ICTs in education to serve to reduce, rather than increase, disparities in education access and quality; and

- **Compassion** – to indicate the need to harness all possible means, including a wider range of technologies, to benefit children and adults in this region who face many, and increasing, vulnerabilities and risks.

Since the ultimate goal of teacher/facilitators' training and professional development is to improve learning, I believe my concerns are also applicable to your consideration of teacher training and professional development for effective use in education.

I hope your expertise and experiences in varied educational and cultural environments will help ensure that the JFIT-supported projects, including this one, will make a real difference – to influence teachers/facilitators in improving practice in the field for improved learning.

While regretting being unable to be with you, I give my best wishes to all of you for a fruitful Experts' Meeting.

II. An overview of the JFIT-supported project on Training and Professional Development of Teachers/Facilitators in the Effective Use of ICTs for Improved Teaching and Learning
Zhou Nan-Zhao
APEID Co-ordinator and Project Officer

Project summary

Teachers, as well as school heads and education policymakers, are central forces in tapping the learning opportunities created by the introduction of information and communication technologies (ICTs). They also contribute to bridging the prevalent between- and within-country digital divides in education. They hold the key to what and how teaching and learning takes place in classrooms, at schools and in the communities. It follows that they should be at the centre of educational change, using technologies for teaching, learning and development purposes. The main problem to address in using ICTs in education is these facilitators' lack (or inadequacy) of relevant capacity (knowledge, skills and attitudes) at individual, institutional and national levels.

Consequently, this project aims at building national capacity in effective use of ICT through training and professional development of teachers and other facilitators in integrating/infusing ICTs in educational processes and for facilitating student-centred approaches to achieve learning objectives in varied cultures and learning environments.

The immediate objectives of the project are:

- to improve teachers'/facilitators' competence and confidence, through both pre-service education and in-service training, in integrating/infusing ICT and in effecting ICT-assisted interactive/ independent learning;
- to identify, create and disseminate country-/locally-specific ICT pedagogies and models of teachers' use of ICT in/for different learning environments;
- to improve learning achievements through active learning experience by teachers' improved competency in ICT;
- to develop and put into operation a regional online teacher resource base and an offline network of centres of excellence for sharing expertise and innovative practices in professional development of teachers in using ICT for educational purposes.

A country-based Gansu Joint Innovative Project (JIP) in China will be affiliated to this larger APEID project to harness the potential of ICT in reducing within-country digital divide in teaching-learning quality through capacity-building in disadvantaged areas.

Context and background

Teachers are key forces in exploiting ICT-facilitated learning opportunities and bridging digital divides in education between and within countries of the Asia-Pacific region. New ICTs have had a profound impact on the roles of teachers in an information-intensive society. However, many teachers lack the knowledge, skills and attitudes in effectively using ICT as tools in facilitating learning in ICT-pervasive learning environments.

ICT can mean different technologies in different national/local contexts. Appropriate models and approaches to effective use of different ICTs remain to be developed to suit mixed learning needs in varied contexts of countries in Asia and the Pacific.

Many countries have launched teacher training programmes for the use of ICT, but most of the training activities are crash programmes, over-emphasizing computer literacy, while few countries have developed coherent strategies to enable teachers to fully integrate their use as pedagogical tools in the classroom.

Levels of ICT integration in teacher training, and even patterns of using ICT by teachers and educational managers, vary greatly in the region. One can generally distinguish three levels of computer use in classrooms:

1   teaching pupils basic computer skills;
2   subject teaching at classroom level with the help of computers;
3   using ICT to facilitate pupils' self-directed, active learning capabilities, to practise information skills and to discover collaborative and interdisciplinary learning.

ICT can improve learning outcomes, even in traditional rote learning exercises. Nevertheless, this project intends to experiment and innovate in developing new ICT integration pedagogies. Changes will have to be introduced in teaching-learning methods as well as in content. Students will enjoy learning actively, such as by bringing the outside world into the classroom and vice versa, or by interacting with peers, experts and others. Furthermore, they need to learn new skills, such as techniques for finding appropriate information, questioning the authenticity of sources, and collaborating with other learners, to name but a few.

