

Full Length Research Paper

A Sri Lankan one-to-one computing initiative and its impact on formal learning in primary School

Peter Mozelius*¹, Kalelur Rahuman² and G. N. Wikramanayake²

¹Stockholm University, Sweden

²University of Colombo, School of Computing, Sri Lanka

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One-to-one computing has lately become a frequently used buzzword in the discussions on e-learning in primary education. The main idea in one-to-one computing is to provide every student with a personal computer. This has often been combined with Internet access and the idea to share content but not to share the computers. This study has been focused on the Sri Lankan OLPC initiative and data has been gathered from three selected primary schools in the project. In the Sri Lankan OLPC model there is no focus on Internet connectivity and the emphasis is on content development in local languages. Schools chosen in this first one year pilot project are to be classified as to be “*the poorest of the poor*” and located in rural areas. The research question in this paper is, if and why the introduction of one-to-one computing has had an impact on the formal learning outcomes. All the visited schools have had technical as well as pedagogical problems during the first year, but findings show that there has been an impact on formal learning in subjects like Mathematics and English. We believe that the Sri Lankan emphasis on content development is part of the explanation but also that the strong commitment amongst teachers and parents has contributed. Our recommendation is that this pilot project should be extended but that the focus should be kept on poor schools in non urban areas. We also give some suggestions on how to improve the content development and how to extend the support.

Keywords: One-to-one computing, One Laptop Per Child, OLPC, E-learning, ICT4D, Technology enhanced learning, Sri Lanka

INTRODUCTION

One-to-one computing has lately become frequently discussed in the field of e-learning in primary education and the use of information and communication technology for development (ICT4D) (Pal, Patra, Nedeveschi, Plauche and Pawa, 2009). The main idea in one-to-one computing is to provide students with individual laptop computers. This has in many implementations been combined with Internet access and

The idea of sharing content but not to share the computers. Examples of low-cost laptop brands produced for one-to-one computing are *Intel Classmate*, *Asus Eee PC* and the *One Laptop Per Child (OLPC) XO computer*. Different versions of the one-to-one computing concept have been implemented in the developing world as well as in several developing countries.

One-to-one computing initiatives are sometimes linked to pedagogical ideas like a shift to self learning or project-based learning but none of the one-to-one computing initiatives seen so far are holistic in a sense that they would explicitly look at major curriculum development or whole educational systems (Tedre, Hansson, Mozelius

*Corresponding Author E-mail: mozelius@dsv.su.se; Tel: 0046737078748

and Lind, 2011). Several studies on one-to-one computing have been published in the context of rich countries. In a study at a school in California, USA researchers found that the laptops stimulated students and improved their literacy skills (Penuel, 2006) (Suhr, Hernandez, Grimes and Warschauer, 2010). Analyses of one-to-one computing initiatives in countries in developing regions have often been more negative with criticism of the high investments in hardware and the absence of digital content and pedagogic models (Unwin, 2010). In some countries like Peru even the participants working in the project would like to classify it as a failure. (OLPC News, 2011) Research on technology-enhanced learning have shown that new technology alone is unable to bring about any radical improvement (Greaves, 2012) and teacher training, pedagogy changes, curriculum development and teacher involvement are crucial factors that has to be considered. (Tedre et al, 2011) (Lehmann and Livingstone, 2012)

One-to-one computing in Sri Lanka

As in other countries there have been various variations on one-to-one computing concept implemented on the Sri Lankan island. One example is the so called eVillage project where the Intel's Classmate computers have been used. In this initiative students have been sharing computers in education based on Internet access (MP3-eVillage_Interview.mp3, 2011). Another example is the *Sri Lankan One Laptop Per Child* (OLPC) initiative where most of the schools have provided one laptop per student but with a focus on digital content development in local languages instead of Internet connectivity (MP3-Gunadasa, N._SriLankanOLPC.mp3, 2011). This study will focus on the Sri Lankan OLPC initiative where data mainly has been gathered from three selected primary schools that the authors have visited.

Main Local Languages in Sri Lanka

The Sinhala Speaking Majority

Sinhala or Sinhalese is the mother tongue of the Sinhalese ethnic group which is the largest ethnic group on the Sri Lankan island. It is a language from the Indo-Aryan branch of the Indo-European language group. Sinhala is spoken by about 16 million people in Sri Lanka with about 13 million of them being native speakers. The other main constitutionally-recognised official language of Sri Lanka is the Tamil language.

