



Ethiopia Implementation Report, September - December 2007

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Abbreviations and explanation of terms

ELS	- Eduvision Learning System
ECBP	- Engineering Capacity Building Programme
EFA	- Education For All
GTZ	- Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Assistance)
Melepo	- Eduvision interactive book reader, part of the ELS suite
OLPC	- 'One Laptop Per Child' non-profit organisation
Sugar	- OLPC designed user interface for the XO laptop
XO laptop	- Low cost laptop designed by OLPC

1.0 Introduction and overview

From September to December 2007 Eduvision embarked on a joint venture with GTZ/ECBP in order to conduct initial tests regarding the educational and technical suitability of the Eduvision software for use in the Ethiopian classroom.

This report begins with outlining the aims and objectives of the study. It then focuses on the pedagogical context in order to provide an understanding of the pre-existing educational framework that is in place. Following this is a brief explanation of the technology involved and an overview of the research methods that were utilised. The analysis is split into three sections of key findings; change in teacher and learning style, the effect of age on the use of Melepo, and the use of Eduvision to aid computer skills. As a primary purpose of this study is to provide a foundation for forthcoming monitoring and evaluation, the methodological and technical constraints that were encountered are then listed. In closing the report, attention is given to the way ahead for Eduvision in Ethiopia in light of the documented findings.

2.0 Aims and objectives

The aim of the study is to assess both the educational and technical effectiveness of the Eduvision software when used on the XO laptops in Ethiopian classrooms.

The objectives of the study were specifically to:

- gain feedback from students and teachers
- assess impact on teacher and learning style
- conduct technical product testing
- identify any weaknesses in system implementation
- test the suitability of training

Each of these objectives was pursued in order to provide an effective foundation for further study.

3.0 Pedagogical context

Ethiopia is faced with significant educational challenges at every level from primary through to tertiary. Despite attempts to provide free universal access to primary education (United Nations, 2000; EFA, 2000), national figures demonstrate that only 60% of children are

enrolled in primary education, with an average of 72 primary school pupils for every teacher (EFA, 2008). As with other countries across the region, increasing class sizes in Ethiopia are leading to significant difficulties in maintaining levels of attainment (Fredriksson, 2004; Naidoo, 2003). Such an environment necessitates sustained research and investment into the educational sector across Ethiopia in order to effectively address the significant challenges being encountered (Negash, 2006).

Operating within this context is the OLPC initiative and the role of Eduvision and Melepo. In order to assess effectively the efficacy of the Eduvision intervention it is vital first to consider the traditional Ethiopian pedagogical framework and its relation to the model that the programme aims to foster. This provides context and rationale for the challenges and constraints which were experienced in the initial pilot study and will be considered further in due course.

Conventional Education

The dominant mode of education in Ethiopia can best be understood against the background of a long established model of teaching, influenced by both cultural and religious traditions (Lasonen et al. 2005). Such traditional models still play a significant formative role for the educated population, with most current teachers and related professionals having received their schooling within this context. Unsurprisingly, the experience of learning in this environment has had significant influence on the strategies employed in the teaching and learning process of today. From primary through to tertiary education, those responsible for education are, on the whole, teaching in the way they themselves have been taught and perpetuating a rote-based approach to learning (Smith and Ngoma-Maema 2003; Negash, 2006).

Within such a system, politeness and obedience are the main qualities that a teacher wishes to instil in their students. Exceptionally high importance is placed on the established hierarchy of authority from the teacher and the subordination of the student. The notion of a student discovering information or teaching themselves is perceived to be connected with the idea of teachers failing to do their job properly. Subsequently, there is a reluctance for students to say or do anything more than

what is asked of them, not necessarily due to ignorance or lack of interest but out of politeness and respect towards the teacher (Negash 2006).

Significant Challenges

In light of this experience, and as documented elsewhere, it is clear that attempting to copy learning and teaching approaches from one socio-cultural context to another without first adapting them to local conditions is likely to be an unsuccessful pursuit. The pedagogical stance promoted by OLPC, known as constructivism, is at risk of doing just this. Constructivism holds that students should learn by doing as well as learn to learn in their own way (Richardson, 2003). It is an approach that is highly student-centric with the teacher expected to adopt the role of facilitator. This approach is evident in the OLPC applications which are tailored to activity-based projects that a child completes either on their own or in a small group environment. Whilst this is a novel and at times desirable approach, it must be understood that it stems from decades of Western-centred educational development.

