Cases and Approaches in Training ICT-Competent Teachers

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A variety of information and communication technology (ICT) can facilitate not only delivery of instruction, but also learning process itself. Moreover, ICT can promote international collaboration and networking in education and professional development. There's a range of ICT options - from videoconferencing through multimedia delivery to web sites - which can be used to meet the challenges teachers face today. ICT is opening new doors to corporate for more flexible and responsible learning and performance solutions. In fact, there has been increasing evidence that ICT may be able to provide more flexible and effective ways for lifelong professional development for today's teachers.

This paper introduces a variety of cases where innovative approaches for ICT integration in teacher training have been observed. The training approaches identified in a variety of cases are grouped into four main categories: 1) applications of ICT use as the training content, 2) ICT as a part of teaching methodology, 3) ICT as a core technology for teacher training, and 4) ICT as a means to facilitate professional development and networking. A final section provides a conclusion of this paper by offering some of the implications and challenges for ICT teacher training.

Key words: ICT teacher training, ICT use, online training, teacher training, training approaches

1. INTRODUCTION

Research indicates that information and communication technology (ICT) can change the way teachers teach and that it is especially useful in supporting more student-centered approaches to instruction and in developing the higher order skills and promoting collaborative activities (Collis and Jung, 2003). With the emergence of ICT commonly available to schools since the middle 1990s, teacher training has focused on how to make use of ICT in the classroom and at the same time teachers themselves have been learning via ICT.

In this changing context, teaching is becoming one of the most challenging professions in our society where knowledge is expanding rapidly and much of it is available to students as well as teachers at the same time (Perraton, Robinson, and Creed, 2001). For most teachers, it is not sufficient anymore to teach a certain body of knowledge and skills. As new concepts of learning have evolved, teachers are expected to facilitate learning and make it meaningful to individual learners rather than just to provide knowledge and skills. Modern developments of innovative technologies have provided new possibilities to teaching professions, but at the same time have placed more demands on teachers to learn how to use these new technologies in their teaching (Robinson and Latchem, 2003). These challenges ask teachers to continuously retrain themselves and acquire new knowledge and skills while maintaining their jobs (Leask, 2001).

Today, a variety of ICT can facilitate not only delivery of instruction, but also learning process itself. Moreover, ICT can promote international collaboration and networking in education and professional development. There's a range of ICT options - from videoconferencing through multimedia delivery to web sites - which can be used to meet the challenges teachers face today. ICT is opening new doors to corporate for more flexible and responsible learning and performance solutions. In fact, there has been increasing evidence that ICT may be able to provide more flexible and effective ways for lifelong professional development for today's teachers. One of those evidences includes open and distance teacher training. Open and distance training method has been used since the 1960s (Robinson and Latchem, 2003) and now incorporates advanced information and communication technologies.
ICT as Core Technology

<table>
<thead>
<tr>
<th>Approach 1:</th>
<th>Approach 3:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT as content of</td>
<td>ICT as core technology</td>
</tr>
<tr>
<td>teacher training</td>
<td>for teacher training</td>
</tr>
</tbody>
</table>

Learning

How to Use ICT

<table>
<thead>
<tr>
<th>Approach 2:</th>
<th>Approach 4:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ICT as part of</td>
<td>ICT used to facilitate</td>
</tr>
<tr>
<td>teacher training</td>
<td>further professional</td>
</tr>
<tr>
<td>methods/curriculum</td>
<td>development</td>
</tr>
</tbody>
</table>

ICT as Complementary Technology

Learning

VIA ICT

Fig. 1. Categories for ICT use in teacher training (adapted from Collis and Jung, 2003, p. 176)

Over the last years, many countries around the world have developed teacher education reform policies and integrated ICT training into their teacher education system. Recognizing the importance of ICT in teaching and learning, these countries have provided ICT teacher training in a variety of forms and degrees. Even though many teachers report that they have not had adequate training to prepare themselves to use technology effectively in teaching and learning, there seem to be several efforts around the world in which countries are effectively using technology to train teachers, and/or are training teachers to use technology as tools for enhancing teaching and learning.