Tamil speaking groups

The four main Tamil speaking groups on the Sri Lankan island are:

1. Tea Estate Tamils or Indian Tamils
2. Jaffna Tamils
3. Colombo Tamils
4. Tamil Speaking Muslims

A majority of the *Tea Estate Tamils* are immigrant from Tamil Nadu in India. They came to Sri Lanka with the main purpose to work in tea estates *Jaffna Tamils* live in the Northern regions around the city of Jaffna. *Colombo Tamils* live in Colombo often in Southern Colombo along the Galle Road and in Wellawatta. This area is since many years also known as "*Small Jaffna*". Most of them are Hindus but the majority of Muslims speak Tamil as well (MP3-KaleelRahuman_OnMuslimsAndTheTamilLanguage.mp3, 2011). The Jaffna Tamils mainly live in the northern part of Sri Lanka around the city of Jaffna. Tamil Speaking Muslims live in the Eastern Province and in the capital Colombo. Kaleelur Rahuman is a Tamil and Sinhala speaking Muslim born in the Eastern Province but now living in Colombo.

Aim

The aim of this study is to analyse and discuss if the first year of the Sri Lankan OLPC initiative and its impact on formal learning. We will also give our recommendations for how to continue and extend the current pilot project.

The Sri Lankan OLPC Initiative

Initially nine schools in nine provinces were selected for a one year pilot with the schools spread out all over the Sri Lankan island with funding from the World Bank. Students in the schools are from different ethnic groups but all schools are in poor rural areas where computers are rare. The OLPC Lanka Foundation has collaborated with the Ministry of Education in the setup and deployment of 1000 XO computers with funding from the World Bank. Later private sector funding has enabled an increased number of XO laptops and an additional 350 units has been distributed to another four schools. Activities in these 13 schools have been monitored by the Sri Lankan Ministry of Education and World Bank officials. (OLPC Sri Lanka, 2011)

Digital content has been developed based on the primary school curriculum in English for learning objects on Mathematics and English and local languages. Later

the developed content was localized in the two national languages Tamil and Sinhala with different versions for different schools. The Sugar operating system has also been localized to both national languages so all students can work with the laptops in their mother tongue. Teachers were trained as well to use the XO computers and to lead teaching sessions based on digital learning objects (Rahuman and Wikramanayake, 2009). The Sri Lankan Ministry of Education has, unlike in many other OLPC implementations, chosen a model where emphasis is on content development in the Sinhala and Tamil languages instead of a focus on Internet access and online activities. (MP3-Gunadasa, N._SriLankanOLPC.mp3, 2011).

METHODOLOGY

The study has a qualitative mixed approach and is based on a literature study, observations, teacher team group discussions, interviews and an analysis of extracts from the selected school's grading registries.

Observations

What people say or write are often the major sources of qualitative data but there are limitations to how much can be learned from what people say and write. To fully understand the complexity of some situations direct participation and observation of phenomena might be the most comprehensive research strategies (Patton, 2001). In our observations we have been participating in the children's computer based learning activities and watched how they work with their computer based exercises. Kalelur Rahuman has also been involved in the teacher training in the OLPC project and the translation of digital learning objects to the Tamil language. A skilled interviewer also has to be a skilled observer and able to read nonverbal messages and body language (Patton, 2001).

Semi-structured Interviews

Qualitative interviews could be seen as purposeful discussions between two or more people with open-ended questions that intend to elicit views and opinions from the informants (Creswell, 2009). There are also different models for interviews in the gathering and selection of relevant data for specific research topics. In a span from strictly structured and formalized interviews to more informal and unstructured conversations the

interviews in this research could be classified as semi-structured interviews (Scribd Inc, 2010). Interviews conducted in Tamil and Sinhala have been translated directly by Kalelur Rahuman. We have in all schools conducted semi-structured interviews with the principals and the teacher teams. The semi-structured interviews are all based on a questionnaire constructed by Peter Mozelius and Kaleel Rahuman. In some of the schools we have had more informal interviews with technical staff, students and parents. Authors have also visited the Sri Lankan Ministry of Education and discussed the OLPC project with the involved staff. We have later also followed up the discussions with questions by email to Niel Gunadasa who is the main responsible for the administration of this initiative.

(MP3-Gunadasa, N._SriLankanOLPC.mp3, Mar 2011)

Recorded Interviews in MP3-format

Academic research has a tradition of in-depth interviews as a tool for gathering data on people's opinion of more abstract and complex phenomena. Another tradition is to mainly capture the answers by taking notes during the conversations. In journalism interviews have been recorded for many years as an alternative to written text and shorthand. Today's digital audio technology has opened up new possibilities for data gathering, storage and reuse. (Mozelius and Hansson, 2009) All the interviews listed in the end of the article are stored at <http://people.dsv.su.se/~mozelius/thesis/interviews/>. File names are the same as they are given in the separate section for "Recorded interviews in MP3-format" at the end of this article. We have chosen the mp3-format since it is an open standard that can be played on most of the existing computer platforms without any additional software.