Attempts simply to deposit a constructivist model of education into an Ethiopian educational system which is firmly rooted in rote learning will face significant challenges. The conceptual pedagogical shift required is too radical to be implemented effectively without time and attention given to gradual transition and contextualisation. This is true at both a theoretical level and also in the practical example of OLPC. The Sugar-based applications that OLPC uses are challenging to incorporate into a class without compromising the standardized Ethiopian school curriculum.

The Eduvision Approach

In contrast, the model that best describes Eduvision's approach to education is one of active learning. The functionalities that Melepo offers, as well as those it aims to offer through future developments, positions the student in a role where they can participate in their own learning (Ellerman, 2004). This is achieved through the utilization of the local language content of pre-existing Amharic textbooks (Stroud 2002; Mazrui, 2000), and using these as a launching pad for additional content. Basing the approach in established teaching resources serves to circumvent much of the resistance that OLPC's methodologies have received from local

stakeholders.

Due to the limitations of the OLPC learning methodology, there is a significant role for Eduvision in ensuring that the educational potential of the initiative is fully realised and that the XO laptops are successfully integrated into the classroom. Melepo provides unique opportunity for participating students and teachers to operate within the existing structures of the curriculum and wider conventional educational culture whilst also being given the freedom to develop valuable skills of creative thinking and independent enquiry (Carr, 2005; White, 1982).

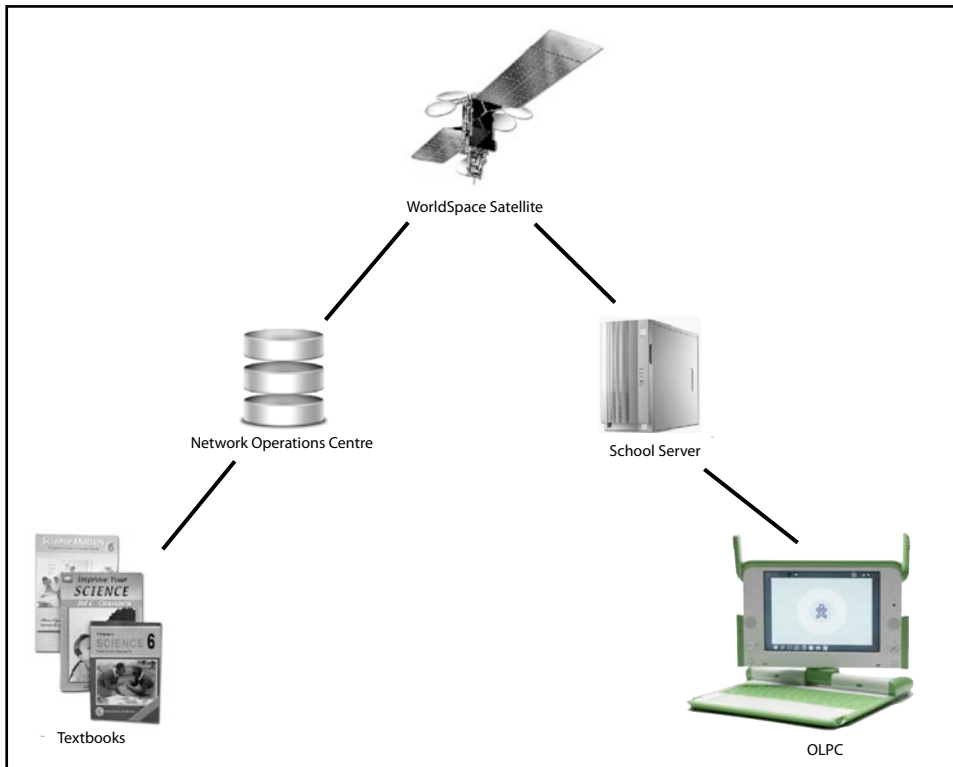
For a more detailed study regarding the specific educational dilemmas associated with the introduction into classrooms of the XO laptop please refer to contrasting reports from Hartel (2008) and Kort and Reilly (2008).

