Low-cost laptops for Education in Ethiopia.

Summary of Addis Ababa Implementation Report,
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David Hollow, May 2008

Introduction

From September to December 2007 Eduvision embarked on a joint venture with ECBP (Engineering Capacity Building Programme) with the **aim** of conducting initial tests regarding the educational and technical suitability of the Melepo software for use on XO laptops in the Ethiopian classroom. 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
Melepo is the Eduvision educational software which has been included on the low-cost XO laptops being piloted in the OLPC programme (One Laptop Per Child).

Education in Ethiopia – the challenges

Rapidly increasing levels of primary enrolment in Ethiopia have led to significant educational challenges in regard to availability of resources, large class sizes and decreasing attainment levels. Such a situation necessitates a focus on building capacity within classrooms, widespread training of teachers and improving of educational quality and attainment. This is the broad context within which the OLPC initiative and Melepo is attempting to operate. There is therefore considerable need for ongoing research and reflection to ensure that the initiative does actually constitute an effective contribution to improving education in the country.

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.

The dominant mode of education in Ethiopia is based on a long established model of teaching, influenced by both cultural and religious traditions, and based on rote learning and deference to authority. Despite the significant strengths and cultural heritage in such a model, one broad result is classrooms in which obedience, memorisation and adherence to hierarchy are valued above creativity, questioning and critical thought. There is therefore often a widespread reluctance for students to say anything more than what is asked of them, not necessarily due to ignorance or lack of interest but out of submission and respect towards the teacher.

In light of this, it is clear that in Ethiopia there will be significant challenges in promoting the constructivist approach to education espoused by OLPC. This is not unexpected, as experience demonstrates that attempting to copy educational approaches from one socio-cultural context to another without first adapting them to local conditions is often an unsuccessful pursuit. Constructivism is a highly student-centred approach which maintains that students should learn as individuals, by experimentation and with only limited direction from a teacher. Whilst such notions

of learning are novel and at times desirable, it must be understood that they stem from decades of Western-centred educational development. If it were decided that such a radical pedagogical shift were desirable then implementation and transition would require significant time and attention given to ensuring gradual contextualisation into the standardized Ethiopian school curriculum.

Education in Ethiopia – The Melepo contribution

In contrast to constructivism, the model that best describes the Eduvision approach to education through Melepo is one of active learning. This is achieved through the utilization of local language content of pre-existing Amharic textbooks, used as a launching pad for additional content that can catalyse interaction and student collaboration. Grounding the approach in established teaching resources serves to circumvent much of the resistance that the OLPC methodologies have received from local stakeholders. The clear limitations of the OLPC learning methodology mean that 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.

The Trial

The trial was conducted in Menelik II and Atze Naod schools with a total of 12 teachers trained and participation from students in Grade 2, 7 and 8. Initially the machines in use were XO Beta-2, running build 4.16. Part way through the trial these were supplemented by XO Beta-4, running build 5.16. The teachers were allowed to use the machines at home but the students were restricted to in-school usage. The only modifications to the default OLPC software set were the inclusion of the Melepo e-book reader and the installation of Amharic fonts.

The Methodology

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

- Every lesson that took place with the XO laptop during the two month trial was monitored by trained observers who completed **structured observation forms**. The primary objective was to assess teacher and student behaviour and impact on class environment.
- Ten detailed **focus groups** were conducted, five with teachers and five with students. This was done to gain qualitative feedback regarding the effectiveness of Melepo and provide opportunity for participants to critique the content and offer suggests for improvements.
- A Melepo **icon recognition test** was designed to establish the suitability of the icons used in the interface. The aim was to assess student understand of the existing icons and learn lessons for the generation of new and more intuitive alternatives.
- A **descriptive test** was used to determine the intuitiveness of the software. 20 students described to a researcher the main processes involved in operating Melepo. All 120 students involved also completed a selection of tasks within Melepo after one week of usage and again after three weeks in order to assess the speed with which they gained understanding.
- At the end of each class observation a **questionnaire** was given to the teacher in order to gain feedback and provide opportunity to communicate challenges encountered.

- **Interviews** were conducted with a total of 16 teachers and the headmasters of both schools at the beginning and end of the trial period in order to gain detailed feedback regarding the ways in which Melepo was affecting the learning environment.
- A voluntary **after school computer club** was created in order to work with an older group of students outside the classroom context. This facilitated closer interaction, honest dialogue and constant opportunity for the students to critique the software from the user perspective.
- A **structured rating system** was used to track every class throughout the two month trial. 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).

Analysis and Challenges

For the purpose of this report the analysis is presented as six areas of challenge and benefit which were encountered during the trial. These are the approach to teaching, student motivation, age, computer skills, curriculum integration and teacher training.