Selected Primary Schools

Out of the total 13 primary schools in the pilot project we have chosen the following 3 schools in 3 different ethnic and geographical regions:

1. *Blackwood Primary School* in Haputale, Central Highlands of Sri Lanka
 2. *Gampaha Seelaratna Vidyalaya Primary School*, Gampaha District
 3. *Palmunai Primary School*, Ampara District
- (A more exact geographical location of the schools can be seen in *Appendix A*)



Figure1. Teaching session in the Palmunai OLPC School
Photo by. Peter Mozelius

Blackwood Primary School in Haputale

This is smallest of the selected schools with just above 100 students located in a Tamil speaking tea estate area up in the Sri Lankan Hill Country. It is a quiet and a bit isolated place where the introduction of the XO computers could be seen as the first technology enhanced learning ever. Many parents are employed at the surrounding tea estates. Tamil is the mother tongue of everyone except for one of the teachers. Most computers equipped with software in Tamil but some laptops have been delivered by mistake with operating systems in Sinhala.

(MP3-Blackwood_OLPCSchool_TeacherTeam.mp3 , Feb 2011)

Seelaratna Vidyalaya Primary School in Gampaha

A relatively big and noisy school and the only one where there are not one laptop per child. This situation has been aggravated when some XO computers have broken down.

(MP3-SeelaratnaVidyalayaOLPCSchool_TeacherTeam.mp3, 2011). This situation could be seen as an example of the fact that children are willing to share content but not computers. The school is situated in the richer Western region and donations from the student's parents have

paid for renovations and repainting of the classrooms. In this area agriculture is the main income for many people. It is a Buddhist dominated Sinhala speaking region but the teacher would like to have digital content in Tamil as well to support the idea of *"language harmony"*. (MP3-SeelaratnaVidyalayaOLPCSchool_TeacherTeam.mp3, 2011)

Palmunai Primary School, Ampara District

A Muslim school where religion is present more obviously than what is the case in the other schools. Teaching sessions and our interviews were interrupted by one of the 5 daily Muslim prayers. (Palmunai_MiddayPrayer.mp3, Mar 2011) As the case in the Blackwood school this is the first time ever that the school has got any support at all for technology enhanced learning. This school is located in a poor Muslim and Tamil speaking area in the Eastern region of Sri Lanka, an area that recently has been severely affected by flooding in the beginning of 2011. As in the other visited schools we met a teacher team that was committed but here also a very engaged Principal who had explored the pros and cons of the XO computers and e-learning. (MP3-S_Lahir_PalmunaiOLPCSchool.mp3_, Mar 2011) (figure 1)

FINDINGS AND DISCUSSIONS

The introduction of XO computers in the selected schools have certainly had a catalytic effect and brought in new energy and new ideas to teachers as well as to students. (MP3 - Blackwood_OLPCSchool_TeacherTeam.mp3, 2011) There has also been an impact on the way of teaching where some teachers felt that the computers have freed time for other work where other teachers see the XO computers as something time consuming (SeelaratnaVidyalayaOLPCSchool_TeacherTeam.mp3 , Mar 2011).

In one school the principal has seen the OLPC initiative as an interesting pedagogic experiment (WP_Abeysekare_SeelaratnaVidyalayaOLPCSchool_Principal.mp3, Mar 2011), in another school the principal also has scrutinized the technical aspect of the XO computers and looked at how they can be resources in the primary school formal education. (S_Lahir_PalmunaiOLPCSchool.mp3, 2011) There are good reasons for many of the principals' objections and remarks on the project so far. The XO computers are not particularly robust and not always well designed. Computers have had software and hardware problems and Sri Lanka is not the only place where people have questioned the quality (Unwin, 2010) (OLPC News, 2011). In the Sri Lankan OLPC initiative there exists a nation-wide support team that should help out but sometimes the schools have to wait for months to get a laptop repaired (SeelaratnaVidyalayaOLPCSchool_TeacherTeam.mp3, 2011). The reason for the long waiting is mostly that spare parts must be ordered and shipped from China. (Gunadasa, N._SriLankanOLPC.mp3, 2011) The idea that have been discussed in some of the schools about to only use the computers at school seems inhibiting. If the students are not allowed to take the laptops home pedagogic ideas as well as parent involvement would be expected to suffer. School staff that have previous experience of other computer brands and operating systems also have found other limitations with the XO computers and the software setup (SeelaratnaVidyalayaOLPCSchool_LibraryAssistant.mp3, 2011).