This paper looks at a variety of cases where innovative approaches for ICT integration in teacher training have been observed. Those cases show different pedagogical uses of ICT in initial and in-service teacher training practices. Via a variety of examples, the author tries to show that ICT use in teacher training can bring new possibilities in providing cost-effective teacher training, widening access to professional development opportunities and resources, enhancing networking among teachers, and improving the quality of teacher training. At the same time, the author aims to indicate that ICT use in teacher training also brings with it new implications and challenges for ICT teacher training. Methods employed in this study include desk analyses of various ICT teacher training cases and approaches across different countries and face-to-face or email interviews with experts for verification.

2. FRAMEWORK FOR CASE ANALYSIS

Analyses of ICT teacher training cases reveal that innovative approaches have been designed to promote knowledge and skills of teachers in integrating ICT effectively and efficiently into their teaching and learning. That is to say, ICT teacher training has taken many forms and adopted different approaches depending on the situation each country or institution faces. In some cases, ICT is introduced as a subject major and elective in teacher training programs. In other cases, ICT is used as a tool to train ICT-competent teachers or to promote further professional development and networking. Teachers can be trained to learn HOW to use ICT or teachers can be trained VIA ICT. ICT can be used as a core or a complementary means to the teacher training process (Collis and Jung, 2003). Fig. 1. provides a framework to categorize ICT teacher training efforts found in different countries. There may be several approaches to ICT teacher training. However, four approaches suggested in the Figure can help position a variety of cases in ICT use in initial and in-service teacher training.
introduced in this paper.

3. APPROACH 1: ICT USE AS CONTENT OF TEACHER TRAINING

This approach focuses on the use of ICT as the content of teacher training. It addresses issues such as selecting appropriate ICT tools and supporting students in the use of those tools, using ICT to promote learning activities, developing new methods of facilitating learning and evaluating student performance, and so on. Two example cases - Singapore's initial teacher training and Malaysia's in-service teacher training - are provided below.

3.1. Core content for initial teacher training

In 1997, Singapore's Ministry of Education launched the Masterplan for IT in Education to ensure that all students have the knowledge, skills and confidence to compete in a constantly changing technological environment. This Masterplan aimed to train every teacher in the use of ICT for teaching, equip trainee teachers with core ICT teaching skills, and involve institutions of higher learning and industry as partners with schools.

As Singapore's only pre-service teacher training institute, the National Institute of Education (NIE) was entrusted with the responsibility for integrating ICT into initial teacher training programs. Accordingly, the NIE developed and began implementing a new ICT plan in 1998, which identified four main areas that needed change: curriculum; physical and technological infrastructure; human resource infrastructure; and R and D in the use of ICT in education.

For the purpose of this chapter, I will focus on how NIE has revised its curriculum to promote ICT use in the classroom for future teachers (Jung, 2001). Thus NIE's curriculum revision was undertaken to equip student teachers with appropriate ICT skills, and to allow them to experience learning in an ICT-integrated environment.

The curriculum was revised to include three kinds of ICT courses for student teachers: basic ICT-skill workshops, a 30-hour ICT foundation course, and a 26-hour elective course. In addition, the 6 to 12 hours of ICT integration into each curricular subject class was recommended.

Basic ICT skill workshops, paid for by students, are provided by external organizations and cover word processing, PowerPoint, Internet literacy, and other technical skills.

A 26-hour elective course is provided by the Division of Instructional Sciences (DIS) under the course name “Message Design and Computer-Based Instruction”. The course covers the design and production of computer-based instruction.

A 30-hour ICT foundation course is offered by DIS entitled “Instructional Technology”. According to the course description, it covers: “learning, thinking and the effective use of instructional technologies in the classroom; instructional planning models; selecting, creating, evaluating, and integrating instructional technologies and resource materials; promoting creativity and complex thinking through IT project work activities; and organizing and managing instructional activities with appropriate IT resources in the classroom.”

Besides taking these courses, NIE students pursuing a Diploma in Education must have five weeks of practicum during the first year of their pre-service training and ten weeks during the second. The trainee is expected to use ICT while teaching, depending on the school's ICT infrastructure. When interviewed about the new teacher training curriculum, student teachers all agreed that the foundation course provided useful pedagogical strategies for the use of ICT in classroom teaching. In particular, student teachers appreciated being able to download basic information and materials from the Internet. However, they reported that the 30 hours of instruction was not enough time to gain ICT proficiency, and some wanted more ICT integration in the practicum.