4.0 Technology used

The Eduvision platform currently consists of three components: the Network Operations Centre (NOC), Base Stations and a piece of end-user software called Melepo. Of these, the NOC is, and will continue to be, based at Eduvision's headquarters in Switzerland, running on a Linux-based virtual machine on an Apple Xserve. The other components are based in the implementing country. In this instance, the two Base Stations deployed to Ethiopia were Hewlett-Packard thin-client PCs.

Initially, all students participating in the study were assigned OLPC XO Beta-2 machines, running build 416 of the OLPC operating system and applications. Teachers were given the machines to take home and use at anytime from mid-September. Students were distributed machines at the beginning of October, but used them only in one class, and did not remove them from the school. In December an additional consignment of 40 OLPC XOs became available, this time Beta-4 machines running OLPC build 5.16. The decision was taken to outfit one class with the new machines so each class had both the same hardware and operating system build.

The only modifications to the default software set that OLPC ships were the inclusion of Melepo, Eduvision's



was to gain preliminary data regarding the effect the XO laptop and Melepo had on the overall class environment.

5.2 Focus groups with teachers

Five focus groups were conducted, each with eight teachers from a combination of both schools. Each focus group lasted for between two and three hours. Two of the focus groups were designed to gain feedback on the teachers' perception of the effectiveness of Melepo in the classroom and to determine what additional features teachers would like to

previously mentioned e-book reader and the installation of Amharic fonts.

5.0 Methodologies

It was decided to conduct the trial in two schools; Menelik II and Atze Naod. Initially only 2nd grade was chosen as the class for the trial however in the latter stages of the trial Atze Naod permitted the participation of 7th and 8th graders in the form of an after school club. In total, 12 teachers were trained, six teachers from each school. In Menelik all six teachers were involved in teaching with the XO laptops at some stage during the trial. At Atze Naod however, only one teacher participated on a regular basis.

A variety of methodological approaches were utilised in collecting data that would contribute towards analysing the key objectives.

5.1 Structured observation

For a period of two months every lesson that took place with the XO laptop was monitored by two trained observers. The primary objective was to create and test two observation tools, one for teacher behaviour, the other for student behaviour. The secondary objective

see incorporated. Two focus groups were designed to gather information on effective teaching methods that were used or could be used in the future. In addition to acting as a feedback method, these groups also proved to be a vital tool for teachers of both schools to share their experiences of Melepo and the XO laptop with one another. The final focus group was conducted at the end of the teacher training period in order to gain feedback on the teaching methodology, the amount of training given and the content of the training.

5.3 Focus groups with students

Five focus groups were also conducted with students in the two schools and each consisted of nine students. Four of these groups were conducted with 2nd grade students. The aim of these focus groups was to gain student feedback on their perception of Melepo as a learning tool and whether or not they understood the concepts behind the product. These groups were also invited to provide a critique of the software interface as well as suggest additional features that they wanted to see included. The final focus group was held towards the end of the trial with 7th and 8th grader students who participated in an after school computer club. In this group, students were encouraged to offer their suggestions regarding the nature of content they would

like included on the XO laptops that did not directly pertain to the curriculum. In addition, the students were given opportunity to redesign any aspects of the Melepo interface that they had trouble operating.

5.4 Activity based tests

An 'icon recognition test' was designed to establish the intuitiveness of the icons used in the Melepo interface. For example, two weeks after the introduction of the software to the classroom, 54 students were asked to name the function of each icon used in Melepo depicted on a sheet of paper. One week after this test was given the same students were asked to draw what they thought the icons were for a given function, with instructions to draw what they thought would be the most likely looking icon if they were unsure. The aim was to generate new and more intuitive icons from a student-centred perspective alongside testing if the students were able to reproduce the pre-existing icons. Building on this, nine students from the 8th grade were asked to redesign each Melepo icon in their preferred manner.

5.5 Task completion tests

A descriptive test was also used in order to determine more intuitive processes within the software. 20 students were each asked to describe each of the main processes involved in operating Melepo. They were asked to do this with the laptops whilst explaining aloud the rationale for each of their moves. Following this, a different group of 20 students were asked to describe how they would perform these same processes, but this time without having the laptop in front of them. The objective was to assess whether describing the procedures without a laptop present would expose a more intuitive means of operation.

