1. Bhutan “Support for Teacher Education” Project

Philip Wong

Introduction

This case study describes an innovative project to assist Bhutanese teacher education institutions to provide trainee teachers with skills in ICT and with the ability to utilize ICT in the classroom to enhance the quality of teaching and learning. This paper begins with background information about the situation in the Royal Kingdom of Bhutan and the need for the project. The two phases of the project are then described and the process of developing an “ICT in Education” curriculum is explained. Following this, other aspects of the project are outlined, including equipment supply, professional development and the evaluation process.

Background

The Royal Kingdom of Bhutan's education system covers Kindergarten to Grade 12. The medium of instruction is English with additional lessons for teaching their national language, Dzongkha. Based on 2006 statistics, there are about 190,000 students enrolled in about 512 schools. School enrolment is 95 percent and the national literacy rate is 60 percent.

Information Technology (IT) courses are offered in Grades 9 and 10. Computer classes are offered in Grades 11 and 12 but they are theoretical courses in C++ programming and follow the Indian syllabus. A local IT curriculum has recently been developed for Grades 11 and 12, however, and this will be implemented in 2008.

In Bhutan there are two teacher education institutions, namely, Paro College of Education (formerly known as the Teacher Training College and later as the National Institute of Education) and Samtse College of Education. Both colleges are member institutes of the Royal University of Bhutan and they offer a three year undergraduate Bachelor of Education qualification for primary and secondary school teaching. Trainee teachers spend eight months as an apprentice teacher at a school before embarking on the Bachelor of Education programme. Postgraduate teacher training (Post Graduate Certificate in Education) is offered at Samtse College of Education for those who already have a bachelor’s degree. Similarly, Paro College of Education offers postgraduate courses such as a Master in Education and a Diploma in Management and Leadership.

Prior to 2000, no “ICT in Education” modules were offered at either of the colleges. At that time there were not enough trained lecturers nor was there sufficient computer equipment to be able to teach computer skills to all the trainees.

Recognizing the need to introduce ICT to trainee-teachers so as to enable them to acquire ICT skills and use ICT in teaching, an approach was made to the Singapore International Foundation (SIF), a non-profit foundation, for assistance in developing an ICT-enhanced curriculum for teacher education and

\[1\] Philip Wong is an Associate Professor at the National Institute of Education, Singapore.
\[2\] Bhutan Government website.
for assistance in building capacity so that the colleges would be able to provide ICT training. The teacher education institutes were also interested in introducing an ICT track for their Bachelor of Education programme so as to train teachers who could teach ICT skills and use ICT in teaching in schools.

**SIF ICT in education project**

The SIF ICT in Education project, initiated in 2000, aimed to assist Bhutan’s Ministry of Health and Education (MoHE) to introduce ICT into its education system to help bridge the gap between the low ICT-skills among pupils (the future workforce) and the growing adoption of ICT technology in the workplace. The project, conducted by the SIF Specialist information technology (IT) team, also trained teacher educators and curriculum design specialists to utilize ICT in their work and to integrate computer-based training materials into the school curriculum. Funding for the project was obtained from the Singapore Government and philanthropic foundations in Singapore.

In May 2000, a technical feasibility visit was made by a team of specialist volunteers from one of Singapore’s polytechnic colleges to assess the parameters of a project with the Paro College of Education.

The project was conducted in two phases. Phase One was implemented in 2001 and 2002, and Phase Two was implemented over the period from 2002 to 2007.

**Phase One (2001 – 2002) – ICT-literacy training and course development**

An SIF IT Specialist Team, comprising volunteers from Temasek Polytechnic in Singapore, conducted the first training workshop in ICT-literacy in December 2001. Attended by 25 Bhutanese high school teachers, the workshop was held at the request of the Bhutan Ministry of Health and Education, to kick off a three-year Post-Graduate Certificate in Teaching Information Systems that the Ministry had initiated.

