TACKLING THE PROBLEMS OF QUALITY AND DISPARITY IN NEPAL'S SCHOOL EDUCATION: THE OLPC MODEL

Saurav Dev Bhatta*

Abstract

Poor quality of public education and the disparity in access to quality education are the two main problems facing Nepal's school education sector today. One approach to addressing these problems involves integrating Information and Communication Technology (ICT)-based teaching learning approaches in mainstream pedagogy so that students, teachers and families in different geographic and economic locations can access the same high quality educational resources. The ICT-based teaching learning approach discussed in this commentary is the One Laptop per Child (OLPC) model. The paper argues that utilizing the full potential of the OLPC concept requires simultaneous work in four areas: digital content development, teacher preparation, network and power infrastructure development, and government capacity development. And it also emphasizes the need for a systematic approach to implementation where the implementers start by learning to solve implementation challenges in a test phase. They can then properly evaluate the model in a scaled up pilot phase before proceeding to nationwide expansion. The paper also addresses some of the major misconceptions related to the OLPC model and briefly discusses the issue of affordability in the Nepali context.

Keywords: Nepal; education quality; disparity; ICT; OLPC

---

*Education Director, Open Learning Exchange Nepal, Kathmandu, Nepal and Adjunct Assistant Professor, Urban Planning and Policy Program, University of Illinois at Chicago, Chicago, USA.

Studies in Nepali History and Society 13(1): 17-48 June 2008

TACKLING THE PROBLEMS OF QUALITY AND DISPARITY IN NEPAL'S SCHOOL EDUCATION: THE OLPC MODEL

Saurav Dev Bhatta

Introduction

The revolution of 1951 (2007 v.s.) marks a turning point in the history of education in Nepal. The collapse of the Rana regime ushered in new values not only in politics but also in the education sector. While education was considered an exclusive privilege of the ruling elites and access to education was deliberately restricted to them during the 104 year Rana period, the new political system did away with state restrictions on access. As a consequence, the number of primary schools in the country increased from just 321 in 1951 to over 7250 within two decades. And Nepal's Gross Enrollment Rate in primary education increased from under 1 percent in 1951 to an impressive 32 percent in 1970 (MoE 1971).

Lifting restrictions on access, however, is not the same as deliberately expanding access to education. The growth in the number of schools during this period was more a result of community effort than a result of large scale investments by the State. But things changed in 1971 with the introduction of the New Education System Plan. For the first time in the nation's history, the concept of mass education was embraced by the Nepali State. This is undoubtedly the most important turning point in the development of Nepal's education sector.

Since then, Nepal has made significant progress in expanding access to basic education. Government statistics show that the Net Enrollment Rate (NER) at the primary level increased from below 30 percent in 1971 to over 87 percent in 2006 (MoES 2006). Furthermore, the right to basic education has now become recognized as a fundamental human right in Nepal. The School Sector Reform Core Document (2007) of the Government of Nepal, for example, states that "Education is both a basic human right and a development tool" (MoES 2007, p. 18). It is thus clear that the importance of providing universal access to basic education has been well established in Nepal.

By declaring its commitment to the Education for All concept, the government of Nepal has given continuity to its commitment to expand education access to all Nepali children. Increasing the "quantity" of

Studies in Nepali History and Society 13(1): 00-00 June 2008

education, however, is but one step in creating an educated, open and just society. An equally important step is the enhancement of education quality. There is evidence that Nepali students consistently rank poorly in mathematics and science by international standards and have learning outcomes significantly below the targets specified by the national curriculum. Also indicative of poor learning outcomes is the 50 to 70 percent failure rates we routinely observe in the compulsory School Leaving Certificate exams (Bhatta 2004, 2005).

Coupled with the problem of overall poor education quality is the issue of increasing disparity in education quality across school types (public vs. private), locations (urban vs. rural, remote vs. accessible), and population groups (males vs. females, privileged ethnic groups vs. marginalized ethnic groups). In particular, students from public schools and from schools in remote areas are at a severe disadvantage compared to students from private schools. As a consequence, the aggregate performance of public schools in national board exams is distinctly below than that of private schools, and public schools are increasingly being viewed as inferior educational institutions attended only by the poorer segments of society. Considering that the public school system in the nation accounts for over 75% of the total student population, this disparity in education quality means that the education system is actually worsening the inequities across Nepal's different socio-economic population groups.

The above discussion shows that the major challenges facing Nepal's education today are the twin problems of poor quality of public education and disparity in education quality. It is also worth adding that although the nation has made impressive progress in increasing access to education, the level of access varies greatly across regions and population groups. According to the 2003 EFA National Plan of Action, for example, 1.6 million school-age children never attend school (MoES 2003). And 46% of students drop out before grade five. Most of these children are from remote locations and disadvantaged population groups. Thus while education access at the aggregate level is no longer a major issue, disparity in education access continues to be a serious problem.

Clearly, it is now time for policymakers and educators to shift policy focus from quantity to quality and equity. The government has typically tried to tackle both quality and quantity problems in education by sticking to traditional approaches to educational development—approaches such as improving physical infrastructure, increasing teacher-student ratios, and enhancing teaching skills. While such improvements continue to be

important, past experience has shown that they are far from adequate in the context of Nepal. It is, therefore, necessary to look beyond these input-centered approaches if we want to ensure equitable access to high quality education by all students.

One approach to breaking out of the traditional mode of working involves utilizing the power of modern information and communication technology (ICT) in delivering quality education. By integrating ICT-based teaching learning approaches in mainstream pedagogy, we can enable students, teachers and families in different geographic and economic locations to access the same high quality educational resources. In particular, proper use of computers and modern networking technology has the potential to effectively address the problems of both quality and disparity.

Four crucial changes taking place globally and nationally make this the right time for Nepal to leap into the world of ICT-based education. The first is the increasing integration of national economies in a global economy that is "high speed, knowledge driven, and competitive" (Haddad 2003a, p. 3). In order to build a human resource base that can compete in this dynamic global economy, students and teachers need ready access to the constantly and rapidly expanding global knowledge base, and they must be provided with opportunities for self-learning both in school and outside. Bringing ICT-based education into the public education sector is essential for achieving this purpose. The second is the progressive increase in quality and rapid decline in price of computers and other ICT hardware. In particular, multiple brands of low-cost, high-performance laptop computers targeted towards children in developing countries have entered the marketplace during the last two years. Thus ICT is becoming more and more affordable every day even for developing countries.

The third is the declining cost and continuing expansion of the internet, which is making it increasingly feasible for people in poorer countries to have access to up-to-date information from all over the world. And the fourth is the continuing expansion of a global community dedicated to contributing open-source software and open content digital materials for public use. The rapid pace of these changes means that a developing nation that fails to seize this window of opportunity to enter the world of ICT-based education might be left behind permanently in the global economy.

The primary objective of this commentary is to discuss the relevance of one particular ICT-based educational approach—the one laptop per

child (OLPC) approach—to Nepal and how it might be effectively implemented here. It begins by discussing the role of ICT-based education in enhancing student learning outcomes and reducing the disparities in the education sector. This discussion is followed by an overview of the different approaches to using the computer in the school setting. The remainder of the commentary focuses on the OLPC approach. It discusses the essential steps that must be taken to implement the OLPC model properly, explains what Nepal is doing in this area, and clarifies certain misconceptions associated with this concept. The issue of affordability is also briefly discussed. The last section presents some concluding remarks.