Every student involved in the trial, totalling 120 children

including those at the after school club, was given an exercise in which they attempted to complete a selection of tasks within Melepo. Two identical tests were given, one after one week of Melepo use in the classroom and another after three weeks. The primary function of these exercises was to help demonstrate to the teachers the limitations of their teaching methods, resulting in limited student ability to reproduce simple actions practiced in class. These exercises also served as a means through which to evaluate the effect of student age on the use of Melepo.

5.6 Questionnaires

At the end of each class observed a questionnaire was given out to the teacher. The purpose of the questionnaire was to keep track of any of the difficulties that the teacher may have experienced when teaching with Melepo. In addition, it provided the opportunity for teachers to evaluate their own teaching methods as well as ask for support and suggest new ideas.

5.7 Structured interviews

Structured interviews were conducted with 16 teachers as well as the headmasters of each school in order to get an overview of the way Melepo was affecting the learning and teaching environment. The first set of



interviews was conducted after one week of using the software whilst the second was given at the end of the trial period.

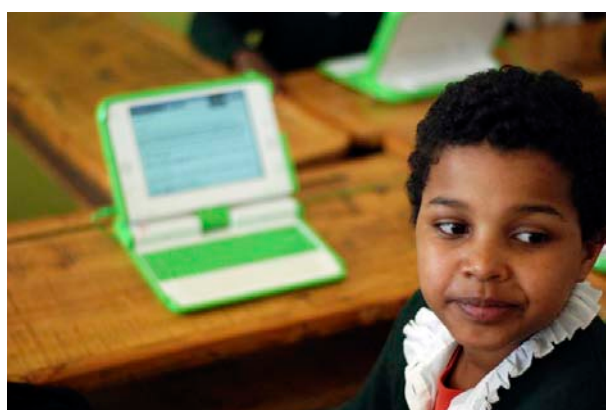
5.8 After class clubs

A voluntary after school computer club was created in an effort to work with an older group of students outside the formal classroom context. The primary goal of this club was to foster a closer relationship with students than would normally be possible in a school environment and, through so doing, progress beyond culturally assumed correct answers and establish a rapport that would facilitate more open and honest dialogue. Throughout the life of the club, students were continually asked to provide a critique of the software as well as provide general feedback on the use of computers in schools.

5.9 Teacher training feedback session

Initial training of teachers was conducted through three workshops which were followed by in class and after class support for a total of 14 lessons.

Whilst the support classes were underway, feedback was collected in order to serve as the basis for improving upon the teacher training package available.



5.10 Student performance

A structured rating system was used to track every class for 2 consecutive months. Each five minute block of every class was recorded with trained observers rating the percentage of the class that were on task (with and

without the laptop) versus the percentage that were off task (with and without the laptop). Data was collected on a total of five different applications including Melepo to determine student on task behaviour.

6.0

Analysis

For the sake of clarity in this document, the analysis is separated into three sub-sections which document the key findings: change in teacher and learning style; effect of age on impact; and use of Melepo to aid computer skills. Each section ends with bullet points suggesting potential steps forward in light of the analysis given.

6.1 Change in teacher and learning style

The teaching environment of the two test schools placed significant limitations on the student ability to understand new concepts due to the lack of attention given to helping them process what they were doing and why they were doing it. As previously mentioned, obedience and subordination to authority are perceived as such important virtues that individual initiative and inquiry can be seen as deficits. As the lesson observations demonstrated, questioning in class was often perceived as an insult to the integrity of a teacher rather than a sign of a keen student. On the occasions where individual enquiry was encouraged by a teacher, lack of resources made it challenging for students to explore beyond their textbooks.

Due to the teacher centred pedagogical model witnessed throughout the trial, students are placed in the role of passive recipients of information rather than active learners. Initially, there were very few instances where the teacher asked students to interact with each other, form groups, conduct basic research activity or ask them to explain a concept in their own words.