A second activity conducted by the Specialist Team in 2001 was to assist the Bhutan Education Department to develop a three-module course (called Functional IT) within the pre-service teacher training programme. This course was designed to equip all Bhutanese teachers with ICT skills and to help them to prepare instructional materials. This course was subsequently introduced at the Paro College of Education, and Samste College of Education and was offered to all trainee teachers at these colleges.

**Phase Two (2002 – 2007) – Curriculum developed for a Bachelor of Education in IT**

The key objective of the second phase of the project was to develop and launch a new elective ICT subject within the Bachelor of Education (B.Ed) programme. To achieve this objective, another Specialist Team from Singapore expanded the ICT resources available at the Paro College of Education, provided training for lecturers at both colleges, and provided assistance in conducting the new elective subject.

The Specialist team worked with the lecturers from the Paro College of Education to design and develop an IT curriculum which would achieve two goals. First, equip the trainees who opt for this elective with sufficient skills to teach computer studies in middle and high schools. Second, provide trainees with the skills required to design and develop teaching materials and to teach using ICT.
The ten-module curriculum that was developed, known as “Enhanced IT” (EIT), is similar in terms of coursework demands to other courses offered in the Bachelor of Education programme, requiring a period of three years to complete. In addition to taking the EIT modules, trainee teachers also specialize in another discipline.

The curriculum development process took approximately one year. It began with an initial face-to-face meeting which was followed up on through a series of e-mail exchanges. When the curriculum was complete, it was submitted to the Paro College academic board for approval, which was obtained in late 2002. The first batch of six trainees started the course in February 2004. Initially, the curriculum will only be offered at the Paro College but in time it will also be available at the Samtse College.

Aside from developing the curriculum, the project involved providing various training courses to lecturers at the Bhutan colleges in order to develop human capacity and ensure lecturers have the expertise required to teach the EIT curriculum. Training was provided by Singapore volunteers in Bhutan. Lecturers from both colleges also attended training courses in Singapore.

The use of computer technology in education can be classified into three categories.³

- Computers can be considered as an “object” which students learn about (hardware and software).
- Computer technologies can be an “aspect”, which means using them as tools in subjects, such as computer-aided design courses, or as general tools in educational settings, such as the use of graphic design software to create web pages for a school.
- Computer technologies are a “medium” for instruction. In this category, computer technologies can be used for teaching and learning.

The curriculum that was developed for the Bhutan teacher education institutes incorporated all of these categories, with a good balance between the categories.

A number of competencies and skills are required of a 21st century learner,⁴ including digital-age literacy. A 21st century student needs to be aware of various tools for digital communication and be able to use them. Recognizing this, the concept of digital-age literacy was taken into consideration when developing the information and communication technologies (ICT) curriculum for Bhutan.

Conventionally, teachers are trained to use a teacher-centred approach, however, in developing the new curriculum for teacher training institutions in Bhutan there was a conscious shift towards approaches that lead to constructivist and independent learning. This shift was made in recognition of the fact that through the use of computers and the Internet new forms of learning can take place, including problem-based learning, project-based learning, and authentic learning using real-life scenarios.

**Curriculum development process**

The EIT curriculum was designed with the following goals in mind.

- To equip trainees with skills in using the computer and related applications for improving productivity, for preparing teaching materials (lesson plans and multimedia instructional materials) and for integrating technology into their teaching.
- To prepare trainee teachers to be able to teach computer studies to students in grades 9 and 10.

³ Plomp, ten Brummelhuis, and Pelgrum, 1997
⁴ NCREL, 2003
During the development of the curriculum, it was speculated that many of the trainees who would take the Enhanced IT course would not have any previous ICT experience. Thus the modules would need to start from basic computing technology and move on to more advanced content later. This assumption was subsequently justified by results from an annual survey conducted at the beginning of the academic year: nearly all trainees entering the EIT programme said that they had little or no IT experience.

