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Distance Education in Bhutan: Improving access and quality through ICT use

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Since 2004, the National Institute of Education (NIE) in Samtse, Bhutan, has made systematic efforts to introduce information and communication technology (ICT) for learning support into its distance teacher education program. This article describes the early experiences of using ICT for distance education in Bhutan by teachers and students with relatively limited ICT background. It discusses the challenges of providing student support for a distance teacher education program in Bhutan and it explores the use of ICT for student support. The article also reports an assessment of student perceptions and readiness for ICT use, the introduction of a learning management system and regional study centers as ICT access points, and the experiences and challenges encountered in the process of ICT introduction in its early stages. The use of ICT by distance students based on log data from the learning management system Moodle™ and regional study centers are discussed, as well as the challenges of ICT use under infrastructure and technological support limitations.

Introduction

Bhutan is a small, landlocked country in southern Asia, between China and India. Its population is 634,982, and it covers 38,394 square kilometers (Royal Government of Bhutan, 2006). It has one of the world's smallest and least developed economies. Agriculture, forestry, and hydroelectric power provide the main sources of income for 90% of the population. International agencies are currently supporting a number of educational, social, and environmental programs. In 2003, the higher education sector in Bhutan was reorganized through the creation of the Royal University of Bhutan bringing together eight higher education institutes and

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two teacher education institutions, including the National Institute of Education (NIE) in Samtse, which is on the southern border of Bhutan with India. Recently, the NIE was renamed as Samtse College of Education (SCE, 2007).

In 1995, the SCE augmented its regular campus-based programs with a distance teacher education program (DTEP). This was in response to the need to provide greater access to teacher education, for the Bhutanese primary school teachers in all regions of the country who wanted to upgrade their credentials. These teachers have a Primary Teaching Certificate (PTC), which is a 2-year program that they undertake after completing their middle secondary school education (Grade 10). The DTEP is a 5-year version of the 3-year Bachelor of Education for Primary teachers (BEdP). The program is delivered using printed study guides and an annual 1-month compulsory residential session at the beginning of each level of the program. During the residential school, orientation, tutorials, and learning materials are provided. Examinations of the previous level are also conducted during this period. There are approximately 2,000 primary school teachers with only a PTC, of which 10% are currently enrolled in the DTEP (figures taken from NIE statistics, 2006). This means that there are over 1,500 primary teachers who will soon need upgrading.

The DTEP students live in all parts of the country, mainly in primary and community schools in rural and remote locations. Many of these schools do not have road access. Bhutan's rugged terrain and bad weather in both summer and winter often create roadblocks that make accessibility very difficult. Many students have access to a telephone service, however, regarded as an effective but often underestimated medium for student support (Simpson, 2000). According to an informal survey conducted during the DTEP's residential school in early 2005, 74% of the students have access to a telephone at home. Seven regional study centers around the country provide Internet access and basic facilities such as printing, telephone and fax, to provide asynchronous modes of communication of benefit to students who do not have ready access to computers and the Internet (Gyatsho, Daker, Galey, & Jamtsho, 2005). These centers are located in schools identified as education resource centers. A teacher from each of these schools has been trained as coordinator. Besides serving as access points for information and communication technology (ICT) support services, these centers are designed to provide students with "the support and friendship of other people in addition to what can be provided through machines or the written word" (Mills, 1996, p. 85). It is hoped that these centers will grow into environments for activities such as peer tutoring, faculty visits, arranging for local teacher coaches, and group work in the near future.

The design and provision of effective student support services has been one of the DTEP's greatest challenges, however. In this article, student support services refer to "activities beyond the production and delivery of course materials that assist in the progress of students in their studies" (Simpson, 2000, p. 6). Such activities involve interactions between the instructors or tutors and students, between students, and the provision of information and resources to promote learning. There