Diversification of approach

Such an environment meant that new concepts in Melepo would often be introduced using rather ineffective teaching methods. Students would be told the procedures of using a particular feature of Melepo then asked to repeat it out loud. The teacher would then move directly to the next procedure, not allowing students to put the instructions into practice. However, after a week of using this method, teachers soon realized

that they needed to diversify the way they taught. Students were then asked to follow practical instructions rather than simply repeat. Activities were also set up by the teachers to challenge the knowledge of the students. Teachers would also ask individual students to come to the front of the class and share what they had learned that day. Towards the very end of the test period teachers were observed using structured group activities and competitions to teach their class. This transition to effective Melepo use catalysed a method of teaching that the teachers themselves admitted they had rarely or never used before.

Teachers also realized that they needed to create structured lesson plans in order to cope with the introduction of the XO laptops. As a result, many of the teachers also started to incorporate daily lesson plans into their other classes.

Student collaboration

Another positive change in teaching methods was the amount of individual attention that they were able to give to students during the trials. As a result of the time students spent operating Melepo there was more opportunity for the teachers to provide individual assistance. Towards the end of the trial it was observed that this teaching style spread to the remainder of the lessons. Addressing the class as a whole was done only when necessary whereas previously it was the primary method of communication. Students had the opportunity to work in small groups and began to help each other



allowing the teachers to move around from one group to the other, giving instructions and correcting student work. Almost all the Melepo applications that were tested resulted in an increase of student collaboration. This would often occur when a student did not know how to perform a specific action and would need the assistance of another student. There were also many occasions when a student, knowing they had discovered something novel, would teach other students to do the same.

Teachers who created structured lesson plans successfully integrated the functionalities of Melepo into a regular curriculum based class. They clearly stated the objectives of the class as well as outlining how they would be met. Activities using Melepo were linked to other activities such as using write and draw. Teachers also allocated a section of each lesson for students to ask questions, something that would almost never be done in a typical lesson.

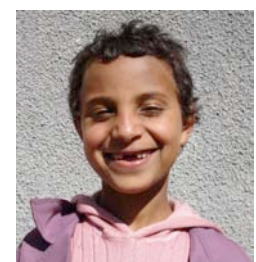
Increased motivation

During interviews, teachers regularly commented that students were paying more attention to their lessons using a digital textbook than they would normally have done using a paperback textbook. Several children also commented on their increased motivation through using Melepo:

I like to use Melepo more than textbooks because it is more interesting for me to use. I enjoy opening the pictures and making notes about these pictures so that I can show my teachers and friends.
[Natanial Balta, grade 2]



I like the way I can hold so many different books in a small space and how it is more fun than a normal book because you can put so many things in it and it does not get full.
[Medhanit Maru, grade 2]



Simply highlighting text or adding a note where necessary was seen to make a significant difference to the way a student approaches their textbook. The textbook becomes a working document to which they can contribute. This was confirmed by preliminary analysis of the data collected regarding on task behaviour which suggests that student motivation and performance is higher when using Melepo than with other tasks.

- These factors point to an opportunity to create functionalities within Melepo that encourage a more diverse pedagogical approach that encourages collaboration and group work, for example, a discussion board linked to individual textbooks for question and answer sessions or an interactive template for the creation of lesson plans.
- There may also be a need to supply teachers with a form of instruction package for introducing both Melepo and basic computer literacy into the classroom. Whilst there is no one correct approach to this process, it would be extremely beneficial if teachers had access to example lesson plans, tips and general advice on how best to integrate the software into the curriculum.

6.2 The effect of age on the use of Melepo.

Although Eduvision provides Melepo to a wide variety of age groups, it is clear from the testing that, in the current format, it is older students who receive the greatest benefit from the technology. Due to the rote-based approach used with the younger students (1st to 4th grades) there is little perceived need for individual interaction with textbooks. As long as the teacher has a copy of the textbook, students are able to continue class as usual by reading from the chalk board, copying text and answering questions out loud. Most, if not all, the exercises are completed within class time with little need for homework. This means that the more advanced functionalities that Melepo can incorporate into the experience of using a book are somewhat lost, with limited need for highlighting, adding notes or using

the navigation functions.

- There is significant need to develop Melepo features that cater to the needs of younger students with sufficient anecdotal evidence to suggest the need for two separate versions of Melepo (presuming the back end is capable of supporting this). Version One, a simple, child friendly Melepo that allows children to access books through an intuitive interface. Version Two, a powerful, feature rich version built on the existing concept that caters for older users (5th grade and older).