How ICT-based education can help improve education quality and reduce disparity

The determinants of student learning outcomes

Enhancing the quality of education means enhancing student learning. In order to understand how ICT-based education can enhance student learning, it is useful to begin with the model shown in Figure 1. Based on a research tradition known as school effectiveness research, this model shows how learning outcomes of students are related to various determinants of outcomes.[1] It says that school inputs, teacher inputs, student inputs, and family inputs along with the national, community, and school contexts act through the school process to determine student outcomes. The context can also have a direct impact on outcomes and various inputs, while inputs can themselves be altered as a result of feedback from the school process.

Within this framework, school context represents a variety of contextual variables including the school governance structure and socio-economic characteristics of the student body. The socio-economic characteristics of the local community are represented by the community context. And both school and community contexts are nested in the national context.

Student inputs represent not just the effort a student puts into the learning process but also her prior knowledge and other characteristics. The socio-economic characteristics of the student's family and their inputs into the student's academic life are included among the family inputs. School inputs refer primarily to school expenditure and physical

1 The model presented in Figure 1 draws from Scheerens (2004), Levacic and Vignoles (2002) and Ridker (1997).

plus human resources of the school, while teacher inputs represent the qualifications and characteristics of the teachers.

School processes are grouped into three categories: school-level processes which deal with the overall school environment and administrative structure, classroom/ teacher level processes which focus on instructional approaches and teaching quality, and student level processes reflecting the learning approach of the student. It is assumed that the school-level conditions can influence the conditions at the classroom/teacher level and student level (Scheerens 2004).

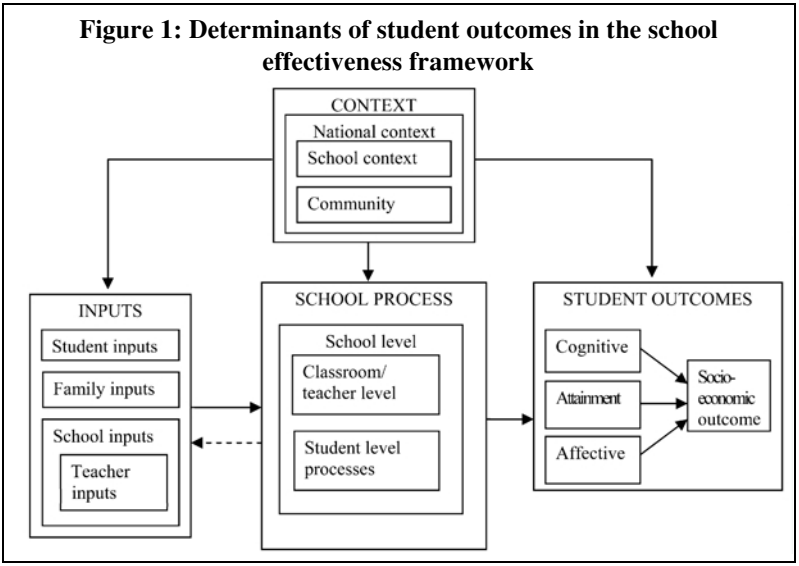
Four categories of student outcomes are identified in Figure 1. The first category—cognitive outcomes—refers to academic achievement and is typically measured using test scores. A related, though different, group of outcomes is attainment. The duration of school enrollment, the highest grade achieved, and academic qualifications are the important outcomes in this category.[2] Affective outcomes, on the other hand, refer to social skills, behaviors and attitudes towards learning. These three types of outcomes, which may be viewed as proximal outcomes, largely determine the status of the student in the world of work. Hence, Figure 1 shows arrows leading from the first three outcomes to the fourth outcome category, namely, socioeconomic outcomes. Work skills, employment status, and earnings are some of the indicators of socio-economic or post-school outcomes. This model assumes that the school process, which is affected by both inputs and context variables, has an impact on all four types of student outcomes.

As is clear from Figure 1, while inputs are important, they are not the only factors affecting the learning outcomes of students. Thus it is not surprising that traditional input-focused approaches to educational development are far from adequate in enhancing student outcomes. Within the context of public education in Nepal, the government has historically focused primarily on school and teacher input enhancement. In recent years, it has also made some effort to improve the school process. But these efforts have mainly concentrated on school-level processes such as school-level planning and the enhancement of the overall school environment. Teacher and classroom level processes have changed very little. Modern child-centered, interactive teaching approaches have yet to be established in mainstream pedagogy.

---

2 It might be pointed out that while academic achievement can be used an indicator of the quality of education, attainment is only an indicator of quantity.

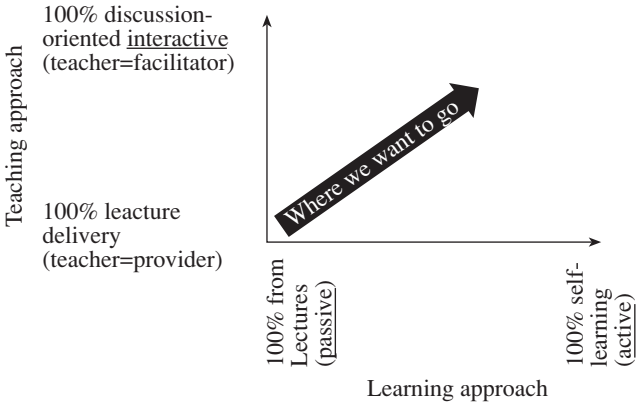
Figure 1: Determinants of student outcomes in the school effectiveness framework



Source: Bhatta (2005)

Effective use of ICT-based teaching-learning can potentially have a profound impact on the classroom/teacher-level processes and student-level processes. The role of the teacher in most Nepali public schools today is that of a provider. She is considered the fountain of knowledge and her job is to deliver this knowledge to her students through one-way lectures. At the same time, students in these schools are expected to learn from their teachers by passively absorbing the knowledge imparted upon them. While there is no doubt that the lecture-based approach to teaching has its merits, relying exclusively on this approach severely limits the effectiveness of the teacher. Interactions between the teacher and students and among students are essential for creating a conducive learning environment. Similarly, there is plenty of research evidence to show that student learning is faster and more effective when children have the opportunity to actively engage with the topic they are learning.

Figure 2: Learning-Teaching dimensions



Source: adapted from Haddad (2003b)

Figure 2 shows the spectrum of teaching-learning approaches in graphical format. Nepal's public school education is currently located near the bottom left corner of the graph—the teacher is a provider and the student learns by passively absorbing lectures. Positive changes in the classroom/teacher and student level processes should lead us in the direction shown by the arrow. The goal is not to eliminate the role of the teacher, but to change her role so that she is not just a provider of knowledge but also a facilitator in an environment where knowledge can be shared.

Role of ICT-based education in enhancing education quality

ICT-based teaching-learning approaches, by their very nature, facilitate movement in the direction shown by the arrow in Figure 2. But before discussing how this movement is facilitated, it is useful to clarify what is meant by ICT and ICT-based education in the context of this paper. The term ICT generally refers to a broad range of technologies including relatively old technologies such as radio and television and modern technologies such as palm pilots and dedicated messaging devices. Most of these technologies can and have been used for educational purposes in different parts of the world. However, in this paper, ICT refers mainly to computers and the internet. And ICT-based education refers to educational approaches that attempt to utilize the power of computers and the internet in delivering educational content.