The curriculum developers realized that the curriculum had to strike a balance between methods and content. In terms of methods, the curriculum covered teaching methodology for computer studies, developing and preparing teaching resources and integrating technology into teaching. The content covered multimedia design, instructional design, programming, and scripting languages. These courses were designed to build IT skills and also equip teachers with the knowledge required to teach computer studies in grades 9 and 10.

The curriculum developers were also aware that the curriculum must be relevant in terms of the Bhutan context and yet must be up to date in terms of international standards. When designing the curriculum it was therefore necessary to take into consideration the resources available in the colleges and the schools so that the courses would be in accordance with existing computer resources. It was observed that sometimes the resources available in the training colleges did not match those in schools. For example, Internet access was available in the Paro College but schools (where trained teachers would be working) did not have any Internet access. It was also observed that although certain software programs were required for the training of some modules, funds were not available to purchase them. It was therefore decided to use as many freeware options as possible so that cost of software would not be a problem. Some of the freeware options selected included: Hot Potatoes (software for producing online tests), Gimp (image manipulation software) www.gimp.org; and Picassa (image sharing and storage software) www.picassa.google.com.

Since the trainee teachers needed to become qualified to teach computer studies in schools, the curriculum development process included a concerted effort to match the curriculum to the schools’ computer studies syllabus. However, at the time the curriculum was being developed there was a move to revamp the old computer studies syllabus for Grades 9 to 12. Because of the uncertainty of the school syllabus, it was therefore difficult to develop the curriculum. Consequently, it was agreed that the curriculum would be based on the existing syllabus and the relevant modules would be altered in future to match the revised school syllabus.

Each of the 10 modules were classified as either “M”, which stands for teaching methods, or “C” which stands for content. In total there are three Method modules and seven Content Modules.

The greater emphasis on content than method was necessary because when the curriculum was designed in 2002 it was anticipated that most trainees joining the programme would not have any computer skills or any prior ICT knowledge. However the emphasis will change, as necessary, in future.

**Supply of ICT equipment**

It was recognized from the beginning that for the B.Ed programme to be successful, adequate computer resources, teaching resources, reference materials and textbooks were required. When Phase Two of the project began in 2002, Internet access was slow, with dial-up access to the country’s Internet

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1 The curriculum-design approach outlined by Posner and Rudnitsky (2005) was adopted in the curriculum development process.
service provider. There was only one computer lab and it was open to all trainee teachers, not only those enrolled in the EIT programme. Relevant software was not available and funds were limited. To help out, various software titles were donated to the college. One approach was to donate older versions of software. For example, when the university in Singapore bought a newer version of a program, it donated the old version to the teacher education college in Bhutan so that trainee teachers could have access to a legal version of proprietary software. In addition, desktop and laptop computers were donated for student use. The college also received funding from an international source to construct a block to house computer labs, and for professional development of the lecturers and purchase of resources. Recently, three computer labs were built in the new block, along with a server room, and one of the computer labs is reserved for use only by trainees in the EIT programme. The Paro College has slowly built up its resources and now has fast Internet, with satellite connection.

**Professional development of lecturers**

When Phase Two of the project began in 2002, it was anticipated that the lecturers teaching the course would need help to build their capacity. As such, a professional development programme was developed. Due to time and resource constraints, professional development was carried out in phases and aligned with the module schedule. There were three phases of training activities.

In the first phase, volunteers visited Bhutan and conducted a week-long training course based on the module that the lecturers would be teaching in the following semester. For example, if a module was going to be offered in Semester 2, then a professional development course to prepare the lecturers to teach that module was conducted in Semester 1.

A number of academic volunteers from the Singapore National Institute of Education and Temasek Polytechnic were involved in conducting these training courses. Each volunteer was selected based on their expertise and on the content of the modules. During the training in Bhutan, the content was introduced to the lecturers at the college, and lecturers developed teaching materials that they would be using, designed assignments and exercises, and participated in discussions about the sequence of content. Also, the lecturers experienced working as a team, which had the advantage of enabling teaching resources to be developed faster.