The importance of the textbook is far greater in higher grades, with homework playing a larger role in the curriculum and in this context the value of Melepo was clearly visible. Throughout the focus groups the students continually spoke of the usefulness of adding notes to a textbook that referred to a homework assignment. The 8th grade students were able to use all the functions in Melepo after only one hour of training and so benefited from the true potential of Melepo as a learning tool.

Significance of educational games

Despite the general suitability for older students, one strong feature of Melepo for the younger age group was the linking of educational games to subjects such as Mathematics and English. During the final stage of the trial three different educational games were used with both 2nd and 8th grade students. The games included a Maths equation based game, an English language game and a typing tutorial. The response received from the 2nd grade students demonstrated that they understood the concept of the games and were highly motivated.

The maths game represented the clearest example of an educational application being directly applicable to the curriculum. Students were significantly more motivated to do math using this game than when they used a book. In addition, the contents of these game-based applications are almost identical to the textbooks and so the teacher could assign a period of class time for use on the application.

6.3 Use of Melepo to aid computer skills

The trial demonstrated Melepo's significant potential for contributing to teacher and pupil computer literacy. Simple concepts such as mouse operation, scrolling, and using file systems were all new experiences for participants. The software familiarises the students and teachers with basic computer use and then makes it easier for them to relate to the procedures involved in operating other applications.

Integration with curriculum

One of the greatest assets of Melepo is that its functionalities are built around existing material that students and teacher are familiar with. The familiarity and comfort that this brings to the introduction of a computer into the classroom is something that should not be underestimated. The research team was repeatedly told by teachers how great Melepo was for overcoming their fear of using computers and intrinsic resistance to the concept of introducing their classes to such technology. The main fears they articulated were a lack of relevancy, a waste of time and a source of constant maintenance. Their introduction to Melepo helped to quell some of this resistance and demonstrated a direct link between a computer application and the material being taught in class. In addition, the familiarity of emulating day to day functions such as opening a book and adding notes also increased accessibility. Furthermore, Melepo displayed entire texts in Amharic which provided a very comfortable base from which to introduce students to computer use.

Teacher training

Training the teachers in basic computer literacy proved to be invaluable for the successful adoption of Melepo. The teachers benefited from careful and in-depth explanations, diffusing a lot of the initial fear they had. Many teachers also commented that the training allowed them to grasp a concept and be more confident in demonstrating this to pupils in class. After class support was found to be the most productive training method. This consisted of guiding the teacher through the class they had just conducted, asking what the difficulties were and troubleshooting these difficulties. Directly after class was also the most effective time to discuss pedagogical issues as the teachers could remember exact incidences and examples.

- There is the possibility to program a self

teaching computer literacy tutorial. This tutorial would aim to guide a student from complete beginner to competent usage of all the functionalities of Melepo. The nature of the software is such that all the skills one would learn in this program would be transferable to most other programs a student would interact with.

- The potential for Melepo to include links to relevant content may act as a method of redeeming low-quality textbooks. This serves to add value within the current system without undermining its structures in a way that could lead to resistance.
- Beyond digitising of textbooks there is significant scope for other educational applications to be linked to books and subject areas such as dictionaries, thesauruses and calculators (graphic + scientific for older classes). Inclusion of entire applications such as a drawing feature or a word processor that corresponds with the books would be of great help to both the teachers and the students and would minimize the stress on a teacher of integrating computer use into their daily class. This can be further supported by the introduction of a wealth of knowledge in the form of a digital library, which can be accessed by all users from the school.

7.0 Methodological constraints

Schools involved

- The schools involved in the trial were not an accurate representation of an average Ethiopian primary school. The teacher to student ratio was 1:30, far higher than the national average of 1:65.
- In addition, the prestigious nature of the schools served to attract unusually experienced and dedicated teachers.

Teacher training

- The training was conducted in a modern GTZ/ECBP office building with multimedia support. Many of the challenges that

would be faced in a rural context were thus avoided.

- Teachers also received daily ongoing support during the trial. This could have had an unrealistic impact on their ability to integrate Melepo into the classroom.