Effective use of ICT in education means, among other things, creating adequate digital content for schooling purposes and integrating it in the regular teaching learning process. In particular, we can think of three types of digital content—a) interactive activities (or software modules) that the teachers and students can use in the classroom and at home, b) a digital library through which full-text documents and other educational resources can be accessed, and c) creative works from teachers and students themselves. For example, interactive exercises require students themselves to play with these software modules on their own or in collaboration with their peers to learn new concepts, do practice exercises, and self-evaluate their progress. Hence, once the teacher begins to integrate the interactive activities in her classroom teaching, she automatically begins to act as a facilitator as well as a provider of knowledge.

Similarly, a digital library that is accessible from the classroom itself can be used in the classroom and beyond to train students in the art of independent inquiry and research. Again, this leads to a change in the roles of both the teacher and students in the direction of the arrow shown in Figure 2. And enabling teachers and students to upload and share their creative works with others further encourages knowledge sharing, collaboration and independent learning. Effective use of ICT can also help the teaching-learning process by improving the efficiency of school administration in areas such as making school improvement plans and tracking student progress.

It needs to be emphasized that one key difference between traditional approaches to educational quality enhancement and the ICT-based approach is that the latter puts special emphasis on the student-level processes. By unleashing the potential for multisensorial learning through the use of multimedia, this approach is likely to increase the motivation of students and make school more attractive. Even more importantly, it drastically improves opportunities for interactive self-learning and independent inquiry. Thus a notable virtue of using the ICT-based teaching-learning approach is that it prepares individuals to “fish on their own” rather than simply “teach them to eat the fish someone else has caught for them”.

While it is clear that ICT-based education can have a positive impact on education quality by changing classroom/teacher and student-level processes, it can also improve quality by influencing some of the other factors depicted in Figure 1. In particular, effective use of ICT in

education can have a significant impact on both the quality and quantity of student inputs and teacher inputs.

For example, given the excessive work-loads of teachers, homework assignments are rare in most public schools. Furthermore, since the majority of parents do not have the academic background to guide their children in their schoolwork or understand the time input needed by the students to properly comprehend their lessons, it is difficult for most public school students to study on their own at home. If children have access to digital interactive materials and a digital library outside the classroom (and preferably from home), they will have more opportunities and motivation for self-study and independent inquiry. Thus both quality and quantity of student input can increase.

The ability to readily access and share ideas, teaching support materials, reference materials, and teacher training modules remotely can increase opportunities for professional development and enable the teachers to stay up to date with best teaching practices. Apart from an enhancement in teacher inputs through these opportunities, we can also expect improvements in class preparation since integrating ICT-based teaching in the regular classroom requires teachers to carefully plan their lessons and be more organized.

In the case of ICT-based education involving laptops, an increase in the quality of family inputs can also be expected. In particular, if members of the student's family can also access and utilize a digital library from home, a more conducive academic environment can emerge to support the student. This kind of change can also have a positive spillover effect on the overall community context.

Role of ICT-based education in reducing disparity

Given that each individual is different, it is natural to see differences in learning outcomes across students even in the same classroom and same socio-economic context. Hence although reducing inequality of learning outcomes is a desirable goal, it is relevant to clarify that reducing disparity in education refers to reducing the inequality of educational opportunity and not of educational outcomes per se. Increasing equality of educational opportunity means, among other things, reducing disparities in the various inputs shown in Figure 1. ICT-based education can help to do this in a number of ways.

Let us start with school inputs. Currently, educational resources provided by the school vary greatly across school types (private vs. public) and locations (urban vs. rural; remote vs. accessible). Not only are

there vast differences in physical infrastructure, but there are significant differences in access to educational materials as well. Very few public schools have library facilities, and few public school students and teachers have access to supplementary teaching-learning materials. Furthermore, even required textbooks are not delivered to many of these schools on time. Once the computer hardware and networking facilities are in place, it is possible to partially compensate for the poorer infrastructure and human resource limitations of disadvantaged schools by enabling students and teachers in these schools to access the same high quality, up-to-date educational content available to other school students without delays.

Another important category of school inputs is teacher inputs. Lack of adequate number of teachers is a serious problem in many public schools in Nepal. In addition, resource constraints force many public schools to hire teachers who do not have the educational background to teach certain subjects. ICT-based education has the potential to compensate for weak teachers by providing more opportunities for interactive self-learning for both students and teachers.

The expanded opportunities for interactive self-learning through ICT-based education can also have a significant positive impact on compensating for different levels of student inputs and family inputs. In particular, by allowing students to interactively learn at their own pace and at their own time, ICT-based education can help to level the playing field between students with different academic and family backgrounds. In cases where students can communicate amongst themselves via a computer network, children from even uneducated families can make up for limited family inputs through remote interactions with their peers. It should also be stressed that effective use of multimedia can enable students with different learning styles and abilities to have a more uniform understanding of the subject matter being taught.

Another interesting aspect of ICT-based education is that its use can change the context within which the school, teachers and students operate. Access to the internet opens a wide new world of information for everyone, thereby making them a part of the same global community. Hence, disparities in student outcomes resulting from differences in context variables can be reduced by making proper use of internet access.

Different models of computer usage in the school

When we think of ICT-based instruction, the first thing that comes to mind is the computer. It is the medium through which ICT-based

education is delivered to the learners. There are a number of different models for integrating computers in the education process. Here, I will briefly discuss only the three most popular models.

The traditional computer lab is the most common approach to providing students with access to the computer. The idea is to have a separate room with computers where teachers can hold special classes in specific subjects and where students can work on specific projects at fixed hours. As in most other countries, the computer lab in Nepal—where it exists—is almost exclusively used for practice sessions in computer science-related classes just like a science lab is used exclusively for doing science experiments.[3] And this is precisely the weakness of the computer lab model—it is not integrated into the normal teaching-learning environment. The student's relationship with the computer ends once she leaves the computer lab. It does not become a part of her normal box of tools for learning new concepts and exploring new ideas. The lab, in the student's mind, is a separate room designed to be used for very specific purposes only. In other words, the lab represents a relatively ineffective approach to utilizing the computer for educational purposes.[4]

A second model is the mobile computer lab consisting of a cart of laptops that can be wheeled into different classrooms as required. The advantage of this model is that the computers can be integrated into a regular class period without requiring the students to move to a specific laboratory room. For example, the teacher can spend one part of the class period doing regular paper-and-pencil exercises, another part of the period on hands-on activities, and yet another part on computer-based activities. This allows the teacher to use the computer as just another tool in the teaching-learning process. And there is no reason to restrict the use of the computer to computer-science classes. Another advantage of this approach is that the laptops in the cart can be split between different classrooms if necessary—something that is not possible with a computer lab. The main disadvantage of this model is that students continue to

3 There are only a handful of public schools in Nepal that have functional computer labs. The vast majority of public schools do not have any computers at all.

4 A variation of the traditional computer lab model is the library computer lab where a cluster of computers is located in the school library. While this model does allow students to utilize the computer for general education purposes, it is difficult to use this type of lab for regular instructional purposes.

associate the computer with the school and classroom rather than view it as an integral part of their broader learning environment.

The third model is the One Laptop per Child (OLPC) model currently making headline news in different parts of the developing world including Nepal. While this is a relatively new concept even for industrialized countries, it has now become a global movement.[5] The model departs from the previous two in its emphasis on making the laptop an integral part of the child's everyday environment. Hence this model requires each child to have a laptop which becomes a part of her normal box of tools for learning new concepts and exploring new ideas.