In the second phase of the project, a volunteer was attached to the Paro college for one year. Previously the head of the IT department in a school in Singapore, the volunteer helped the lecturers to develop training materials for Modules 1, 2, and 3. The volunteer also taught some of these modules and she helped the lecturers to mark the assignments.

In the third phase of the project, seven lecturers from Paro and Samtse college went to Singapore for three months, December 2005 until February 2006, for professional development training at the National Institute of Education (NIE) in Singapore. While in Singapore, the lecturers also visited educational institutions and interacted with staff from e-learning companies.

The lecturers received training in the following areas:

**Content:**
- Preparing multimedia materials with Authorware™
- Using Macromedia Flash™ to create animations
• Editing pictures with Adobe Photoshop™
• Creating webpages with Dreamweaver™
• Principles of programming - Java Script Language

Curriculum:
• Development of e-portfolios
• Instructional Design

These modules were specially designed to enable the lecturers to conduct the teaching of modules EIT 7, EIT 9 and EIT 10.

**Review and evaluation of the curriculum**

**I. Mid-project review**

In May 2005, one and half years after the programme of study began, a review was conducted to evaluate the curriculum and to make any necessary modifications. By the time of the review, Modules 1 to 4 had been completed by the first batch of trainees and a second batch of trainees had completed Modules 1 and 2. During the review process, trainees from both batches were interviewed to obtain feedback about the content, methodology of delivery, assignments and adequacy of resources.

Based on the feedback, no changes were made to EIT Module 1 since this was a basic course. All trainees were required to attend FIT modules and the trainees from the EIT programme attended EIT 1 and this is equivalent of two FIT modules. However, since many trainees were first time users of ICT, the trainees requested more time to practice and to allow them to go at a slower pace. Trainees taking EIT modules were given more access to computers and extra disk space on the network drive.

For Module EIT 2, a method module, the use of an instructional CD ROM was discontinued as this kind of media was no longer easily available. Instead, learning objects based on Java or Flash were used, as many of these are available on the Internet and it would be easy for trainees to incorporate them into their school lessons.

**II. End of project review**

In March 2007, the volunteer team from Singapore visited Bhutan again to undertake a final evaluation at the end of the five-year project. The review involved conducting a survey to obtain feedback from the trainee teachers, graduate teachers, lecturers and the Director of the Institute on the effectiveness of the curriculum and the project. Classroom observations were also conducted to determine how teachers were using the new skills they had gained.

Feedback from trainee teachers and graduate teachers indicated that many were concerned that the principals of their schools expected them to be “experts” in computers and to solve hardware and network problems. Since schools do not have technicians, teachers attempt to solve minor computer problems but are unable to go beyond this.
Based on the feedback and observations, some modifications to the curriculum were made. The most notable changes were the addition of hardware maintenance training, instruction in basic networking and in setting up simple networks, and training in the use of Flash software rather than Authorware as a developmental tool.

As technology is constantly changing, the curriculum will need to adapt accordingly, so further changes and updates to the curriculum will be conducted at regular intervals in future.

**Conclusion**

The project succeeded in bringing about changes in teacher training in the area of ICT. The survey data indicate that teacher educators’ skills and knowledge increased tremendously as a result of the project. Lecturers went from not knowing anything about computers to being able to design web pages – a tremendous jump in skill acquisition. In terms of pedagogy, teacher educators moved from the conventional teacher-centred approach to more collaborative modes. There was also an increase in group work activities, use of project-based teaching, exploratory methods of learning, and constructivist approaches.

The five-year project can therefore be considered a success. One of the success factors was the support given to the project by all parties, including the Ministry of Education of Bhutan, the teacher education colleges in Bhutan, the Singapore International Foundation and volunteers, and the donors and sponsors from Singapore and Switzerland. All participating organizations had a role to play in the project and their combined efforts resulted in a successful outcome.

**References**

Bhutan Government website.

Paro College of Education website.
http://www.nieparo.edu.bt

Samtse College of Education website.
http://www.niesamtse.edu.bt