APEID has previous project experience in this area. With support from UNESCO HQs, and in co-operation with Information Programmes and Services, APEID implemented a project on New Technology in Teacher Education. The project focused on the development of modules intended for use in the "training of teacher trainers" programme, in which attention was paid to the application of different ICTs, including printed materials, radio and television, and PTP technology. The experiences and the findings of that project will be utilized in this one, along with those of other ongoing projects from Field Offices and Member States.

Rationales: project justification

The fundamental role of the teacher is to facilitate learning and to help to create an autonomous learner – one who can continue to learn by him-/herself, especially with the assistance of new ICTs. However, there is a definite deficit in the knowledge, skills and attitudes needed to use ICT as an effective teaching-learning tool. Well-trained teachers using ICT are not available in sufficient quantity, as many regard technology as a threat to their authority as the main source of knowledge. In addition, pupils are often superior to their teachers in computer skills, further undermining teachers' traditional authority. Consequently, there is the need to break teacher isolation from peers, promote teacher-teacher/teacher principle interactions by means of ICTs, and ultimately facilitate learner-centred approaches to ICT integration in education, and build multidisciplinary teams of teachers, who could provide the range of skills necessary for the preparation of quality IT-based teaching materials.

There is also a strong need for a more systematic approach to developing ICT in education policies at higher, national levels. The Regional Programme's Clearing House has already begun to disseminate national policies on the project's website, although many countries have yet to develop specific policies for ICT in education.

Schools and local communities need strong leadership and management that is committed to using ICTs for pedagogical/educational purposes and that is supportive of teachers in professional development towards the better use of ICTs. There are major constraints in regard to ICT infrastructure in schools systems along with a lack of relevant software.

Community involvement and support in using ICT for educational and community development are also essential. One problem is that many parents and community leaders expect teachers to be "chalk-talk lecturers", or information crammers and, in turn, expect children to be obedient rote learners, capable of achieving high test scores regardless of the relevance of the content of these tests. Therefore, parents and communities need to create supportive learning environments where the use of technologies as effective teaching-learning tools is both encouraged and supported.

Furthermore, in building the capacities of teachers and other facilitators, it is vital that we develop an increased awareness of the impact of new ICTs on teachers, as well as learning how to encourage positive perceptions of technology as an aid, rather than as a substitute or a threat.

Project countries

With limited funds the project has initially included 12 countries: Afghanistan, China, Fiji, India, Indonesia, Japan, Kazakhstan, Malaysia, Mongolia, Philippines, Thailand and Viet Nam.

Though limited in number, these project countries cover the subregions of Central Asia, East Asia, South-East Asia and the Pacific; they also represent both developed and developing countries at different levels of ICT readiness, reflecting the broad digital divide in the region. In this way, the project is intended to cater to diverse education systems and learning environments, and develop corresponding strategies, guidelines, standards, training materials and approaches to technology-pedagogy integration, which are relevant and adaptable to varied national/local contexts. The choice of project countries was made also in consideration of strengthening partnerships and mutual learning between donor and recipient countries.

It should be noted that, as part of a UNESCO-implemented project, these countries will not be funded to undertake their own projects. Rather, they will be supported in taking part in project-planned region-wide activities and organizing national "training of trainers" within a conceptual and curricular framework, for capacity-building of teachers and other facilitators (especially policymakers and school heads) in the use of ICT in education.

In view of different institutional/national capacities and project activities, the level and forms of involvement in project activities will vary, although every country will be provided with regional guidelines and competency-based standards, will participate in regional/subregional training, and be assisted in organizing national training activities.

Meanwhile, some other non-project countries might be invited to take part in certain project activities, for example, joint research or comparative studies, as will consultant/resource persons.

For project implementation, UNESCO Bangkok will work closely with other field offices and national commissions for UNESCO in identifying and recommending experts/specialists or competent institutions in areas of the project focus. Meanwhile, UNESCO Bangkok will also work directly with individual universities, ICT in Education research institutions or leading experts who are internationally/regionally recognized for expertise in technology-pedagogy integration.