A positive finding from the Palmunai school is that students for the very first time have found Mathematics to be fun! In all schools there have been more activities and the students self learning have increased. Students want to do the assignments over and over again. But after too many repetitions they got bored and ask for other exercises and activities. (MP3-Blackwood_OLPCSchool_TeacherTeam.mp3, 2011) The authors' opinion are that the content development based

on the national formal primary school curriculum and the frequent use of the developed digital learning objects are the main reasons for the improved performance in the formal learning. Students have now, in general, achieved higher grades in all the subjects where computer enhanced teaching is a part of the formal teaching sessions.

Teachers in all the 3 schools are disappointed over the absence of Internet access. In the Palmunai there is hardware for an Internet connection but no contract with any provider or actual access. The developed and distributed content have good quality but there exist a limited number of possible exercises and the content is not possible to update. A very interesting idea from both the teacher team in the Seelaratna Vidyalaya School and their colleagues in the Blackwood school is to make the learning objects more flexible and updatable. If the same basic template for quizzes and other exercises could be extended with new questions and assignments the teachers situation would definitely be improved.

Another concept discussed at the schools is to share content with other schools in the OLPC project. And not only to share learning objects in the mother tongue but also to have complementary exercises in Sinhala or Tamil to support the idea of a Sri Lankan *language harmony*. (MP3-SeelaratnaVidyalayaOLPCSchool_TeacherTeam.mp3, 2011) Teachers in the Blackwood would also like to use Internet to share pedagogical ideas and best practices with other OLPC schools.

With Internet access and content sharing the possibilities for more informal learning would definitely increase. In the current situation students use the computers outside schools for listening to music, working with image handling and using the built-in paint program. Below in *Image 2* we can see a girl using her XO computer to take a picture of the authors. (figure 2)

CONCLUSIONS

We believe that the Sri Lankan emphasis on content development is part of the explanation for the positive impact on formal learning outcome in the visited schools. The strong general commitment amongst teachers and parents has probably also contributed and the introduction of computers in the selected schools have also changed the way of teaching. New technology can be of great help and time consuming at the same time. In poor and isolated rural regions the introduction of computer technology can have a catalytic positive effect on teachers, students and parents as well as on the learning process.



Figure 2 . The Blackwood OLPC School Teacher Team
Photo by: Peter Mozelius

Our recommendation is that this pilot project should be extended but that the focus should remain on poor schools in non urban areas. To be able to use the new technology without getting stuck in technical problems we recommend further user training that should include parents as well. An improved software and hardware support would also facilitate and the same goes for Internet access and online sharing of learning objects. A common online learning object repository has earlier been discussed but never implemented.

From a pedagogical view the idea of making the content more flexible and updatable would really improve the teaching and learning opportunities. All XO computers are equipped with a Python interpreter and a programming editor. Python is classified as a programming language that is easy to learn. A vision for the future would be to have teachers, students and parent together, in front of a computer, programming and updating the digital learning objects. We have in this study found that there has been a positive impact on the formal learning in the three visited schools, but this is only three out of thirteen schools in the project. We see this as an interesting finding that we should follow up and compare with the learning outcomes in the other involved schools as well.

Future Work

This work was based on visits to three primary schools

only. If we in the future visit another three schools there would be a more solid ground for judging the initiatives impact on formal as well as informal learning. An interesting idea could be to take a look at the situation at some of the other ten schools and compare the situation at a Tamil school in the former war zone in the north with the situation with a Sinhalese school in the southern part of the island. Of interest would also be to compare the results of this study with the official evaluation that will be done by the Sri Lankan Ministry of Education and the World Bank.