From a pedagogical perspective, the major strength of the OLPC model is that it allows the teachers to fully integrate ICT-based instruction in the regular classroom process and enables students to continue with their learning outside the classroom as well. Furthermore, by allowing students to take the laptops home with them, this model encourages the participation of all the family members in the teaching learning process. Thus, this is clearly the most effective model for fully harnessing the transforming power of ICT-based education discussed in Section 2. The rest of this commentary focuses on this model and discusses how the OLPC concept can be effectively implemented in Nepal.

A framework for implementing the OLPC model

All over the world, media coverage of the One Laptop per Child movement has tended to focus far more on the laptop itself and not enough on how it can be used to enhance the quality of education. The laptop, however, is but a tool that is only as useful as the education content it can deliver and the ability of the user to utilize the content. So distribution of this hardware to children will not in itself lead to any revolutionary changes in the teaching-learning process.

---

5 The OLPC movement is spearheaded by the One Laptop per Child organization founded in 2005 by MIT professor Nicholas Negroponte and his colleagues to "provide children around the world with new opportunities to explore, experiment and express themselves." In order to implement the OLPC concept, OLPC has developed what is popularly known as the hundred dollar laptop (although its current price tag is actually closer to $200). Though relatively inexpensive, this rugged laptop designed specifically for developing countries is technically quite sophisticated and comes with built in components for utilizing the power of multimedia and wireless communications. The technical name for this laptop is "the XO".

Major focus areas

If we want to make a significant impact on the education sector using the OLPC model, the distribution of laptops to children must be accompanied by careful planning and implementation in four key areas: (i) development of digital educational content, (ii) training of teachers to integrate ICT-based educational materials in the teaching-learning process, (iii) design and installation of supporting network and power infrastructure, and (iv) development of the government's capacity in the above three areas. The last area is particularly important not only because basic education is the responsibility of the state, but also because large-scale implementation of any ICT-based educational approach can only be done by the state.

(i) Development of digital content

Content is the backbone of ICT-based education. Providing laptops to children without developing the content that can be delivered through these machines virtually rules out the possibility of their being regularly used in the classroom process.

Three types of digital content were discussed in Section 2—interactive learning activities (software modules), electronic library, and creative works of students and teachers. The development of interactive activities in particular is not only very resource intensive, but it also requires a thorough understanding of education theory and practice. It must be emphasized that if these interactive activities are to be integrated in the regular classroom process, they must correspond to the learning objectives specified in the curriculum followed by the school. In other words, the development of interactive content must be driven by the curriculum needs. And within the context of the learning objectives specified in the curriculum, these activities should be designed to fully exploit the power of multimedia by integrating text, images, audio, and animation whenever possible. The multi-sensory stimulation provided by such activities will make the learning process both fun and effective.

The electronic library is basically a digital repository for full-text documents, images, videos, audio clips, and software relevant to the teaching-learning process. As such, it should include not just course-related materials (e.g., course books) but also other educational materials such as literature, reference books, teaching aids, newspapers, and magazines. In order to maximize the use of the electronic library, users should be able to browse through the major library sections as well as search for individual items they can specify in detail. The first major task

in the development of an electronic library is the development of a library management system (i.e. library software engine) with a suitable user interface and features for browsing and searching. Once the library engine has been developed, adding digital content to the library should be viewed as an ongoing process. Note that the electronic library can also be fully integrated in the regular classroom process by encouraging the teachers to assign readings (e.g., from the children's literature section) and mini-research projects that require students to explore the library. These activities can have a profound impact on not only reading habits but also on the ability of students to engage in independent inquiry and research.

Creative works by teachers and students can include not just writings and works of art, but also computer programs[6] written by them. The development of this type of digital content requires a system that allows users to upload their creations and share it with others. While this type of digital content might not be available in the initial period of any OLPC project, its importance will increase over time as learning through peer interaction and sharing of ideas become more common.

In order to have maximum impact on the education sector, the digital content discussed above must be accessible free of cost and readily modifiable by the users. This means that the interactive software modules and library software must be open source rather than proprietary, and the materials in the electronic library must be governed by open content licensing agreements. Unlike proprietary software, open source software can be used and modified free of cost without the permission of the original author. Adherence to open source software will not only make digital content development cost-effective but will also make it easy to quickly update or modify interactive content according to the changing requirements of the curriculum. Open content copyright licenses allow materials in the electronic library to be feely copied, distributed and displayed.[7] This will maximize the use of the content in the library.

---

6 Theories of "constructionism" advanced by MIT Media Lab Professor Samuel Papert and others suggest that children can actually "learn learning" or "think about thinking" in the process of developing certain types of computer programs. Proponents of constructionism, including the designers of the OLPC laptop, argue that one of the best ways to unlock the creating and problem-solving potential of children is by allowing them independently play with the computer.

7 See, for example, the family of Creative Commons 3.0 copyright licenses (http://creativecommons.org/licenses/by-nc-nd/3.0/).

Any discussion on the development of digital content would be incomplete without talking about the importance of localization. The term localization in the context of software development refers to using, to the extent possible, language, text, images, and context that relate to the user. In the case of Nepal, localizing the digital content would, at a minimum, require the electronic library interface to be in Nepali. Similarly, interactive learning activities for the various subjects other than English should be developed in Nepali. Localization in this manner will allow the children to better understand and utilize the available digital content. If the digital content is based on open source software, localization of the interactive learning materials and library interface can be expanded to other national languages of Nepal over time.

(ii) Teacher preparation

Apart from the students themselves, teachers and the school leadership are the main agents of change at the school level. Hence, one of the most important steps in implementing any ICT-based educational approach is teacher preparation. Unless the teachers are fully comfortable with this new approach to teaching, providing students with computers and educational content alone will have limited impact on the teaching learning process. It is also essential to reassure the teachers that ICT-based education only changes their role, rather than minimizing or eliminating their role altogether. Furthermore, since teachers are highly respected members of the local community, their enthusiastic participation in the endeavor is crucial for generating community support for this new education approach.

The goal of teacher preparation should be to empower teachers to integrate ICT-based educational materials in the teaching-learning process so that they can independently design and implement lesson plans incorporating ICT-based materials. Effective teacher preparation in ICT-based education requires adequate training in three areas:

1) Information technology (IT) literacy
2) Child-centric interactive teaching
3) Integration of ICT-based instruction in child-centric interactive teaching.

Among these three areas, making the teachers IT literate is the most straightforward task. The biggest challenge lies in the third area. While teacher preparation for successful implementation of any OLPC type

project should cover all three areas, it must be emphasized that integration of ICT-based instruction in child-centric interactive teaching should be the focus of the training. The focus of the IT literacy training should be on helping the teachers to overcome their fear of the computer and in making them familiar with the use of digital materials. But it must, at the same time, constantly encourage the teachers to reflect on how they can utilize the available digital content while teaching their respective subjects.

ICT-based learning puts children at the center of the classroom process by expanding their opportunities for self-learning. Furthermore, interactive teaching is essential for effective ICT-based instruction. Hence, preparing teachers to integrate ICT-based instruction in the classroom process requires them to have some basic understanding of the theories and techniques related to child-centric interactive education.[8] In addition, it is also necessary to provide teachers with practice in techniques specifically relevant to a classroom where each student has a laptop. This can include topics such as different models of classroom arrangement for maximizing laptop protection and class interactions, techniques for managing the class (e.g., how to get the students to pay attention to the teachers when she is giving instructions), appropriate classroom rules and job lists, and pre and post non-computer activities that can be used to integrate the computer-based activities more effectively. Lesson planning exercises, model lesson demonstrations, and practice teaching sessions that integrate ICT-based activities are other essential components of the training.