Development goals and immediate objectives

This project aims at capacity-building of teachers and other facilitators in genuinely integrating ICTs in teaching-learning processes, and at tapping the potential of new technologies for improving educational quality through teacher professional development and for reducing disparity between and within countries in terms of student achievement.

The immediate objectives of the project are:

1   to improve capability of teachers/facilitators, through both pre-service education and in-service training, in integrating ICT as pedagogical tools and educational resources and in facilitating ICT-assisted participative/interactive learning:
   •   produce prototype course materials (such as "changing roles of teachers in technology-assisted learning environments" and "learning to teach with technology");
   •   regional guidelines developed on technology-pedagogy integration;
   •   up to 10 "train the trainers" workshops conducted at national, regional and subregional levels, and more than 500 master teachers/facilitators in 10 project countries trained in the effective use of ICT for educational purposes;

2   to identify, create and disseminate country-/locally-specific ICT pedagogies and models of teachers' use of ICT in/for different learning environments:
   •   different ICT models for different learning environments created;
   •   country-specific, case-based pedagogies for active learning with ICT developed and pilot-tested in 10 selected schools per project country.
   •   assessments of changes in teaching and learning, sharing of results and lessons learnt.

3   co-develop and put in operation a regional online/offline network for sharing teacher-developed education course-wares and innovative practices in effective use of ICT as teaching tools and educational resources, in co-operation and co-ordination with the JFIT-supported Project on Clearing House information services:
   •   create an online curriculum centre for teachers in co-operation with project partners for information/innovation sharing;
   •   establish an offline network of teacher training, for the effective use of ICTs as educational tools and resources.

Principles

•   Different technologies should be used in different national/local settings as relevant. ICTs are only a part of a continuum of technologies in supporting and enriching learning.

•   Respect diversity of learning environments, culturally-specific and universal values, and reflect this in guidelines, standards, content materials and approaches to training and professional development.

- The use of ICTs in education shall not be technology-driven since ICTs are only tools. Newer, more advanced ICTs may not be the most appropriate technologies in a given context. Different learning environments need different ICTs. A comprehensive approach needs to be taken in selecting technologies and will be used and adapted as such to serve educational goals. ICTs are supplementary to the fundamental process of teaching and learning, and human communication and teacher-pupil interaction shall remain central to the process of learning. Thus, the focus of the project is not training in specific computer skills but on the acquisition of knowledge, competence and positive attitudes toward technology-pedagogy integration and enhanced teacher-pupil interaction.

- Capacity-building of teachers/facilitators should be based on better understanding of the roles of technology in the educational process. The great potential of ICTs should be fully tapped to support access to a wider range of learning opportunities and active learning experiences. Meanwhile, deliberate efforts should be made to ensure that teachers and teacher trainers in developing countries or disadvantaged regions shall be priority targets to reduce the digital divide in education between and within countries.

- "Pedagogical expertise is at the heart of teaching as a profession" and therefore ICTs should be used for or with good pedagogy.

- Developing an appropriate range of good pedagogical skills in using ICTs shall be a process of long-term experiential learning, rather than one-shot training or short-term conceptual learning. This requires initial teacher education with built-in key technology elements and in-service teacher training and ongoing support for professional self-development, with teachers taking greater responsibility for core competencies in technology-pedagogy integration.

- Educational technologies should be aligned with education and learning objectives. Teachers shall be trained not only to enhance teaching but ultimately to facilitate and improve active learning as the very purpose of improved teaching. Therefore, a learner-centred approach should be introduced to increase both teacher-pupil interaction and teacher-teacher peer support that will enhance professional skills development in technology-pedagogy integration.

- The continuation of teacher professional development must be ensured. Teachers cannot be trained once and for all in the effective use of technology in education. Professional development, both for individual teachers and for the profession as a whole, has to be a lifelong process. Although the project has a limited period of duration, the planning and implementation should be conducted with a view to building capacity for both technological and pedagogical expertise, and the major project activities shall not be of the one-off kind. The outcomes of the project can be sustained even after completion by the vision of teacher and their understanding of the nature of the teaching-learning process; the quality of training modules; supportive leadership and policy environment for increased use of ICT; and the network of centres of excellence for continued teacher development.