Approach to teaching -
The rote-based teaching and learning environment dominant in the test schools placed significant limitations on the ability of the students to understand new concepts. The discouragement of creativity and individual enquiry meant that there was little attention given to helping students process what they were doing and the reasons why they were doing it. Questioning in class was often perceived as an insult to the integrity of a teacher rather than a sign of a keen student. At the beginning of the training it was common that students would be told about a particular feature of Melepo and then be 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, over time the teachers adjusted their approach and introduced learning activities to the lessons. There was an increase in student interaction and collaboration, group activities, and use of structured lesson plans with clear learning outcomes.

Student motivation -
Teachers regularly commented to the researcher team 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." (Nataniel Balta, Grade 2)

The ability to highlight text or add a note where necessary was seen to make a significant difference to the way students approaches their textbook, transforming it into a working document to which they can contribute and in turn enhancing motivation and on-task behaviour. This suggests benefit in creating additional functionalities within Melepo that encourage a more diverse pedagogical approach involving collaboration, group work and questions.

Age -
Melepo can be adjusted to suit a wide variety of age groups but it is clear from the trial 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 (Grade 1-4) there is little perceived need for individual interaction with textbooks and so the more advanced functionalities of Melepo are lost. However, the importance of the textbook is far greater in higher grades where homework and note-taking has a larger role in the curriculum. There is sufficient anecdotal evidence to suggest the need for two separate versions of Melepo, one a simple, child friendly Melepo that allows children to

access books through an intuitive interface and the other a powerful, feature rich version built on the existing concept that caters for Grade 5 and above.

Computer Skills -
The trial demonstrated the significant potential of Melepo 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 allowed the students and teachers to become familiar with basic computer use and this made it easier for them to then relate to the procedures involved in operating other applications.

Curriculum Integration -
Melepo functionalities are built around existing curricula material that students and teacher are familiar with. The reassurance that this brings when introducing a computer into the classroom is something that should not be underestimated. The research team was repeatedly told by teachers how useful Melepo was in overcoming their fear of using computers and their intrinsic resistance to introducing technology into their classes. In addition, the familiarity of emulating day to day functions such as opening a book and adding notes also increased accessibility, as did the inclusion of entire texts in Amharic.

Teacher Training -
Teachers commented that the training they received diffused a lot of their initial fear and allowed them to grasp the concepts more fully. This in turn meant that they were able to demonstrate the technology with more confidence to their students in the classroom. It was found that after class support was the most productive training method, guiding the teacher through the class they had just conducted, asking what the difficulties had been encountered and providing suggestions for how to best overcome them.

Considerations

It is important to note that the two schools involved in the trial were not representative of the average Ethiopian primary school. The teacher to student ratio was 1:30, considerably higher than the national average of 1:65. The teacher training was also conducted in a modern office building with multimedia support and many of the challenges that would be faced in a rural context were thus avoided. Daily support and advice was available to the teachers throughout the trial which means they demonstrated a greater ability to integrate Melepo into the classroom than can be expected more widely. In addition participants demonstrated a great willingness to please the research team when providing feedback and this resulted in frequent challenges in obtaining honest and accurate responses.

Constraints

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. The localization of Melepo into Amharic was also more difficult than expected and was only realized towards the end of the trial. Some of the machines were delayed in customs for most of the trial which meant that it was impossible to gain insight into the effects of student ownership on the use of Melepo. Grade 2 students were the primary trial class and there would have been significant benefit in sampling a more representative group of children.

Conclusion

- Melepo can 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, provides alternatives to the rote-based system and enhances levels of student collaboration.

- Melepo works most effectively with older children where interaction and homework are significant components to the education.

- Melepo equips teachers to utilise technology in the classroom. The development of a teacher instruction package for effective Melepo usage would help to facilitate and further realise the potential benefits of the technology, including sample lesson plans, tips and general advice on how best to integrate the software into the curriculum.

- Melepo is a valuable tool for teaching applied computer skills for students and teachers with little or no previous exposure. It removes fear of technology by building upon familiar educational concepts and builds confidence through simple and effective training.

- Melepo has potential to include links to relevant content and thus add value to low-quality textbooks. Additional content such as dictionaries, thesauruses and calculators could also be added and this would significantly increase the educational potential of the programme.

The lessons learnt throughout the initial pilot study will be used to shape the ongoing Eduvision approach and refine both the educational and technical aspects to the programme. They will also be utilised in the forthcoming monitoring and evaluation exercise to be conducted alongside the introduction of 5000 XO laptops to five schools in Ethiopia in September 2008. A detailed outline of the monitoring and evaluation framework is included in a partner document and is available on request.

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