Implementing a new teaching-learning concept like the OLPC approach in a school requires the enthusiastic support of the teachers, school administrators, and the local community. Hence, it is useful to include all the teachers, the school leadership, and representatives of the school management committee in the training.

(iii) Network and power infrastructure development

While computers are essential tools for delivering ICT-based education, the full power of ICT in education can only be realized when these tools are connected to a wider network that allows users to access information from across the globe and share their knowledge with others. We can view an OLPC project as consisting of four levels of networks.

8 Examples of relevant theories include Piaget's theory of cognitive development, Vigotsky's theory of scaffolding, and Papert's concept of constructionism.

At the most basic level, the computers are connected to each other through a wireless mesh network that enables each computer to directly talk to other computers within a finite radius. This is a powerful feature for facilitating the sharing of knowledge and information among a school's students and teachers. The next level of networking is between the computers used by students from a particular school and a dedicated server situated in the school. The school server can serve the dual purpose of storing certain categories of digital content (e.g., student creations) as well as facilitating wireless communication among the computers.

The third level of interconnection is between each school server and a central server (or its mirror) that includes, among other things, the electronic library. By regularly updating the content in the central server, it is possible to provide the same, up to date, digital learning materials to all the students and teachers at the same time. And finally, at the highest level, the computers in the project can be connected to the internet through the central server. This connection will enable educators and learners to communicate and exchange knowledge with the rest of the world. The last two networks can be constructed using a combination of land lines and wireless technology. This commentary is not the appropriate place for discussing technical details involved in installing these networks. But it is worth mentioning that although networking technologies for these four levels are not new, application of these technologies to rural settings in Nepal poses many practical challenges.

Note that the first three levels of networking represent a national network (an "intranet") that does not require a connection to the internet. Hence it will be possible for users to access the electronic library and other digital content in the central server without paying for internet connection charges which are, so far, quite high in Nepal. However, the continuing decline in the cost of internet service both globally and in Nepal suggests that access to the internet will become affordable in the near future.

It is useful to discuss the issue of power alongside issues related networking. Without reliable power for charging the laptop batteries, the local mesh network will not be fully functional (of course, power availability at this level is fundamental to using ICT in the classroom even if we are not concerned about networking per se). In addition, an uninterrupted power supply is required to maintain the school server and the central server. Although the OLPC laptop in particular consumes very little power (around 2 Watts), it does nevertheless require electricity input for charging the laptop batteries at least once a day.

Given the reality of regular power cuts and high poverty levels in Nepal, it is useful to have laptop battery charging facilities for students and teachers both at school and at home. At school, for example, one option is to have charging racks that can charge a large number of batteries at the same time. Using these charging stations, it is possible to ensure that all students have properly charged batteries in their laptops during class time.

In the case of Nepal, many rural areas are not connected to any electricity grid, which means that charging batteries in these areas requires alternative sources of power. A number of alternative power sources have been discussed in the media during the past two years—from hand cranks that feed power to the laptop batteries to larger human powered chargers. However, many of these options are still in an exploratory stage. Perhaps the most promising alternative power source is solar power. OLPC has recently been experimenting with small stand-alone solar panels for charging individual laptops. But they have yet to be field tested on a large scale in different climatic conditions.

Implementation steps

This commentary takes the view that basic education is the responsibility of the State and that the goal of any OLPC project should be to make substantial improvements in the public education sector. Furthermore, it is important to keep in mind that only the State has the necessary resources and administrative infrastructure to undertake large-scale implementation of any ICT-based educational approach. Hence, it is essential for the government to be involved in the endeavor from the very beginning.

Since the OLPC concept is relatively new, there is very limited knowledge in the world about the practical challenges involved in implementing it in different settings. Furthermore, any large scale implementation of this concept will require substantial resources. A country or region that wants to implement OLPC should, therefore, start with a small-scale test before jumping into large-scale implementation.

The purpose of the test phase is to gain experience in implementing the project in an environment where it is possible to carefully monitor the progress and learn about the practical problems associated with all areas of the project. Given this objective, it is useful to select a test school that not only represents, to some extent, the socio-economic realities faced by poor public schools, but is also easily accessible to the project staff so that they can closely and regularly observe the progress and quickly try out different solutions to problems encountered on the way. Furthermore, it is

also useful to select test schools whose leadership and teachers are motivated to enthusiastically participate in the test.

After refining the project implementation approach based on lessons learned from the test phase, it is useful to implement the concept in a small number of pilot schools representing different geographical and socio-economic conditions of the country.[9] Like the test phase, the pilot phase too is useful for gaining experience in project implementation—in fact, it allows the implementers to better understand implementation challenges (including in the area of logistics) in different settings. But the more important goal of the pilot is to evaluate the relevance of the project concept itself under the assumption that the pilot has been implemented as planned.

It is important to point out that project evaluation should be an integral component of both the test phase and pilot phase and should be done periodically during the lifetime of the entire project. But the focus of the evaluation should be different at different stages of the project. During the test phase, the primary goal of evaluation should be to identify and solve problems associated with project implementation so as to minimize the chances of implementation failure when the project is expanded to more schools in the pilot phase.[10] Thus the evaluation should focus on questions related to fine tuning implementation in the following areas: teacher training; content delivery in the classroom; laptop maintenance at home; networking, power, and all hardware maintenance. The pilot phase, however, should also include an evaluation of the effectiveness of OLPC concept in terms of enhancing the learning outcomes of the students in the short run.[11]

---

9 The selection of schools for the test and pilot phases is as much a political process as it is a technical process. It is natural for politicians, bureaucrats, and local stakeholders to press for including schools in their localities in the pilot. The challenge, therefore, is to balance the technical merits of the selection process with the political pressures from different stakeholders.

10 This type of evaluation is known as formative evaluation.

11 The standard approach to doing a rigorous impact evaluation involves comparing student outcomes in the pilot schools with the outcomes in a set of control or comparison schools chosen using an experimental research design. The statistical methods used to compare the outcomes in the two sets of schools are fairly complex, especially when it is not possible to do a true randomized experiment (i.e., it is not possible to randomly assign schools to the pilot and control groups).

The test and pilot phases are also important from the perspective of building the government's capacity to implement ICT-related projects in education. Given the limited experience and skills in ICT within most ministries of education in developing countries, the test and pilot phases might involve non-governmental partners with the requisite skills and resources. However, in the medium to long run, it is essential for the government itself to take a leadership role in all aspects of the project—from digital content design to teacher development to installation of the power and network infrastructure in schools.

Lessons learned from the pilot phase can be used to gain a better understanding of the benefits and costs of the OLPC concept, at least in the short run. Although the long run benefits cannot be estimated on the basis of the pilot, the accumulated knowledge will be very valuable for policymakers in deciding whether or not it is worthwhile to expand the project across the whole country. It must be emphasized that nationwide implementation of the OLPC concept cannot be done by the education ministry alone. Given the magnitude of the undertaking and the diverse expertise required, the whole nation needs to be mobilized. Without a firm commitment from and active participation of the nation's leadership, the project cannot proceed beyond the pilot phase. At a minimum, the ministry of finance must be fully supportive of the project along with the ministry of education. And this type of support will not be forthcoming unless convincing evidence of the viability of the OLPC concept can be presented to the public through a successful pilot.

