

‘Kids on the tab’: Kenya National Library Service’s Tablet Computers Project for slum school children

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Abstract:

In Kenya, as elsewhere, Information and Communication Technologies (ICT) have become essential tools in all aspects of life. The education system has a major role to play in providing the ICT knowledge and skills citizens need, and this is reflected in school curricula across Africa, which increasingly include technology studies, technology or ICT as formal, examinable school subjects. In Kenya, the basic and secondary curricula offer a variety of technology and computer studies options. However, technology roll-out has been slow, and schools do not have enough computers or Internet connectivity to keep up with demand. The reasons are many: distance; cost of computers and Internet connections; poor electricity and telecommunication infrastructure. Also, there is resistance by some school managers who fear introducing computers because of maintenance and other costs, and teachers who lack confidence and computer and technology teaching skills.

This paper considers the experience and impact of Kenya National Library Service / Kibera Library’s e-learning tablet computers project for slum school children, supported by Electronic Information for Libraries (EIFL) Public Library Innovation Programme. The project uses ICT to equalize opportunities for children of poor families to interact with technology. By pre-loading tablet computers with educational content related to the school curriculum, the project also aims to support classroom teaching across all school subjects (language, science, mathematics, etc.) and to help children improve their marks. The paper discusses implementation of the project, how librarians overcame challenges, including initial resistance from school heads and teachers, and the need to meet children’s other basic needs – for food, for quiet space to rest, and a safe place to play – for successful implementation. The paper also considers the impact of the project, which has inspired a love of reading among children, increased the numbers of young library users and contributed to improved school results. It argues that the Kibera community library’s experience offers a cost-effective, efficient and replicable model for bringing ICT to marginalized children.

Key Words: ICT, curriculum, education, slum, knowledge, technology.

Introduction

Like many countries in Africa, Kenya is rapidly integrating information and communication technology (ICT) into its economy. This is captured in the long-term national planning strategy document, Kenya Vision 2030, which emphasizes the role of schools, technical colleges and universities in providing ICT training to meet future skills needs, and the need to improve knowledge of mathematics and science.¹ In line with the Kenya Vision 2030, school curricula increasingly include technology studies or ICT as formal and examinable school subjects.

In Kenya, the basic and secondary curricula offer various technology and computer studies options. Nevertheless, technology roll-out to schools and teaching of these subjects has been slow. Reasons for this are many: distance and poor roads make technology roll-out difficult, especially in rural areas; computers are expensive; school internet connectivity are non-existent or unreliable; similarly, many schools do not have electricity or struggle with frequent power blackouts. Some head teachers block introducing computers to classrooms, fearing high maintenance and other costs; teachers themselves lack technology skills, or technology teaching skills.

Through a variety of ICT programmes, knls is supporting efforts to put Kenya on the path towards becoming a knowledge economy, by providing access to digital technology, the Internet and ICT and e-literacy training. One of these programmes is an ICT project for children and youth in Kibera, a giant urban slum bordering Nairobi, the capital of Kenya.

Families in Kibera live in poverty in shacks made of wooden and mud. Schools are under-resourced and most classrooms do not have electricity. Poor education means children struggle to pass national exams; lack of access to ICT disadvantages these children in the job-markets that increasingly demands ICT skills. School students lack space at home to study, do homework, and space to play during their leisure time.

The Kibera tablet computers project is the first of its kind to be offered by Kenya National Library Service, which has 59 branches. The project was launched in 2012 with funding support from the [Electronic Information for Libraries \(EIFL\) Public Library Innovation Programme \(EIFL-PLIP\)](#)², and is implemented in partnership with the educational agency, [eLimu](#)³.

Named ‘Kids on the Tab’ by young learners, the project uses tablet computers pre-loaded with material linked to the school curriculum to teach children ICT and e-literacy skills and to improve their knowledge of school subjects like science and mathematics. It also aims to encourage disadvantaged children to use technology to advance their learning, and to see the value of technology to their future careers.

¹ URL:http://www.vision2030.go.ke/cms/vds/Popular_Version.pdf (visited April 23, 2014)

²EIFL is EIFL is an international not-for-profit organisation dedicated to enabling access to knowledge through libraries in more than 60 developing and transition countries in Africa, Asia, Europe, and Latin America. Learn more at www.eifl.net.

³eLimu is a non-governmental organization promoting ICT in education, based in Nairobi. See <http://e-limu.org/>

Why the library chose tablet computers

There were a number of reasons for the choice of tablet computers: they are cheaper than laptops and desktops; their size means they are easy to store securely; they are modern and attractive. They are light for the children to hold and carry. The tablet interface is similar to that of a smart phone, of which some children have experience. Kibera library does not have many power connections, or space for desktops and laptops. Tablet batteries, once charged, run for long periods.

The tablets are used in the library and they are never lent out to users. Concerns about lending are that the laptops may be stolen or lost, and there is potential for poor handling by unskilled friends and family members. In the library, the children soon learnt how to access pre-loaded educational material, including puzzles, quizzes, video and animations, and could work on their own or in groups, without much supervision.