is a growing recognition and acceptance, in Bhutan as in distance education (DE) the world over, that knowledge is a means rather than an end in itself. The learner is seen as an active shaper of learning, while the teacher may be seen as a guide rather than the owner of knowledge (Gaskell, Gilmartin, & Kelly, 2005; Louw & Engelbrecht, 2006; Miller, 1996; Oliver & McLoughlin, 2001; Sweet, 1993). Boot and Hodgson (1987) distinguished between "dissemination" and "development" approaches to DE, and in Bhutan increasing importance is being attached to the development approach, which emphasizes active participation and communication for the students' intellectual and personal growth, as opposed to more passive traditional information distribution models, which generate more passive learning roles. It has been envisioned that the DTEP will "provide opportunities for students to express, reflect and share their experiences as practitioners … provide context relevant teacher education by relating theory and practice" (NIE, 1998, p. 2). The traditional DTEP infrastructure allows very little room, however, for this type of knowledge construction drawing on the students' wide experiences. The program's traditional approach has been more like the "dissemination model" in which the primary concern is that of transmitting knowledge, skills, and values. The DTEP staff has come to regard this as a serious mismatch between the program's objectives and activities.

Thus, the usage of ICT in the DTEP (primarily the telephone) has mainly been for administrative support and information dissemination functions rather than for academic support, for example, discussion of students' study-related problems. This shortcoming is compounded by scheduling problems arising from the fact that many DE students and tutors are in full-time employment as classroom teachers. Apart from a limited use of telephonic communication and postal mail, the residential school is the only major opportunity that students have to interact with their instructors or tutors, and receive services such as tutorials and academic counseling. The month-long annual residential school is divided among numerous activities, including face-to-face interaction sessions, examinations, and accessing essential resources from the library. With the emphasis more on delivery, hardly any time is available for such support activities. Even if enough time were available, not all support problems can be anticipated during the residential school. Any support provided during the school therefore tends to be one-off and not necessarily timely. Problems usually arise when the students begin to study on their own, and are generally very difficult to anticipate during the residential school; and communicating with the learners after the school is largely restricted to the telephone and postal mail, which may take at least 2 weeks to arrive in each direction. In such cases, even the promptest response can take a month or longer. Hence, provision of timely guidance and support constitutes one of the biggest challenges. The DTEP, therefore, runs the risk of being an isolating experience involving one-way knowledge transmission alone (Paul & Brindley, 1996; Simpson, 2000).

While the DTEP has been successful in making teacher education more widely accessible to Bhutanese teachers in general, concerns have been expressed about this lack of interaction between students and instructors outside the yearly residential

session. The print-based nature of the program and the geographic isolation of many of its teachers have meant that, after the residential session is complete, students are virtually on their own for the rest of the year. Although collaborative learning methods are known to enhance understanding (Bruffe, 1999), the traditional delivery method of the DTEP does not facilitate this approach. The use of ICT-supported methods, however, can increase interaction and the use of collaborative learning approaches. Until recently, the technological infrastructure of Bhutan made the use of ICTs impractical. Since the introduction of TV and the Internet in 2000, however, considerable progress has been made in improving the country's ICT systems, and the door has been opened to the greater use of ICTs to enhance the DTEP's interactive element (NIE, 2003). The NIE's leaders felt that, enhanced by ICTs in this way, the quality of the DTEP could be improved for teachers around the country in need of professional upgrading.

By 2003, the expanded use of ICT for student support for the DTEP was regarded as a viable option for several reasons:

1. The advent of ICT, notably computer-mediated communication (CMC) affords numerous possibilities of interaction, particularly in an asynchronous mode—a significant move away from the traditional delivery mode. CMC here refers to "any form of organized interaction between people, utilizing computers or computer networks as the medium of communication" (Romiszowski, 1997, p. 32). CMC's use has been reported as facilitating numerous aspects of learning that might otherwise be missing from distance-based programs, for example, social construction of knowledge, reflective thinking, and development of higher order thinking skills (Murray & Mason, 2003). It has the potential to increase service access and quality, interaction among students, and to provide access to resources that were previously inaccessible (Brigham, 2001). With CMC, it becomes possible to provide continuous and sustained learner support. Students can remain connected with their instructors and each other throughout their course, communicating at convenient times. It allows for interaction amongst students through conferencing and discussions. It has the potential to facilitate interaction and dialogues that are both valued and enjoyed—qualities advocated as essential for any effective student support system (Tait, 1996).