At the 7th UNESCO-APEID International Conference on Education, Sir John Daniel, UNESCO Assistant Director-General for Education, suggested four principles that should be applied to all efforts to harness ICT for quality teaching, learning and effective management, (Daniel, 2001). These principles are most relevant to the JFIT-supported projects on ICT in education in Asia and the Pacific.

1   *Avoid bias*: namely, avoid the assumptions that can misdirect our efforts in using technology. The most prevalent of these was the "vendor bias", or the dot.com fanatics arguing that the Internet was going to replace the entire education system that had gone before, and that attempts to graft the new onto the old were doomed to failure.

For the JFIT Project on teacher training, this implies that no matter how advanced ICTs may become, technologies will remain instruments or tools that serve educational purposes, and will not replace or supersede teachers. New technologies do have great potential to enhance the effectiveness of teaching-learning processes and have had profound impacts on the roles of teachers, but they will never replace the human interaction that takes place between the teacher and the pupil, which remains essential and crucial to education. Technology will not perform miracles and solve all the problems in education. Therefore, the teacher training project will not be technology-driven, but focus on technology-pedagogy integration. We need to be realistic about the roles which ICT can play and take an evolutionary approach to technology; we need to be critical in reviewing research and evaluation on application of ICTs in teaching and learning at schools; and we need also to avoid bias or prejudice that favours private sector provision over public provision.

2   *Detect bull*: in other words, use critical faculties and expose hollow or loose thinking about technology and its application in education. UNESCO needs to encourage member governments to engage in "evidence-based policy-making", and to look for evidence in making statements about technology.

As far as the UNESCO-implemented JFIT project is concerned, this means that practical consideration should be given to nationally- and locally-specific conditions for ICT application to education. For countries and communities where there is restricted access to electricity, for example, the Internet and computers might not be the best or most appropriate technology for improving teaching and learning.

3   *Think broadly:* which is to say, look at the bigger picture when considering using technology to help pupils learn. ICT means much more than the Internet, and the Internet won't render obsolete all preceding technologies. Also, technologies always involve people and their social systems.

Different ICTs (including e-books, electronic white-boards, film, radio, television, programmed learning, etc.) should be designed and applied to different technology-assisted learning. The focus of the project should not be on ICT hardware but on teachers'/facilitators' competencies in ICT integration; on diminishing teachers' isolation from each other; and on online/offline networks for capacity-building in more effective uses of hardware and software in improving teaching, learning and management of education systems.

4   *Seek balance*:

– a balance between enhanced teaching and enhanced learning: whether to use technology "to expand the range/impact of the teacher", or to use technology "to create a good learning environment for the student wherever and whenever the student wants to study". It is both more effective and more cost-effective to concentrate on improving access to learning, improving its quality and reducing its cost. The JFIT project shall train teachers in using ICT to facilitate learner-centred approaches and support active learning experiences with technology.

– a balance between using ICT for teaching and learning about computers, on the one hand, and everything else, on the other: while ICT is best taught by using ICT itself, children can learn many kinds of technological skills on their own with minimal help from adults.

For facilitators other than teachers, especially policymakers and school heads, the JFIT project will help develop leadership that is committed to using technology for educational/pedagogical purposes and that will provide a favourable environment to support teachers in the use of ICTs to improve teaching and learning. The facilitators should also be able, through training, to develop aggregated cost-benefit analyses of programmes that introduce ICTs into a school system, in view of the pedagogical and quality gains likely to result from the appropriate use of affordable technologies.

"*Getting the right balance or the right blend between different elements of learning is the key to both pedagogical and economic success*" in using technology in teaching and learning (Daniel, 2001). In view of this, the JFIT project should place high priority on teacher training and professional development in using ICTs to enhance a blend of independent learning and interactive learning from the perspective of pedagogy and cost-effectiveness. Teachers should thereby develop competencies in harnessing the potential of ICTs to support active learning experiences and access to a wide range of media and learning opportunities.