3.2. Core content for in-service teaching training

The Teacher Education Division (TED) of the Malaysian Ministry of Education is responsible for training ICT-competent teachers in collaboration with teacher training colleges and other teacher training institutions.

In 1996, TED launched an in-service ICT teacher training program to train forerunners to the Smart School Project which was one of the seven applications specified in Malaysia's Multimedia Super Corridor Project. The in-service training program focused on the upgrading and updating of knowledge and skills of teacher trainers (they were called “Master Trainers.”) in integrating ICT in classrooms and providing training for other teachers (Malaysian Ministry of Education, 1999). This in-service program for master trainers covered aspects such as integrating computers in teaching and learning,
using software and designing sample software, planning and implementing training packages for training of trainers, and inculcating positive attitudes.

A more comprehensive in-service training targeting general teachers was introduced later in two phases. Phase 1 program focused on generic skills such as thinking skills, study skills, facilitating skills and computer skills for fourteen weeks. Especially basic computer skills were emphasized. Phase 2 program was more focusing on pedagogical skills and effective use of ICT in teaching and learning process. In addition, best practices in using ICT for teaching and learning were shared during this Phase 2 period. As a result of these series of in-service training courses for running the Smart Schools, quite a few numbers of teachers have been trained.

4. APPROACH 2: ICT USE AS PART OF TRAINING METHODS

This approach uses ICT to facilitate some aspects of teacher training by adopting ICT as complementary technology for training. A selection of some cases of using a variety of ICT as part of effective teacher training methodology will be analyzed.

4.1. Mixed use of technologies

Captured Wisdom is a resource developed by the federally-funded (USA) North Central Technology in Education Consortium (http://www.ncrel.org/cw/) for K-12 teachers, school administrators and extended to adult literacy educators. It uses videotape and CD-ROM to help US teachers to see how technology can be integrated into their work. The Captured Wisdom (tm) CD-ROM Library is made up of stories about teachers who are making meaningful and creative uses of technology in their instruction. These CD-ROMs contain video descriptions and demonstrations of how technology is used in teachers’ classrooms. They provide “examples of real educators and learners using successful practices of technology to support instruction and learning in their classrooms”. Video sequences are viewed by teachers’ focus groups who then discuss the strategies and techniques of classroom management, assessment, etc.

The Korea National Open University (http://www.knou.ac.kr), with the support of the Korean government, created a 60-hour nation-wide distance training program entitled "Open and Flexible Learning in Primary Schools: Why and How", for primary school teachers using a self-study textbook, Cable TV, and a two-way videoconferencing system. By winter 1998, the program had been delivered four times and each time about 1,000 primary school teachers, including some administrators and school principals, took this training course at home. In 1999, another distance program with similar topics was delivered to secondary school teachers nation-wide. 89% indicated the course was useful in improving their teaching. 78% enjoyed active interaction with instructors via videoconferencing. The Internet has been integrated into the training sessions as a communication medium.

The Shoma Teacher Development Program (http://www.shoma.org.za/) uses satellite TV, Internet technology and collaborative lesson planning to support in-service training for underqualified teachers in South Africa. Shoma was launched and is supported, in part, by MIH, a holding company for a satellite cable TV provider, an Internet service provider and a satellite signal distributer. Shoma collaborates with South Africa’s National and Provincial Departments of Education and designs training to support the National goals and priorities. Primary foci of the training at this point are on the Government’s 2005 Outcomes Based Education program, teaching methodologies and classroom assessment.

4.2. Use of online technology

The SchoolNet, Canada offers the “Teacher’s Corner” on the web to provide tools and resources to help educational professionals successfully integrate the Internet and other technologies into their teaching (http://www.schoolnet.ca). Similarly, the National Information Center for Educational Resources in Japan (http://www.nicer.or.jp) provides web resources for students, adult learners, teachers and school administrators. Resources for teachers include national policies with respect to ICT skill development for students and specific ICT skills required for teachers.