2. In today's information-driven society, it becomes very important to empower students to be self-directed knowledge "navigators" on the information superhighway (Skagen, Blaabjerg, Torras, & Hansen, 2006). Teachers also need to be educated on how to help their students in the ICT context. The introduction of CMC therefore not only helps the students to succeed in their DTEP studies, but also prepares them to help themselves and their peers for the increasingly complex information society. The progress made in Bhutan's ICT infrastructure development since the beginning of the millennium has made it possible for the SCE to consider ICT (e.g., increasingly accessible Internet services) as providing viable student support in DE.

The Project (2003–2007)

The first stages in fulfilling the DTEP's development objectives have been made possible in a 4-year project funded from 2003 to 2007 by the International Development Research Centre (IDRC) of Canada. The project's overall goals were *to improve the quality and access to DE in Bhutan*, by:

(a) developing and pilot-testing an appropriate ICT-based distance teacher education system in terms of learning support and accessibility;
(b) assessing whether the use of ICT improves the quality and access of the distance teacher education system;
(c) formulating recommendations from the research findings for national teacher education policy; and
(d) examining learning satisfaction and access to the ICT-supported distance teacher education from gender perspectives.

The project consisted of three phases:

1. *Preparation*. In the first phase, the prior quality and accessibility of the DTEP was assessed. This assessment confirmed a decision to design an ICT-supported distance teacher education system.
2. *Intervention*. As a result of Phase 1, an open-source learning management system, Moodle™, was installed on the SCE's server, and tutors were trained in how to use online technology in support of learning. Online learning activities have been designed for four modules: *Sound & Speech* (EFC 305); *Teaching Strategies* (EDN 335); *Teaching of Social Studies* (PCS 371); and *Teaching of Science* (PCS 381). These modules were pilot-tested in 2005. In addition, a computerized student information management system and online program-related information were developed.
3. *Data collection and analysis*. The final phase of the project evaluated the effectiveness of the online learning in these pilot modules, and assessed whether the use of web-based ICT improved the quality of, and access to, the distance teacher education system. This phase also examined learning satisfaction and access to the system from gender perspectives.

The project has had the following secondary goals of determining:

(a) the impact, if any, of the implementation of an ICT-supported learning support system on access, learner satisfaction, and persistence;
(b) how tutors use the system and their perceptions of it; and
(c) whether any gender or geographic differences exist in students' responses to the ICT-supported learning support system.

Data have been collected from the following sources using a variety of techniques and instruments:

(a) *Semistructured interviews with tutors*. Interviews were conducted with 12 of the 33 tutors (36%) to determine their perceptions of the use of ICTs in the DTEP.

A stratified sample was selected on the basis of geographic location (urban, rural, remote) and gender. Interviews used a semistructured protocol and were conducted face-to-face by an interviewer who was independent from the College. The interviewer used the protocol as a guide to ensure that key issues were covered, and conducted the interviews in a conversational manner so as to allow issues and themes to emerge.

(b) *Semistructured interviews with students*. Similarly, semistructured interviews were conducted with a representative sample of the students. A stratified sample was selected based on gender, geographic location, and level of study. Interviews were conducted with 25 of the 190 students (13%). The same semistructured, conversational approach was used as in the interviews with the tutors.

(c) *A questionnaire* was developed including demographic items, and 5-point Likert-type attitude scales to gauge opinions about the DTEP, its ICT-based support, and how it could be improved. The questionnaire was mailed to all 33 tutors and 190 students with stamped, self-addressed envelopes. Responses were obtained from 13 (39%) tutors and 107 (56%) students. The results were compiled using the SPSS statistical software.

(d) *Web server log files*. Log data from the Moodle™ system were used to determine frequency and times of use by students and tutors. This information was used in triangulation with the data on student and tutor perceptions gathered from the questionnaires and interviews.

(e) *Student records*. Data from the SCE's student records were used to determine final student grades and completion rates.

These data were used in developing the DTEP's learning support system in relation to two main dependent variables:

(a) the efficiency of the learning support (i.e., the satisfaction expressed by distance students as a result of the implementation of the online learning activities); and

(b) students' ease of access to the learning support (i.e., the ability of qualified Bhutanese students to enrol in and complete the DTEP, regardless of their geographic location within the country).