For online teacher training in the use of ICT we need to design and develop learning materials that can play to the strengths of ICT, which means materials should be: a) interactive at a sophisticated level; b) communicative, allowing for asynchronous group discussion as a learning tool; c) adaptive (in applications enabling students to manipulate a model or test the impact of variables); and d) productive (allowing operation at scale, thereby reducing unit cost and yielding economies of scale.

As Asia and the Pacific is a region of great diversity, it is vital for the project to respect and reflect diversity in terms of policies, content of training/learning materials, technologies selected, languages of education software and instruction, and models/approaches of technology-pedagogy integration.

Project strategies

In achieving the objectives of the project, a number of strategies will be employed in planning and implementing various activities. The strategies could include the following:

- developing supportive leadership and a favourable policy environment for increased and improved use of ICT by teachers;

- developing positive attitudes of teachers and other facilitators toward the use of technology in education, by improving their understanding of the nature of the teaching-learning process, and the impact of new ICTs on education;

- providing generic research-based guidelines on how ICTs can be integrated into teaching-learning processes as tools for different learning environments;

- defining core competencies needed by teachers in integrating technology with relevant pedagogy in specific contexts;

- setting standards for teachers' acquired knowledge, skills and other core competencies of ICT integration, defined for different levels (beginning/basic, intermediate, advanced, and transforming), with regionally compatible descriptors for teachers' technology-pedagogy integration. Building on national-level standards already developed or used in selected countries, these standards could be adapted to national and local conditions, and project countries will be encouraged to experiment with adaptation and application of the standards for certification and accreditation purposes;

- identifying, synthesizing and disseminating successful approaches/models and good practices in teachers'/facilitators' ICT integration in nationally- and locally-specific contexts, but also with wider educational and cultural relevance;

- organizing training of teacher trainers workshops at subregional/regional levels to facilitate national capacity-building and, at the same time, exploring a new paradigm that may replace one-shot training with lifelong professional development. School-based training with context-specific models will be encouraged, with local case studies and materials included in the training;

- encouraging and rewarding teachers' outstanding efforts in producing educational software and lesson plans, which exemplify technology-pedagogy integration for effective teaching and learning in technology-facilitated environments. A UNESCO Award for Teacher Integration of ICT in Education will be established through this JFIT-supported teacher training project;

- developing an online teacher resource base in the area of technology-pedagogy integration, with information on latest research findings relevant to effective use of ICT in teaching, quality content materials, teacher-designed e-lesson plans and other educational software, for the dual purpose of developing teachers' knowledge base, and sharing experiences/practices in effective use of ICTs for improved teaching and learning;

- strengthening partnerships and networking. Based on project experiences, an offline network is to be developed of centres of excellence, including lead teacher universities, research institutes, and ICT materials/delivery institutions;

- placing teachers at the centre of the capacity-building process, and enabling them to play active roles in the technology-assisted educational overhaul;

- rewarding most innovative approaches to technology-pedagogy integration, high-quality teacher training materials, and best teacher-developed multimedia lesson plans;

- using new ICTs to reduce teacher isolation and enhance teacher-teacher and teacher-pupil interaction; developing peer support for self-reinforcement by the teaching profession as a whole.

Main activities

- organization of an Experts' Meeting to develop a conceptual framework and orient project implementation to improve the capability of teachers/facilitators, through both pre-service education and in-service training, in integrating ICT as pedagogical tools and educational resources and in facilitating ICT-assisted participative/interactive learning;

- development of regional guidelines and a conceptual/curriculum framework for teachers in integrating ICT in education for improved teaching and learning;

- development of competency-based standards, which can be used for recognition and certification of teacher/facilitator competency in technology-pedagogy integration at different stages;

- development and/or adaptation of teacher training modules (through a team approach) on main aspects of pedagogy integration;

- design/development of exemplary course units to integrate key technology elements into initial teacher education curriculum;

- conducting "train the trainers" workshops at national, regional and subregional levels, and reorientation to school-based training of all teachers/administrators in integrating ICTs into classroom instruction and management;

- development of a regional online teacher resource base and an offline network for sharing teacher-developed education course-ware and innovative practices in use of ICTs;

- development of project website and dissemination of printed project documents/materials in and beyond project countries;

- establishment of a UNESCO Award for Innovative Technology-Pedagogy Integration to reward teachers'/facilitators' outstanding efforts in using ICTs for improved teaching and learning.