The biggest challenge in moving from the pilot phase to full implementation is the issue of scaling. If a nation makes a commitment to implement the project across the nation, the expansion should take place in a phase wise manner so that problems related to scaling the pilot can be resolved in a systematic way. In the case of Nepal, for example, it might be practical to proceed by first saturating the project in the pilot districts rather than spreading the project thinly across the entire nation. Also, it might be relevant for the project to first expand to areas where the government is planning to provide internet access.

Experience in implementing the OLPC model

Let us now proceed to an important question that might have come to the reader's mind: how has the OLPC model been implemented in practice and how well has it worked in places where it has been implemented? The answer to this question must be prefaced by the following factual statement: there is very little experience in developing countries in

implementing this model in a systematic manner. And there is not much experience in large-scale implementation of the concept in industrialized countries either.

Within the context of industrialized countries, the United States has the most experience in using laptops in schools. State or local government supported laptop programs have been tested in a number of states including South Carolina, New York, Michigan, New Hampshire, New Mexico, Texas, Vermont and Maine (Gulek and Demirtas 2005; Zucker 2005). In Europe, over 2500 schools have some forms of laptop programs. It should, however, be noted that not all such programs are using the one laptop per child approach. Furthermore, rigorous evaluations of the impact of these programs on student learning have yet to be performed.

The state of Maine (USA) is one of the few places in the world where the OLPC model has been implemented over an extended period of time. In 2002, Maine launched a large scale OLPC project (they call it the "one-to-one laptop program") where the government distributed 42,000 Apple laptops to all the 7th graders in the state. The program continues to this day and now includes 8th grade students as well. According to a recent evaluation of the program, the impact of the laptop program on student learning as reflected in standardized tests is unclear (Silvernail 2007). Nevertheless, a significant percentage of teachers in the program agree that the use of laptops has helped students to better comprehend the subject matter taught in school.

It must be pointed out, however, that students in the Maine laptop program use laptops in the classroom mainly for writing and independent inquiry. During a visit to one of the successful schools in the program last December, my colleagues and I observed that during class, the laptops was used primarily for accessing online resources, doing independent internet-based research on specific topics, and writing reports. The teachers were not using the laptops to integrate curriculum based interactive digital educational activities in the regular instruction process. This is not different from the approach taken in other laptop programs in industrialized countries.[12]

The development of the "100 dollar laptop" by the OLPC organization during the past year has, for the first time, raised the possibility that the OLPC model might be a viable approach to improving the quality of

12 See, for example, Gulek and Demirtas (2005) for a description of how laptops are used in Harvest Park Middle School in California.

education in developing countries as well. As a result, a number of developing countries have recently begun to experiment with the OLPC concept. In some of these countries, the government is taking a lead in implementing the project. In others, the initiative is being taken by non-governmental organizations working jointly with government bodies, or by non-governmental organizations alone.[13] Developing countries whose OLPC initiatives have recently been in the news include Uruguay, Peru, Mexico, Haiti, Rwanda, Ethiopia, Mongolia, Cambodia, Thailand, Pakistan, Afghanistan, India, Sri Lanka and Nepal.

None of the OLPC projects in the above countries have been in operation long enough to provide a sound evaluation of the OLPC concept and its impacts on learning outcomes. Publicly available documentation on these projects is also quite limited at this point in time. More importantly, most of these OLPC projects have focused primarily on distributing laptops to students without paying adequate attention to the focus areas emphasized in Section 5. In particular, systematic development of curriculum-based digital content, and the training of teachers to integrate this content in the regular classroom process appear to be missing in these projects. In other words, they do not seem to be utilizing the full potential of the OLPC concept.

Furthermore, some of these countries have made a decision to directly jump into large scale distribution of laptops without first going through the test and pilot phases in a systematic manner. Uruguay, for example, recently purchased 100,000 OLPC machines for the purpose of distributing them to school children aged six to twelve (BBC 10/29/2007). Similarly, according to Negroponte, Peru has also recently signed a contract to purchase 260,000 OLPC laptops and a Mexican billionaire has purchased 50,000 machines for distribution in Mexico (Globe 12/1/2007). In the absence of knowledge that would have been gained from a systematic pilot, it is not clear how effectively they will be able to implement the OLPC concept.

Among the various countries currently implementing the OLPC concept, Nepal is an exception in that it is the only country where laptop distribution is being accompanied by digital content development, teacher preparation, network and power infrastructure development, and government capacity development in a systematic manner. And Nepal's is

13 As mentioned earlier, this commentary takes the position that the government must be involved in the OLPC project from the beginning if the goal is to influence education policy itself.

the only OLPC project where interactive digital content based on the national curriculum has been developed and where the teachers have been trained to integrate the laptop in the regular classroom instruction process.

The OLPC project in Nepal is being implemented jointly by the Department of Education (DoE) at the Ministry of Education and Sports and Sajha Sikchya Epaati (Open Learning Exchange Nepal)—a Nepali non-governmental organization. The Department of Education has selected two schools in Lalitpur district—Bishwamitra Ganesh Lower Secondary School and Bashuki Lower Secondary School—for the test phase. Laptops were distributed to all the students in grades 2 and 6 in these two schools at the beginning of the Nepali academic year in late April 2008. There are a total of 135 students in these two grades.[14]

During this test phase, the project is focusing on the two subjects Nepali students find most difficult—English and Mathematics. Just prior to distributing the laptops to the students, Sajha Sikchya Epaati conducted a seven-day intensive teacher training program for all the teachers in the two schools focusing on how ICT-based instruction can be integrated in child-centric interactive teaching. Before conducting the training, however, Sajha Sikchya Epaati developed a set of curriculum-based, open-source, platform-independent interactive learning materials for math and English in grades 2 and 6. Similarly, they also built an open access basic digital library that can be accessed wirelessly by the students in the two schools using a network installed specifically for the project. Thus the teachers in the test schools were well prepared to use the laptops for instructional purposes by the time the students had access to the machines.

While it is too early to tell whether the OLPC implementation in Nepal will continue to proceed satisfactorily, the systematic approach taken by Sajha Sikchya Epaati has proved to be quite effective so far.[15] Preliminary findings from a formative evaluation of Sajha Sikchya Epaati

14 Apart from these two schools, DoE has also selected a test school in Kavre district. A collaborative effort between DoE and an organization called OLPC Nepal, this test implementation has focused simply on distributing laptops to students. Around 15 laptops have been distributed to grade four students in this school. But the project implementers have neither developed any curriculum-based digital content nor conducted a training to help teachers integrate the laptop in their instruction process. A sound networking and power infrastructure has not been built either.

15 See www.olenepal.org for details. In particular, the blog posts on this website give regular updates on the work being done at the two test schools.

‘s OLPC implementation in the current test phase suggests that the project’s intensive teacher training program has enabled the teachers in both schools to properly integrate the laptops and available digital content in the daily instruction process (Sharma 2008). All the teachers in these schools have strongly recommended that digital content must be closely tied to the national curriculum if ICT-based instruction is to be used regularly in the classroom. This recommendation is fully consistent with the project’s approach to digital content development. The evaluation findings also reveal that the use of laptops in class and at home has made academics much more enjoyable for the students. There is evidence that the use of the curriculum-based digital content in class has raised the interest level of the students and made it easier for them to learn new concepts. This is also partly reflected in reduced absenteeism among the students in both schools.