Project Results

1. Student Perceptions of ICT Use and Accessibility

The first step in analyzing the feedback data was to understand the students' views on the quality of learning support and the program's ICT uses. It was very clear from the survey responses that there was a need to enhance learning support services for the distance-based program. Only 63% of the students felt that the residential school was sufficient to dispel any doubts or problems related to their distance study; and only 55% indicated that adequate means existed for them to consult their course tutors at times of need. One serious area of concern for the students was the turnaround of assignments with appropriate feedback from the

tutors. While 70% agreed that the feedback from their tutors on their assignments helps them improve, only 27% agreed that the feedback was timely. Besides wishing for assignments to be promptly returned with helpful feedback, another important form of support that students like to receive is a selection of supplementary reference materials. Only 14% of the students reported that they had reasonable access to such materials during their distance-based study. Less than half of the sample (43%) reported that they had opportunities to interact with other students during the program.

Types of ICT were explored as means to improve the DTEP in these respects. Eighty-one percent of the student sample agreed that the program should make use of ICTs; and 78% felt that the Internet should be used to facilitate interaction and support, even though only 35% reported that they had easy access to a computer. (A subsequent survey during the 2006–2007 residential school session has revealed that this figure has since risen to 78%.) More than 80% of the students believed that supplementary radio and TV programs as well as prerecorded audio and videotapes will be helpful to them, while 69% wanted supplementary materials on CD-ROMs. Ninety-five percent of the respondents responded positively to the idea of using regional centers for student support services. The findings of the survey and interviews confirmed the need for additional reference material and for prompt feedback on student work, as means to improve the students' assignment work.

2. Implementing ICT Use for Learning Support

The baseline survey also indicated student preferences for a wide range of ICT use for student support. It was clear that introducing multiple ICTs simultaneously was not feasible, given the resources that would be required, and that it would be difficult to manage. For these reasons, a systematic and gradual approach to ICT introduction was required. In addition to the enhancement of already existing telephone and fax services, the use of CMC was seen as potentially most helpful in meeting the important goal of emphasizing context-relevant teacher education through reflective practice. The open-source learning management system (LMS) Moodle™ was initially introduced into four of the DTEP's course modules, and has gradually been expanded for use in all the course modules. A DTEP website was launched to provide information on institutional regulations, course descriptions, and assignments, as well as links to course resources. Email accounts for the faculty and students were created.

Analyses of the Moodle™ server log data and the regional study center logs provided useful insights into the students' uses of CMC. The use of the LMS generally peaked around the due dates for completion of activities and assignments. The frequency of students' use of it was also higher in the first half of the year than in the latter half, probably owing to a decline in the medium's novelty. Technical glitches experienced during the latter half of the year with the SCE's server and with the LMS software may have discouraged students in making the often time-consuming trip to the regional study centers.

Despite high expectations of interaction on the LMS's discussion forums, these facilities were little used by the students. This may be because none of the courses required or systematically encouraged the students to engage in them. The conferences were mainly left available for students to post queries or socialize on a voluntary basis. It is apparent that successful use of discussion forums requires a learning culture nurtured by systematic preparation. As a new kind of learning environment, CMC takes time for students to get used to it. Other deterring factors were no doubt limited access to the Internet and the slow speeds of available bandwidth. More detailed study of this is in progress with the students, which should provide a clearer picture.

Email was effectively used by students to communicate with their tutors and to send in assignments as attachments. Regional study center logs indicated that many students make use of the Internet for surfing for resources and downloading them. By contrast, very few students used the fax and telephone facilities at the regional study centers. For most students, phone calls are usually more conveniently made from home and in the evenings. Students would also prefer to use email rather than fax to submit their assignments—except in the case of a few students in very remote locations with no access to computer or word-processing facilities. Submitting work by fax tends to be cumbersome and unreliable, especially when the documents are several pages in length. The preferred choice of many remote students continues to be the postal service, unless little time is left before a submission date.