Expected results and outcomes

- greater ability of teachers/facilitators in the effective use of ICT, through both pre-service education and in-service training;

- a set of prototype course materials on integrating technology with pedagogy;

- regional guidelines for ICT in education/pedagogy;

- up to 10 "train the trainers" workshops conducted at national, regional and subregional levels, and more than 500 master teachers/facilitators in 10 project countries trained in the effective use of ICT for educational purposes;

- country-specific pedagogies for active learning with ICT, pilot-tested with more than 500 trained teachers in 50 selected schools;

- different ICT models for different learning environments identified or created;

- assessment of changes in teaching and learning, with results and lessons learnt shared;

- a variety of around 150 pieces of teacher-developed educational software and ICT-based teaching materials developed for core school subjects at secondary and primary levels, reflecting varied learning environments;

- ten to twenty innovative models/approaches developed for capacity-building for appropriate and effective use of ICTs in education: choice of appropriate ICTs for poor communities; community involvement in school use of ICTs; resource sharing between disadvantaged developed regions for better use of ICTs;

- incentives for school teachers developed to encourage creativity in designing/producing quality educational courseware, through such measures as contest of "best practices" and protection of intellectual property rights;

- an online curriculum centre for teachers created in co-operation with project partners for information/innovation sharing;

- an offline network to include an association to publish bulletins on teacher training for effective use of ICT;

- prizes for best teacher-developed educational courseware.

Evaluation and management

Under the overall co-ordination of the Director of UNESCO Asia and Pacific Regional Bureau for Education, the project officer is responsible for planning and implementing the project. Multidisciplinary task forces, whose composition may vary with different project tasks, will advise as resource persons, or undertake actual project activities (e.g. developing guidelines, writing modules, training of trainers, etc.). In many cases, the task forces could be virtual. At the country level it is advisable that multidisciplinary project teams be established, which could include policymakers, instructional designers, ICT specialists, teacher trainers and software developers.

Built-in evaluation will be integrated into the process of project implementation, with six-month and annual reports submitted to UNESCO HQs and the Government of Japan, the donor country.

Through the Manager of the JFIT Programme of ICT in Education in Asia and the Pacific, the project shall share information and outcomes with other projects undertaken by the Bureau and other field offices.

Prior to Japan's new fiscal year in April, a yearly project work-plan and readjusted budgeting will be prepared and submitted.

The project will run over three years covering different stages of planning, outlining, distribution of responsibilities, draft preparations, microlevel pilots and macrofield testing.

III. Selected papers/presentations (in CD-ROM)

Anderson, J. 2003. *Integrating ICT and Other Technologies in Teacher Education: Trends, Issues and Guiding Principles (With a Focus on the Asia-Pacific Region).* Presentation to Experts' Meeting on Teachers/Facilitators Training in Technology-Pedagogy Integration, Bangkok, Thailand. June 18-20.

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IV. Agenda of the meeting

──────────── **Day 1** ────────────
Wednesday, 18 June

09.00 – 09.30   **Opening**
Chair: *Mr Fumihiko Shinohara, Manager,*
            ICT in Education Programme, UNESCO Bangkok

- Message from Director of
  UNESCO Asia and Pacific Regional Bureau for Education,
  Mr Sheldon Shaeffer
- Welcome by
  Mr Zhou Nan-Zhao, Co-ordinator, APEID
  Project Officer, UNESCO Asia and Pacific Regional Bureau for Education
- Remarks by
  Mr Arief Sadiman, Director, SEAMES,
  on behalf of UNESCO Project partners
- Speech by
  Mr Tukuji Hayashi, the Representative from the
  Ministry of Education, Culture, Sports, Science and Technology, Japan