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REFERENCES

- Creswell JW (2009). "Research Design, Qualitative, Quantitative and Mixed Methods Approaches", Sage Publications Inc, ISBN: 978-1-4129-6557-6, p. 181
- Greaves T (2012). "One-to-one Computing", Digital Teaching Platforms: Customizing Classroom Learning for Each Student, Teachers

- College Press, Columbia University, ISBN: 978-0-8077-5316-3
[http://unwin.wordpress.com/2010/04/29/olpc-and-the-east-african-community/Recorded interviews in MP3-format stored at: http://people.dsv.su.se/~mozelius/thesis/interviews/](http://unwin.wordpress.com/2010/04/29/olpc-and-the-east-african-community/Recorded%20interviews%20in%20MP3-format%20stored%20at%20http://people.dsv.su.se/~mozelius/thesis/interviews/)
- Lehmann C, Livingstone P (2012). "One-to-one Computing", What School Leaders Need to Know About Digital Technologies and Social Media, John Wiley and Sons, Inc ISBN: 978-1-118-02224-5
- Library assistant at the Seelaratna Vidyalaya School SeelaratnaVidyalayaOLPCSchool_LibraryAssistent.mp3 (Mar 2011)
- Male teacher at the Seelaratna Vidyalaya School SeelaratnaVidyalayaOLPCSchool_MaleTeacher.mp3 (Mar 2011)
- The Principal's Perpective at the Seelaratna Vidyalaya in Gampaha WP_Abeysekare_SeelaratnaVidyalayaOLPCSchool_Principal.mp3 (Mar 2011)
- Mozelius P, Hansson H (2009.) "Innovative Use of Digital Audio in Research", eAsia Conference, December 2009, Colombo, Sri Lanka
- Native Tamil speaker
- OLPC News (2011). "Who is to Blame for OLPC Peru's Failure? An OLPC Intern Viewpoint" http://www.olpcnews.com/countries/peru/who_is_to_blame_for_olpc_peru.html (retrieved 05/07/2012)
- OLPC S L (2011). http://wiki.laptop.org/go/OLPC_Sri_Lanka/ (retrieved 05/05/2012)
- Pal J, Patra R, Nedeveschi S, Plauche M, Pawar U (2009). "The Case of the Occasionally Cheap Computer: Low-cost Devices and Classrooms in the Developing World". Information Technologies and International Development, 5(1) p 49–64
- Patton M Q (2001). "Qualitative Research and Evaluation Methods", Sage Publications, Third edition, ISBN: 978-0-7619-1971-1
- Penuel WR (2006). "Implementation and effects of one-to-one computing initiatives: A research synthesis", J. Res. on Techno. in Education
- Rahuman K, Wikramanayake G (2009). "Pedagogy Changes for ICT Enabled Primary Education in Sri Lanka." Digital Learning, December 2009, Available at: [http://www.digitalllearning.in/articles/article-details.asp?articleid=2535&ndtyp=RESEARCH 20ARTICLE](http://www.digitalllearning.in/articles/article-details.asp?articleid=2535&ndtyp=RESEARCH%20ARTICLE)
- Scribd Inc (2010). "Collecting Primary Data Using Semi-structured and In-depth Interviews", <http://www.scribd.com/doc/2414859/9primary-data-using-semistructured-and-indepth-interviews> (retrieved 28/03/2012)
- Suhr KA, Hernandez D A, Grimes D, Warschauer M (2010). "Laptops and Fourth-Grade Literacy: Assisting the Jump over the Fourth-Grade Slump." J.Techno., Learning, and Assessment 9(5)
- Teachers' experiences of OLPC at the Blackwood School in Haputale Blackwood_OLPCSchool_TeacherTeam.mp3 (Feb 2011)
- Teachers' experiences of OLPC at the Palmunai School in Ampara PalmuniaOLPC_TeacherTeam.mp3 (Mar 2011)
- Teachers' experiences of OLPC at the Seelaratna Vidyalaya School SeelaratnaVidyalayaOLPCSchool_TeacherTeam.mp3 (Mar 2011)
- Teaching sessions interrupted by the Muslim midday prayer Palmunai_MiddayPrayer.mp3 (Mar 2011)
- Tedre M, Hansson H, Mozelius P, Lind S (2011). "Crucial Considerations in One-to-One Computing in Developing Countries", IST-Africa 2011, May 2011, Gaborone, Botswana
- The eVillage Model for one-to-one computing eVillage_Interview.mp3 (Mar 2011) (Manager and teacher in a one-to-one computing eVillage)
- The Muslim Language Situation KaleelRahuman_OnMuslimsAndTheTamilLanguage.mp3 (Feb 2011)
- The Principal's Perpective at the Palmunai School in Ampara S_Lahir_PalmunaiOLPCSchool.mp3 (Mar 2011)
- The Sri Lankan way of implementing One Laptop Per Child Gunadasa, N. SriLankanOLPC.mp3 (Mar 2011)(OLPC initiative responsible at the Sri Lankan Ministry of Education)
- Unwin T (2010). "OLPC and the East African Community" Tim Unwin's Blog 29/04/2010. (retrieved 28/03/2012) from

Appendix A: The Visited Schools