Cultural and language constraints

- There was great willingness to please amongst the teachers and the students. This resulted in difficulties obtaining honest and accurate feedback. Whilst methods were devised to overcome this constraint it remained a constant factor through the trial.
- Almost all of the feedback we received underwent translation into Amharic then back into English. This impeded the feedback process and opened it to misunderstanding.

Student laptop ratio

- An insufficient number of laptops resulted in classes of 60 being split into two groups which made for unrealistically small class sizes.
- 40 B'4 laptops which were intended for use in the trial were stuck in customs. Student ownership only occurred in the final week of the trial and this made it impossible to gain any valid insight into the effects of student ownership on the use of Melepo

Student age

- GTZ/ECBP primarily focussed on the 2nd grade students as the subjects for the trial. We would have benefited a great deal from a more representative range of ages.
- The pronounced sense of age-based superiority within the school means that selecting some young students for the trial was perceived as very unfair by the older students.

GTZ/ECBP Agenda

- This was a collaborative project and therefore it was necessary to cooperate

with the GTZ/ECBP agenda that placed strong emphasis on the OLPC Sugar operating system. At times this presented a constraint to testing the Eduvision product. However, it should be mentioned that the partnership with GTZ/ECBP was a success, greatly appreciated by both parties. This is best described by the following quotation issued by ECBP Programme Manager Thomas Rolf:

The Engineering Capacity Building Program (ecbp) is an ambitious reform program aimed at accelerating development in Ethiopia. A result of close cooperation between the Ethiopian and the German governments, it was launched in November 2005 and has recorded impressive results since. One of ecbp's objectives is to introduce innovative technologies to Ethiopia's educational system.

In this context ECBP worked together with the company eduvision. The project focussed on the implementation of the 100\$ olpc laptop in two Ethiopian primary schools. Eduvision's role in the project was to provide their solution for editable interactive textbooks as well as their educational consulting skills for a period of 3 month.

Ecbp wants not only to thank eduvision for their first class technical support but much more for their brilliant team work during the project. They were fully integrated Ecbp team members and a real asset to our organisation. We truly appreciate their dedication and hope that they will play a valuable role in upcoming educational projects in Ethiopia

8.0

Technological constraints

Outdated OLPC hardware and software

- For the first half of the trial the only OLPC hardware available were outdated Beta-2 units. These machines are much slower than the current machines and run on a version of the OLPC operating system that is no longer maintained.

Number of digital textbooks in use

- The digitization and conversion of books to appropriate formats was a time-consuming process and this meant that the number of books available at the start

of the project was small.

- Certain books (primarily in those of the youngest students) were more image-based than text-based and were not well suited for the version of Eduvision's software that existed at the time.

of technology by building upon familiar educational concepts. Simple training builds confidence and enables teachers to utilise the software effectively within their classrooms.

Localisation of software

- The localization of Eduvision's software into Amharic was more difficult than expected and was only realized towards the end of the trial.

These findings serve a dual purpose in shaping the future direction of the Eduvision programme in Ethiopia:

- Adjusting and refining both the educational and technical approach to the programme
- A basis from which a comprehensive monitoring and evaluation exercise can be developed

9.0

Conclusion

The introduction of the Melepo educational tool into the Ethiopian classroom is an ongoing process. In light of this, it would be premature to draw summative conclusions concerning the overall efficacy of the programme at this stage. However, despite the significant challenges faced, the diversity of research methods employed in this initial study have demonstrated certain key findings as documented throughout the analysis.

The lessons learnt throughout the initial pilot study will now be utilised in the forthcoming monitoring and evaluation exercise to be conducted alongside the introduction of 5000 XO laptops to five schools in Addis Ababa in April 2008. A detailed outline of the projected monitoring and evaluation framework is included in a partner document and is available on request.

- Melepo has been demonstrated to facilitate change in approaches to both teaching and learning styles whilst operating within the structures of the pre-existing curriculum. It encourages a diversification in teaching approach and alternatives to the rote-based learning system. In addition, it serves to increase motivation and enhances levels of student collaboration.
- In the current format, Melepo works most effectively with older children where interaction and homework are significant components to the education. However, the educational games are beneficial for the younger children and serve to improve their motivation for learning.
- Melepo is a valuable tool for teaching applied computer skills for students and teachers with little or no previous exposure. It integrates well within the existing curriculum and removes fear

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