One more case can be found in UNESCO’s International Institute for Capacity Building in Africa (http://www.unesco-iicba.org/) which has developed an electronic library to improve the teaching of mathematics and science in primary schools. Intended for teachers, teacher trainers, curriculum developers and supervisors, the electronic library is available online.
5. APPROACH 3: ICT AS CORE TECHNOLOGY FOR TEACHER TRAINING

In this approach, ICT is used as the major way of providing the learning experience of teacher training. As you will see in the two examples below, the digital technology is frequently becoming the core technology of ICT teacher training even though other technologies are adopted as well.

5.1. Using web as a core technology

The Virtual High School (http://www.govhs.org/website.nsf) in the USA is a non-profit organization that facilitates a collaborative of participating secondary schools; for every semester a participating school offers a VHS NetCourse that school can enroll up to 20 students in VHS courses. A limited number of student-only schools are allowed to enroll students (10 per semester) on a trial basis, for a single year, after which they must train a teacher and join VHS as a fully participating school. The VHS has developed two graduate-level online professional development courses for teachers of participating high schools: a 26-week Teachers Learning Conference (TLC) course which trains teachers to develop and teach a NetCourse for VHS and a 15-week Netcourse Instructional Methodologies (NIM) which trains teachers to teach an existing online VHS course.

The TLC is designed to prepare classroom teachers to become online course instructors and course developers. The TLC provides instruction on the pedagogy and methodology that each teacher will need to develop an effective NetCourse to be offered to the VHS students. It is focused on online course design, including technological issues, as well as content and course delivery. Each teacher has an opportunity to learn knowledge and skills to create a high quality online course using VHS' course delivery software and to facilitate online learning effectively. A facilitator, a veteran VHS teacher, is assigned to each TLC participant to ensure that they have the correct resources to achieve training objectives. For this 26-week TLC NetCourse, twelve graduate credits are available through Fitchburg State College.

The NIM is designed to prepare classroom teachers to become online course instructors. NIM will provide instruction on the pedagogy, methodology, and moderation skills for effective online teaching at VHS. That is, its primary goal is to prepare teachers to teach an existing NetCourse of VHS whereas TLC focuses on helping teachers design and deliver a new Netcourse. The focus is on content and curriculum, as well as good online course delivery. Experienced facilitators are assigned to help participants access the correct resources and monitor each participant's progress. For this 15-week NIM, six graduate credits are available through Fitchburg State College.

5.2. Adopting culturally appropriate technologies

The LearnLink project supported by USAID and AED, has implemented computer-mediated professional development programs to improve training and support services for teachers in several developing countries (Fontaine, 2000; Collis and Jung, 2003). Some of the country examples are provided below (http://www.aed.org/learnlink).

The main focus of LearnLink in Guatemala includes the development of culturally appropriate Mayan language instructional materials, and improvement of teacher's professional skills in Mayan languages. Necessary equipment and multimedia computer labs have been installed in several teacher training schools in the Quiche region and instructional materials for bilingual teacher preparation, including an interactive multimedia system on CD-ROM to train teachers in oral and written languages have been developed.

In Morocco, the Computer Assisted Teacher Training project has started to help primary school teachers in some provinces. Aims of the project include providing the teacher training institutions in each province with technologies and appropriate teacher training in their use, developing communications networks to facilitate interaction among teacher trainees, teacher trainers, and inspectors. Moreover, collaboration and information sharing among peers across the provinces have been emphasized.

In Namibia, the Computer Assisted Teacher Training project is a part of a greater plan to improve teacher training nationwide. Major objectives of the project include developing computer-assisted teacher training courses and constructing a communications network through the Internet and other technologies.

In Uganda, the Connectivity for Educator Development (CONNECT-ED) project has been designed to improve professional development for primary school teachers, with a focus on computer-assisted teacher training. Multimedia
teacher training laboratories in some primary teacher training colleges provides access to computer-assisted teacher training program and digital library resources. Selected PCs at the colleges are connected to the Internet. CONNECT-ED is designed to link the public, private and voluntary sectors in providing multimedia teacher training.

The US-Brazil Learning Technologies Network (LTNet) is an Internet-based learning environment and clearinghouse on the role of ICT in education and promoting interactive collaboration between teachers in the two countries. LTNet's Web site includes a virtual library for teachers, a SchoolNet program, a help desk, and other interactive features such as email, threaded discussions and live chat, provides networking among teachers, and promotes collaborative projects via Virtual Exchange Environments.