The results suggest that students found the ICT-based learning support of some value overall, and that it improved the quality of their learning experience. It also emerged, however, that there are significant barriers to be overcome in seeking full integration of ICT into the DTEP. For example, in terms of improving their ability to obtain support, students said that the ICT system enabled easier assignment submission, and made it easier to obtain tutor feedback. This is clearly due, in part at least, to technical difficulties, notably lack of Internet access and technical support, and low bandwidth. As a further reason, some students also cited the complexity of using online methods generally. Although the SCE is connected to a 128 kbps leased line, students tend to be connected at a speed ranging from 33 to 56 kbps. This did not present a serious problem in the early months of the project, but Internet speed then began to deteriorate, making it very difficult for students as well as the faculty to use it. Suspecting this to be due to the bottleneck created by too many people trying to access the SCE, the DTEP site was subsequently moved to the web-hosting facilities of the Internet service provider, Druknet. Since then, there has been some improvement in connectivity speed. Currently, the SCE is connected by a 256 kbps VSAT leased line, with plans to upgrade it to 512 kbps in the near future. The use of online technology may also be helped by Bhutan Telecom's introduction of free Internet subscriptions from April 2007, and tariff reductions for various services.

Comparison of men and women in the samples did not indicate any meaningful differences in terms of their frequency and type of use of the system, nor in terms of

their ratings of the system's support functions (e.g., downloading study materials, submitting assignments, and communicating with tutors).

The system's impact on student performance and persistence was difficult to measure. The results show no significant impact on student completion rates. These have been relatively high since 1998, averaging over 80%, and it would have been surprising if the limited implementation of the ICT support system had exerted any direct impact on completion. One may expect a future impact on final grades if the system succeeds in increasing access to resources and timely feedback from tutors.

Issues Raised by the Project

1. Technical Support

A major factor to be taken into consideration by organizations introducing ICT facilities for the first time is the availability of technical support. Occasional technical glitches may be inevitable, and there always seem to be limitations to the extent that institutional technical personnel can solve problems. This may be more the case in small institutions located in rural settings, as in case of the SCE, situated in Samtse on Bhutan's southern border. Due to its remote location and the lack of qualified technical personnel in the area, relatively minor problems sometimes took several days to fix. Replacing or repairing problematic hardware could take weeks. The best of efforts put into the design of the learning support system in the end amounts to little in the face of poor infrastructure and inadequate technical backup.

2. ICT Infrastructure in Bhutan

An equally serious problem faced in implementing ICT-based methods in the DTEP has been the need to adapt them to Bhutan's limited technical infrastructure. Collaboration between educators and agencies such as the Ministry of Education, the Ministry of Information and Communications, and the Royal University of Bhutan, while not always easy, may bring about speedier and more efficient changes in educational ICT in the country. The teachers and students in SCE programs have to access their online support from learning centers or Internet cafés, which are sometimes a considerable distance from their homes and schools. The practical implications of this for the DTEP's project are that ICTs must be introduced gradually, and learning activities that use them must take this limited access into account. It is impractical, for example, to have the kinds of ongoing, asynchronous online discussions that are common in distance-based courses in developed countries. This activity requires an ongoing level of participation (Bullen, 1998) that is currently not possible in Bhutan (see the Appendix).

Initially at least, therefore, traditional educational media should be used more intensively to enhance instructor–student and student–student interaction, and to provide access to learning resources by supplementing and enhancing a print-based DE program. This may be a more effective way of moving students with limited

experience of information technology towards an ICT-based learning culture. Currently, students and instructors only interact during the month-long residential session at the beginning of the academic year. For the rest of the year there is no opportunity for interaction. By using the communication tools in the Moodle™ LMS, learners are able to contact their instructors and fellow students for clarification on points of instruction. It is hoped that, as the Internet becomes more accessible, this kind of communication will lead to the development of a virtual community in the DTEP. The Moodle™ LMS will be used to distribute information and resources; the students will be directed to relevant online resources; and selected readings will be posted in PDF for download.

3. The Need for Training

The crucial need is seen for all members of the DTEP, staff and students, to be trained in the effective usage of ICTs in course delivery and student support. The study has indicated that the extent to which students and tutors use ICT is dependent on their levels of ease and comfort with it. In November 2004, a group of tutors was trained in how to develop online support for their print-based modules. In January 2005, this group of tutors trained another group of tutors. By the project's completion in 2006, most of the DTEP tutors had been introduced to the key issues related to developing online support and the use of Moodle™. LMS training was first conducted for the faculty, and then for the students. In addition, computer literacy classes have been introduced for the distance students, with emphasis on the use of CMC methods for student support. Manuals have been developed for both tutors and students. Coordinators of the regional study centers have been trained in basic skills required for ICT management and coordination. There are also plans to explore and gradually introduce a wider range of audiovisual materials, including radio and audiotaped instruction, as well as supplementary TV and video materials, as long as their "value-added function" can be justified.