09.30 – 09.45   Self-introduction of participants

09.45 – 10.00   Consideration and adoption of Agenda

10.00 – 10.30   *Coffee break*

10.30 – 12.00   **Plenary Session I**
Overview of Programmes and Projects in Teacher Training
in ICT Integration in Education

- Introduction to JFIT Programme on ICT in Education
  in Asia and the Pacific
  Mr Fumihiko Shinohara
- An Overview of the JFIT Project on Training and Professional
  Development of Teachers and Other Facilitators for Effective Use of
  ICT in Teaching and Learning
  Mr Zhou Nan-Zhao
- Reflection on UNESCO HQs Planning Guide for ICT
  in Teacher Education
  Mr Jonathan Anderson
- International Perspectives and Practices in ICT Infusion in
  Teaching-Learning for Improved Outcomes
  Mr Allen Glenn

12.00 – 13.30   *Lunch*

13.30 – 15.00	**Plenary Session II**

Presentations and Interactions by Participating Experts
Moderator: *Ms Lucille Gregorio*

Presenters:	*Mr J Anderson*	*Mr B K Passi*
	Ms P Cabanatan	*Mr Z Qi*
	Mr L Davis	*Mr A Sadiman*
	Mr A Glenn	*Ms U Yamsaensung*
	Ms C Gunn	*Ms N Yelland*
	Mr T Hayashi	*Ms Z Zhanat*
	Ms W Pliansri	*Ms Z Zhu*
	Mr J Kuroda	

15.00 – 15.30	*Break*

15.30 – 17.00	**Plenary Session III**

Presentations and Interactions by Participating Experts (continued)
Moderator: *Ms Lucille Gregorio*

19.00 – 20.30	**Welcome Reception**

Day 2
Thursday, 19 June

08.30 – 10.00	**Plenary Session IV**

*Deliberations on Major Issues in Capacity-building
for Technology-Pedagogy Integration*
Moderator: *Mr Allen Glenn*

- Policy Issues in Teacher Training: Perspectives and Strategies
  for South-East Asia
  Mr Arief Sadiman
- Aligning Teacher Professional Development to ICT Integration
  in School Curriculum
  Ms Lucille Gregorio
- National Experiences in Teacher Training in ICT Infusion:
  The case of China
  Mr Zhu Zhi-Ting
- School-Based Teacher Training in ICT Integration: A Case Study
  in Thailand, a Project under Her Royal Highness Princess Sirindhorn
  Ms Tinsiri Siribodhi
- ICT Development in the Pacific Island
  Mr Naren Prasad

10.00 – 10.30	*Break*

10.30 – 12.00	**Group Discussion**

Group 1 moderator: *Mr B K Passi*
Group 2 moderator: *Ms N Yelland*
- Presentation of group reports

12.00 – 13.30	*Lunch*
13.30 – 14.30	**Plenary Session V** *Regional Guideline and Framework for Teachers'/Facilitators'* *Professional Development in ICT Infusion* Moderator: *Mr Jonathan Anderson*
14.30 – 15.00	*Break*
15.00 – 17.00	**Group Discussion** Group 1 moderator: *Ms P Cabanatan* Group 2 moderator: *Ms C Gunn*

Day 3
Friday, 20 June

08.30 – 09.30	Presentation of group reports
09.30 – 10.30	**Plenary Session VI** *Development of Master Plan for Project Implementation* *and Evaluation* Moderator: *Mr Tokuji Hayashi* • Proposed Logframe Matrix and Calendar of Activities *Mr Zhou Nan-Zhao* • Discussion, Interactions and Recommendations
10.30 – 10.45	*Break*
10.45 – 12.00	**Plenary Session VI (continued)**
12.00 – 13.30	*Lunch*
13.30 – 15.00	**Plenary Session VII** *Co-operation and Co-ordination in Project Implementation* *at National and Regional Levels* Moderator: *Mr Zhou Nan-Zhao*
15.00 – 15.30	*Break*
15.30 – 16.00	**Plenary Session VIII** *Discussion and Adoption of a Draft Final Report of the Meeting* Moderator: *Mr Jonathan Anderson and Mr Allen Glenn*
16.00 – 16.30	**Closing**

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