The LearnLink project is still under implementation. Some of the expected outcomes include: increased collaboration and interactions among educators in each country or among countries, institutionalization of support for learning technology in each country, greater ICT access for teachers and students, ICT-based curriculum reform, and enhancement of pedagogy.

6. APPROACH 4: ICT FOR PROFESSIONAL DEVELOPMENT

There are many examples of ICT, particularly Internet and Web-based communication technologies, being used to support teachers' on-going professional development and networking. Examples follow.

6.1. Resource-based support

The UK Virtual Teacher Centre (http://vtc.nfionline.gov.uk) website provides a "Career Development" area which provides a variety of learning and teaching resources and links to support teachers' continuing professional development. Under "Support Providers," for example, teachers can find a range of resources for professional development, such as the ICT Support Network Directory which provides easy access to ICT provision and training. Teachers also find a link to the New Opportunities Fund (NOF), which is currently providing ICT training for teachers and librarians. "International Professional Development" helps teachers learn from and contribute to educational ideas and best practice throughout the world.

The Korea's EduNet is an integrated educational internet services for K-12 students and teachers managed by the Korea Education and Research Information Services (http://www.edunet4u.net/). Through the EduNet, teachers can search the materials according to training institution, content, instructor, year of publication and type of training, and download them for self-training. These online materials can be also used for individual study in conjunction with face-to-face courses, or as learning resources for online teacher training courses offered by educational institutions.

Other examples include: SchoolNet SA (http://www.school.sa), a South African organization providing supports to educators and learners who wish to use ICT in education; Singapore's Clearinghouse (http://www1.moe.edu.sg/iteducation/resources/welcome.html), a website created by Ministry of Education to provide ICT resources and internet educational resources including lesson plans for various content areas for teachers; Swedish Schoolnet (http://www.skolutveckling.se/skolnet/english/index.html), a website to stimulate the use of ICT in schools; and European Schoolnet (http://www.eun.org/eun.org2/eun/en/index.html), the European framework for the co-operation between the European Ministries of Education on ICT use in education.

6.2. Networking support

The US Teachers Network is a nationwide, educational non-profit organization that identifies and connects innovative teachers exemplifying professionalism and creativity within public school systems (http://www.teachnet.org). This network promotes interactive collaboration among teachers and educators to improve teaching and student achievement, provides resources for designing their own professional development, disseminates the work of outstanding classroom teachers, and attempts to provide teachers with the knowledge and skills needed for good teachers.

TeacherNet UK is an independent professional association for teachers and others in education who wish to make effective use of ICT in education. It promotes and supports teachers' professional development and national and international teacher networking, provides relevant resources, information and news on curriculum innovation projects, and encourages teachers' online discussions and forums (http://www.teachernetuk.org.uk).
Several international organizations have encouraged use of ICT to promote teachers’ networking and further professional development. UNICEF’s Teachers Talking About Learning (http://www.unicef.org/teachers/) was designed for international collaboration between teachers in developing countries using the Internet and television. It provides access to teacher training materials and useful links and promotes discussions among teachers.

Similarly, the OECD Centre for Educational Research and Innovation (http://www.oecd.org/er/) has promoted research and innovation in education in OECD countries for nearly 30 years. Its activities aim to encourage better links between research, policy innovation and practice, enrich knowledge about educational trends internationally, and involve educational researchers, practitioners and government officials in cross-national discussions.

The World Bank’s World Links for Development (WorLD) (http://www.worldbank.org/worldlinks/english/index.html) program provides Internet connectivity and training for teachers, teacher trainers and students in developing countries in the use of ICT and other technologies in education. WorLD then links students and teachers in secondary schools in developing countries with schools in industrialized countries for collaborative learning via the Internet.

7. CONCLUSIONS

This study was conducted as the first part of a five-year project on “International Collaboration and Networking in Teacher Training via Information and Communications Technologies (ICT)” and focused only on the analysis of cases and approaches adopted in ICT teacher training in a variety of contexts. This final section offers some of the main implications and challenges for ICT teacher training from the cases discussed above.