Using the knowledge base developed in this test phase, Sajha Sikchya Epaati and DoE plan to implement a pilot project in around six to twelve schools during the next academic year (April 2009 to April 2010). This will allow the government to evaluate the OLPC concept and make a decision regarding whether to expand the project to the rest of the country.

Misconceptions and concerns

As mentioned earlier, the OLPC model and the OLPC movement have received a lot of media attention during the past two years. However, because of the novelty of the concept, and the limited global experience in implementing it, criticisms about this model are often based on an inaccurate understanding of what it is.

Perhaps the biggest misconception related to the OLPC model is that it is simply a laptop distribution program that assumes handing these machines to children will automatically cause a revolutionary change in the education sector. There are indeed some OLPC enthusiasts who focus primarily on laptop distribution. But as should be clear from the discussion in sections 4 and 3, this is a very narrow understanding of the OLPC concept. In fact, this commentary has described a comprehensive OLPC model where educational objectives drive the teaching-learning process and where laptop distribution is but one component of an integrated OLPC framework consisting of digital content development, teacher preparation, networking and power infrastructure development, and state capacity development.

Another misconception, at least in the case of developing countries, is that the laptops developed by the OLPC organization and the OLPC concept are one and the same. Many people fail to make the distinction between the computer hardware and the OLPC concept which uses the hardware. While it is true that the OLPC "hundred dollar laptops" are currently the most suitable machines for developing countries, the OLPC concept itself can be implemented using other laptops as well. It is reasonable to expect other competitively priced inexpensive and powerful laptops to enter the market in the coming years. And implementers can choose to utilize the machines they find best for their purposes.

The third major misconception is that the OLPC model eliminates the role of the teacher and also replaces traditional paper-pencil based learning by computer-based learning. The discussion in Section 2 clearly explains that ICT-based education only changes the role of the teacher; rather than simply being a provider of knowledge, the teacher now increasingly serves as a facilitator in the learning process. Neither does it replace traditional paper-pencil based teaching approaches by computer-based learning. Rather, the goal is to integrate ICT-based education in the regular instruction process so that the computer becomes one of the many available tools to achieve the learning objectives in a class. In conducting a typical lesson, for example, the teacher might use the blackboard/whiteboard, do demonstrations using physical manipulatives, ask students to do paper-pencils exercises, and also ask them to do some interactive exercises on the laptop. The combination of approaches and tools used depends on the learning objectives of the class.

As the OLPC model has yet to be properly tested in the context of developing countries, it is natural for stakeholders to be concerned about the feasibility of implementing this on a large scale. The major concerns regarding the feasibility of the OLPC model can be grouped into four areas: a) technical, b) managerial/logistical, c) educational and d) financial. Here, I will only briefly discuss the first two areas of concern and focus primarily on the educational and financial concerns.

Technical concerns range from questions about laptops durability to concerns regarding the availability of basic networking and power infrastructure in the harsh conditions of developing countries. In particular, many critics point out that it will be very difficult to implement an efficient system for laptops and networking infrastructure maintenance once the project expands to cover all the school children in a country. At the same time, there are also major managerial/logistical challenges that will need to be tackled when the OLPC project is scaled up to cover the

whole country. For example, at the central level, the process of laptop purchase and distribution alone can potentially overwhelm the government bureaucracy. Similarly, at the local level, addressing issues related to the protection of the laptops (e.g., from theft and destruction) is an equally daunting task. How these and other technical and managerial concerns can be addressed will become clearer once a number of countries have gone through their test and/or pilot phases.

On the educational front, the biggest concern people have is that rigorous analyses of the impact of ICT on learning outcomes are hard to find, especially in the case of developing countries (Banerjee et al. 2004). The limited evidence from developed countries gives mixed signals. Krueger and Rouse (2004) do not find any significant impact of computerized reading instruction on learning outcomes. Fuchs and Wößmann (2005) report a positive relationship between computer use for education at home and student achievement. A study of Israeli students by Angrist and Lavy (2002), on the other hand, suggests that computer aided instruction in schools has a negative impact on math achievement. Rigorous evidence from developing countries is almost non-existent. An evaluation of a computer assisted learning program in India done by Banerjee et al. (2004) is one of the few analyses of the impact of ICT on learning in developing countries. Although the findings of this study show a positive impact of computer assisted learning on math scores, this result cannot necessarily be generalized to other contexts.

Given this scenario, it is not surprising that people are skeptical about the educational value of the OLPC concept. It should, however, be kept in mind that even in developed countries, the evidence on the impact of laptops is more encouraging than the evidence on the impact of ICT in general. For example, a longitudinal study of middle school students by Gulek and Demirtas (2005) indicates that laptop use has a significant positive impact on student learning as evidenced by higher grade point averages and higher scores in standardized test scores. Another point to note is that there are no existing studies that examine the impact of the OLPC approach on student learning in developing countries. As discussed in Section 2, the potential of ICT-based education to positively impact student outcome and reduce disparity in education is especially pronounced in the case of developing countries like Nepal. Hence, at this point, it is reasonable to give the benefit of doubt to theoretical arguments highlighting the beneficial impacts of the OLPC concept in developing countries.

By far, the biggest concern people have about the OLPC concept is the potential cost of the program. Can a poor country like Nepal afford to equip all students with laptops when many students can't even afford notebooks and schoolbags? Considering that even the richest countries in the world have not attempted to give a laptop to each child, does it make sense for Nepal to consider implementing the OLPC concept? These are among the key questions that come up when the OLPC concept is introduced to a new audience (see, for example, Gurung et al. 2007).

In answering these questions, it is first important to stress that putting money in basic education is an investment rather than simply an expense. As a matter of fact, it is one of the few investments that is guaranteed to yield a high return over time. Parajuli (1999) has estimated that the social rate of return to each additional year of primary schooling in Nepal is an impressive 15.7%. Hence, while it is always difficult for poor nations like Nepal to decide how to allocate their resources in the face of scarcity and competing development projects, investment in education should rank high on the list of national priorities. And given the potential of the OLPC project to drastically improve education quality, it might be a worthwhile investment within the education sector from the perspective of generating high economic returns.

It is also relevant to point out that before discussing the affordability of any public project, it is first necessary to determine whether the project's benefits are greater than its costs.[16] If the project's benefits are expected to outweigh the costs, then it is worthwhile for the nation to finance the project. And there are different sources of funding that can be tapped to make the necessary investments in that project. A good example is the introduction of the New Education System Plan in 1971, which committed the state to providing basic education to the masses for the first time. Needless to say, the implementation of NESP resulted in a huge increase in the total budget allocated to the education sector. However, once the policymakers had decided that the benefits of mass education outweighed the costs involved, the government was able to secure the necessary funding for the plan even though resource scarcity was as much a reality then as it is now.

Similarly, in the case of the OLPC project, the question is not whether Nepal can afford it; rather, the question is whether the extra expenditure associated with the project can be justified by the benefits of the project.

16 Here benefits and costs do not necessarily refer only to monetary benefits and costs. These terms should be interpreted in broad terms.

Without a doubt, the project will entail a huge increase in total cost over and above the cost involved in addressing other immediate problems such as the perennial shortage of classrooms and teachers. However, if it will result in significant improvements in the quality of public education and substantial reduction in the inequities in the education sector, then the jump in cost can be justified.