4. Resistance to Change

Finally, perhaps the most inevitable hurdle of all—resistance to change—has to be overcome. Attempting to implement an ICT-based education program encounters various types of resistance. Even in countries with highly developed ICT infrastructures that have adopted the "e-culture" in their personal, leisure, and financial spheres, there is still a resistance to e-learning methods, and a preference for traditional face-to-face approaches. It should be no surprise, therefore, that attempting to use e-learning in a developing country such as Bhutan, where diffusion of the Internet is still restricted to a small elite, generates resistance. The use of ICT in education deviates from Bhutan's traditional modes of teaching and learning, and tends to undermine the traditional perception of the teacher as an authority figure.

Conclusions

The current facilities for educational ICT development in Bhutan have distinct limitations. Certain ICT methods—CMC, for example—have the potential to promote a valuable "developmental" model of learning, but are subject to numerous technical problems, including difficulty of access, bandwidth, and lack of adequate technical support. In order to overcome these technological, infrastructure, and support problems, small institutes with limited resources, such as the SCE, are likely to benefit from establishing links with, and enlisting the support of, the local telecom department and ISPs. Despite these infrastructure-related shortcomings, the project has shown that uses of ICT such as email for faster assignment submission, and the Internet for providing additional resources, add clear value to DE support in Bhutan. Achieving other important benefits such as collaborative activities and knowledge construction through CMC will require systematic efforts that encourage, support, and require learners to participate.

Overall, it is expected that the current project will lead to greater learner satisfaction in the DTEP, and ultimately to deeper learning owing to the teacher–student and student–student interaction and collaboration afforded by online communication methods. It is anticipated that increases in learner satisfaction will derive from improvements in course module completion rates. The ICT-supported DTEP will help the distance students to learn the skills of ICT usage, which is a fast-growing aspect of today's world. The program can help them to be more effective teachers as well as consumers of the wide variety of information sources available on the Internet. Experience gained by faculty in various aspects of ICT use during this research and development project will be applied in the design and development of course materials for conventional SCE programs in, for example, preservice and inservice teacher education, thereby providing wider access to them. At the broad institutional level, the insights gained from the DTEP project will be used to help develop ICT-supported policy, effective ICT-based teaching and learning strategies, and ICT-supported management and networking systems.

Acknowledgements

Notes on Contributors

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Appendix

Since this article was written, the first author has expanded on the technical difficul-
ties of online education in Bhutan, in a personal communication with colleagues
including the current editor (J.P.B.). The following descriptive passage is reprinted
here with the author's permission (Jamtsho, February 2007).

… I have to admit that [Internet] access is still our main concern, although it is improv-
ing every year … Even if one has access, connectivity can be very poor. This week I
experienced [this] in Phuntsholing. After one hour, I still couldn't send one email. It
wasn't so bad the last time I used the Café. So not surprisingly this mail is coming to
you from Jaigaon, on the Indian side of the border town. During the pilot phase, we had
Moodle™ installed on our server at Samtse, but then lightning struck and we were
down for over a month. Then the suggestion from the techies was to have Druknet [the
ISP] host it. Even after moving it there, it went down on a number of occasions … [I]t
always took numerous requests to have it up and running but almost always with some
problems in the features available on Moodle™. Technical support from Druknet has
been rather less than what we would have liked. So we decided to explore possibilities of
hosting it elsewhere where we may receive better support and service. However, we have
not been very successful so far. These are but some of the difficulties we are faced with.

Despite this, for every student who has a terrible experience … I do believe we have
twice as many who find learning very convenient and effective because we have
provided this new avenue through use of ICT. I do, however, suspect that we are quite
far from achieving the ideal situation that many seem to expect almost immediately after
we introduce something new. Anyway, we try our best and hopefully we will have fewer
people having that kind of experience in future …