First, “integrating the national vision for ICT use into teacher training” was indicated as a critical issue in ICT teacher training. As seen in the case of Singapore, NIE has successfully integrated the national vision toward ICT use in education into its ICT plan. All the elements of the ICT-integrated environment at NIE reflect ICT-related goals in Singapore’s education system and in the Masterplan for IT in Education. In addition, the USAID/AED LearnLink project in developing countries is being implemented with close relationship with each country’s government to integrate its activities into the nation’s educational policies and visions. Future challenges for ICT teacher training programs seeking to reflect national education policies include (Collis and Jung, 2003):

- Incorporate and reflect national visions for education in any ICT training plans for pre-service and in-service teachers.
- Clarify specific outcomes based on the national vision.
- Identify the appropriate means to achieve these outcomes.
- Collaborate with policy makers in developing ICT plans for teacher training.

Second, several cases above show that “investment in teacher trainer training” is important for the adoption of ICT for teacher training. For example, the experiences of TED in Malaysia, NIE in Singapore, VHS, and LearnLink indicate the importance of providing a variety of both formal and informal teacher trainer training systems so that trainers could take advantage of the methods which suit them best. Experience shows that to enlist staff support and involvement, it is useful to:

- Employ a variety of teacher trainer training methods, ranging from face-to-face workshops to online self-study programs depending on training objectives and environments.
- Integrate informal support into the formal teacher trainer training system so that the less experienced teacher trainers can obtain timely assistance.
- Plan to provide multiple incentives such as workload reduction, recognition and reward in faculty evaluations, increased research allocations to encourage use of ICT in teaching, and compensation for those providing educational or technological assistance to others.

Third, successful ICT teacher training cases analyzed above emphasize that teacher training courses must themselves “model effective ICT-integrated instructional practices” (Collis and Jung, 2003). Academic staff in initial teacher training institutions or schools of education often do not model the application of ICT in their teaching practices. As seen in the case of NIE, student teachers must produce ICT-based micro-lessons applying pedagogical principles, which may be distributed to school teachers on CD-ROM. VHS has developed pedagogically
sound Web-based teacher training courses to help teachers design and deliver Web-based courses. Future challenges for teacher training institutions in incorporating ICT into their curricula include these points:

- Demonstrate ICT-integrated teaching and learning by using the technology in teacher training curricula.
- Provide short, hands-on ICT foundation courses at the initial stages of pre-service teacher training, courses that relate ICT to the achievement of wider pedagogical objectives.
- Provide more advanced ICT courses as electives.
- Provide opportunities for teachers to produce and disseminate ICT-based instructional materials.

Fourth, the cases above also indicate the importance of "blending different technologies" in providing effective ICT training for teachers. As we know, the situation of ICT development varies from country to country and from region to region even though ICT is undoubtedly prevailing in most countries. Several cases introduced in this paper suggest that it is important to understand the potential of the various technologies for providing effective teacher training in specific contexts. For example, the USAID/AED LearnLink project in developing countries shows a variety of ways of blending technologies and media to enhance teacher training with limited resources in each country. Another example of Captured Wisdom mixes different technologies – CD-Rom, Video, and the Internet – to maximize effects of those technologies on teacher training. These examples suggest guidelines for better uses of ICT for teacher training.

- Analyze connectivity and software tools (access) before adopting any ICT for teacher training.
- Assess preparedness and training needs of teachers in ICT training.
- Select technology and media for particular needs and circumstances. Do not choose a certain technology just because it is available.

Finally, certain cases suggest that national and international partnerships across public and private sectors need to be formed to share resources, knowledge, and experiences in providing effective and efficient ICT teacher training. ICT teacher training efforts made by organizations such as the UNESCO, the World Bank, the USAID, the AED, and the UNICEF have shown training advantages of international collaborations and benefits of using ICT for teacher training. One of such advantages of international collaboration is to bridge the gap between ICT haves and have-nots. Teacher training institutions seeking to promote national and international partnerships should:

- Provide incentives for private and public participation and investment in ICT teacher training.
- Remove legal barriers – for example, classroom attendance requirement – to online training courses shared by several countries or institutions.
- Incorporate a plan to lesson the digital divide that may exist in participating countries or training institutions.

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