So will the benefits of the OLPC project in Nepal outweigh the costs? In order to answer this question, it is necessary to first test the OLPC concept in a number of pilot schools. The pilot will not only allow us to evaluate the impacts of the OLPC concept on student learning, but it will also give a clear picture of the total investment required to expand the project across the nation. If the evaluation of the pilot indicates that the project is worth expanding, then the government should proceed to secure the necessary funding for the project through different schemes.

Financing the OLPC project during the nationwide expansion phase might at first glance look like an impossible task. For example, in a critique of the OLPC model, Hall (2007) estimates that providing OLPC laptops to each of the 6 million schoolchildren in Nepal would cost over $1 billion at current prices.[17] This is around three times larger than the annual budget allocated to the entire education sector in Nepal!

This type of approach to computing the cost of the OLPC project, however, is problematic in a number of ways. First of all, it assumes that laptops will be distributed to the entire school-age population while the OLPC project actually focuses on students at the primary level. Second, it implies that laptops will be distributed to the entire school population at once. In other words, it fails to take into account the fact that nationwide expansion of the project will necessarily have to take place in a phase wise manner. This means that only a fraction of the total schoolchildren will receive laptops each year. Furthermore, since each laptop has a lifetime of approximately 5 years, at most only one fifth of the schoolchildren will need new laptops each year. Third, this estimation approach does not account for the continuing decline in the price of computers in the global market. And fourth, it assumes that the nation would not invest in any computer hardware in the absence of the OLPC project—it looks at the absolute cost of the laptops rather than at the difference in cost between alternative investments in computers and investment in the OLPC project. If all these shortcomings are addressed, then the yearly expenditure attributable to the OLPC project will be

17 This estimate assumes that each laptop will cost around $170.

substantially smaller than the $1 billion estimated by Hall (2007). Computing the actual figures, however, is a complex task since the total cost of the project must also include some of the costs associated with networking and power infrastructure development, teacher training, and government capacity development.

Conclusions

Nepal is currently in the process of consolidating its gains from the peaceful revolution of April 2006. The Maoists have entered mainstream politics, the constituent assembly elections have been held, and the country has shed its old identity as a kingdom and become a republic. Thus, Nepal is at a point in history where radical changes are being embraced and celebrated by the people at large.

But changes in the political sphere alone will not be adequate for meeting the expectations of the masses. These changes must be accompanied by radical improvements in other sectors as well, including education. This commentary has argued that the most pressing problems in the education sector today are the twin problems of poor education quality and disparity in education quality. It has also argued that tackling these problems requires policymakers to think outside the box and that the OLPC model has the potential to bring about the radical changes people want to see in the education sector.

This commentary has attempted to dispel some of the main misconceptions about the OLPC concept and discussed how the OLPC model can be systematically and effectively implemented in Nepal. It has suggested that Nepal is already ahead of most other countries in developing and testing a viable approach for implementing the OLPC concept. And that the test so far has yielded encouraging results.

It is not yet clear whether the OLPC project will yield enough benefits to justify the expected increase in education expenditure associated with the project. This issue can only be resolved through a careful evaluation of a comprehensive OLPC pilot project. But when computing the project benefits and costs in this evaluation, it is important to keep in mind that given the rapidly declining cost of computer hardware, most urban private school students in Nepal will almost definitely have access to inexpensive laptops within five years. Hence, in the absence of a concerted effort on the part of the state to provide ICT-based education to public school students, the gulf between public and private school students will grow even more rapidly. This would definitely not help in creating a more just and inclusive “new Nepal”.

Acknowledgments
The framework for implementing the OLPC model presented in this commentary is an outcome of extensive discussions between the author, Rabi Karmacharya, and Bryan Berry. The author would also like to thank Lazima Onta-Bhatta and Pratyoush Onta and an anonymous reviewer for their comments on earlier versions of the draft.

References

Angrist, J. and Lavy, V. 2002. New evidence on classroom computers and pupil learning. *Economic Journal* 112: 735-765.

Banerjee, A. V., Cole, S., Duflo, E. and Linden, L. 2005. Remedying education: evidence from two randomized experiments in India. Mimeograph, MIT.

BBC (10/29/2007). Uruguay buys first '$100 laptops. *The British Broadcasting Station*.

Bhatta, S. D. 2004. Disparities in school performance in the SLC exams: an exploratory analysis. *Studies in Nepali History and Society* 9(2): 293-343.

Bhatta S. D. 2005. Determinants of student performance in the SLC exams: evidence from survey data. *SLC Study Report* #11. Kathmandu: Education Sector Advisory Team, DANIDA.

Fuchs, T. and Wößmann, L. 2005. Computers and student learning: bivariate and multivariate evidence on the availability and use of computers at home and at school. *Ifo Working Paper No. 8*, Ifo Institute of Economic Research, University of Munich.

Globe 12/1/2007. One Laptop Per Child orders surge. *The Boston Globe*.

Gulek, J. C. & Demirtas, H. 2005. Learning with technology: the impact of laptop use on student achievement. *Journal of Technology, Learning, and Assessment* 3(2).

Gurung, A., Hall, P. and Sharma, K. 2007. Ketāketīlāi laptop cāhindaina. Kantipur, July 28, p. 6.

Haddad, W. D. 2003a. ICTs for education: a reference handbook (Part I: Decisionmakers essentials). Washington D. C.: World Bank, The Information for Development Program (infoDev.org), The World Bank.

Haddad, W. D. 2003b. ICTs for education: a reference handbook (Part II: Analytical review). Washington D. C.: World Bank, The Information for Development Program (infoDev.org), The World Bank.

Hall, P. 2007. Computers in schools - what should be done? The pros and cons of "one laptop per child". Mimeograph.

Krueger, A., and Rouse, C. 2004. Putting computerized instruction to the test: a randomized evaluation of a scientifically-based reading program. *Economics of Education Review* XXIII: 323-38.

Levacic, R, and Vignoles, A. 2002. Researching the links between school resources and student outcomes in the UK: a review of issues and evidence. *Education Economics* 10(3): 313-331.

MoE. 1971. *National Education System Plan.* Kathmandu: Ministry of Education, His Majesty's Government of Nepal.

MoES. 2003. *Education for All national plan of action.* Kathmandu: Ministry of Education and Sports, His Majesty's Government of Nepal.

MoES. 2006. *Flash I 2006/2007 report.* Kathmandu: Ministry of Education and Sports, His Majesty's Government of Nepal.

MoES. 2007. *School sector reform core document: policies and strategies.* Kathmandu: Ministry of Education and Sports, Government of Nepal.

Parajuli, D. 1999. External efficiency and equity in Nepalese education. (mimeograph, The World Bank)

Ridker, R. G. 1997. Determinants of educational achievement and attainment in Africa: findings from nine case studies. *Sustainable Development Publication Series Technical Paper No. 62.* USAID Office of Sustainable Development, Bureau for Africa.

Scheerens, P. 2004. Review of school and instructional effectiveness research: contribution to Chapter 3 of the 2004 EFA Global Monitoring Report. Mimeograph.

Sharma, U. 2008. Preliminary findings from the formative evaluation of the OLPC project in Nepal. Mimeograph.

Silvernail, D. L. 2007. Research and evaluation of the Maine Learning Technology Initiative (MLTI) laptop program: what we know and some early lessons. Mimeograph, University of Southern Maine.

Zucker, A. 2005. Starting school laptop programs: lessons learned. *Policy Brief No. 1*, One-to-One Computing Evaluation Consortium.