Kibera: “Kids on the Tab”

“Kids on the tab” is a name which was introduced by a specified group of Kibera children and youth who were involved in the tablet learning project. The tablet project began in June 2012, and the library was launched in September of the same year.

The library’s main implementing partner, the educational agency eLimu, started through [iHub](#), which is an NGO which promotes technology talent and skills in Kenya. The library chose to partner with eLimu because it develops and provides educational content and uploads it onto tablets. Content is approved by the Kenya Institute of Education curriculum development department and elimu regularly updates the educational materials.

eLimu’s content combines learning with fun, and includes lessons and revision content for all 6 Kenyan Certificate of Primary Education (KCPE) subject areas⁴. It includes 3D animations to help students grasp complex concepts; animated teacher characters who give tips and tricks, and a variety of games, songs, puzzles and quizzes to improve cognitive thinking, memory and focus skills.

eLimu content also includes information on issues aimed at promoting responsible citizenship and sustainable development, for example, environmental conservation; civics and human rights; agriculture, community development and business and entrepreneurship.

Goals of the project

Initially, the project aimed to serve children aged 12 to 14 years, but it became so popular that many other children joined.

The project's overall goals were to:

- Develop students’ basic computer skills.
- Realize their talents in using ICT.
- Improve students' class performance through the interactive programmes using ICT

⁴The KCPE examination takes place at the end of primary school and determines entry to secondary school.

- and engaging eLimu programmed content.
- Create awareness and attract children to learn more about ICT at Kibera community library through using the tablets
- Connect slum children to the world.

Initial Preparations

The team (librarians and staff of eLimu) designed application forms to register schools. They surveyed and selected schools to take part in the project. The team also designed colorful informational posters, flyers and stickers for distribution to schools, and students were encouraged to distribute the materials to raise awareness about the project in the community.

Schools Invited for Training

The following schools were selected for training: Soweto Academy, St. Monica, Talent Academy, P.C.E.A Lang'ata, Kindstar Academy, Horwick Primary School, Hope Academy, Imani Primary, Lan'gata West Primary School, Anajali Primary School, Soda Primary School, St. Christine's Primary School, Ngei Primary School and St. Charles Lwanga.

Training

Training took place on Saturdays. Some head teachers supported training by releasing students from extra Saturday tuition, arguing that the library's tablet computer project was benefiting students. Some teachers accompanied their students for training, because they also wanted to learn how to use the tablets.

On the first training, there were 30 students from six schools who went through the training which were: St. Charles Lwanga, Anajali primary, St. Christine's, Soda academy, Ngei primary, and Lan'gata West primary. The training focused on the basics since most of the students had never seen neither used tablets before. They received trainings on basic operations such as: typing using the on-screen keyboard, navigating to and from various functions, applications and Internet use. By the end of the lesson, the students could quickly locate applications from the homepage, select different functions from the menu and use the Internet.

The Google and Wikipedia functions are very popular with the students since they realized they can obtain information on any topic. Google maps are also popular since students learnt that they can locate countries, capital cities, towns to mention but a few. Students were having fun with the tablet camera especially when learning how to snap photos and make video clips.

The first Game Show was fun and engaging, especially when the children were competing to perform various tasks they had learnt. The tasks included:

- Solving math puzzles in record time
- Solving crossword puzzles in record time
- Searching for synonyms using the dictionary application
- Finding information through Google
- Locating countries and their capital cities using Google maps.

The most enthusiastically performed task was a version of 'Charades', where students took photos that depicted scenarios of friendship, bravery and courage. The students had quiz

shows and winners received prizes to allure them to participate actively. These created an environment for competition whereby the other students were encouraged to perform better in the next game shows competitions. Through the exercises, librarians quantified the progress the students were making in accessing information from the Internet using the tablets. The biggest achievement was the fact that in one week, they had moved from never having used computers to navigating them with ease and even using the Internet. Their typing skills also improved, they could type faster, switch from upper to lower case and perform other functions on the keyboard.

The second phase of training was curriculum-intensive; focusing on the eLimu application's for example science, English and mathematics curriculum. The students were guided through the science topics, calculating mathematics and watching video clips accompanying each topic. The science videos are innovative, unique and engaging for the kids as they learn. This is usually supported by the fact that the students recall most of the information they have garnered from the videos and recite facts and figures accurately at the end of the lessons. The visual and auditory materials definitely enrich the learning process.

After the trainings questionnaires were administered to students in the last session. The simply-designed questionnaires were used to collect data about the children's perceptions of the project. The project coordinators explained the concept of questionnaires and how they were anonymous as it was the first time for most of the children to encounter such an experience. The students therefore felt free to give their honest views on the project, what they had learnt, the methods of implementation and what they felt could be corrected. The questionnaires were used to assess the project's impact in order to make it easier, interactive and more student- friendly.

Achievements

There has been remarkable improvement in the education standards of pupils participating in the Kibera tablets Project. This is based on testimonies from the teachers and children who attended the trainings for example: *"This was the chance of a lifetime. We learnt how to Google, to do research, take photos and we could get access to all school subjects. We learnt through solving puzzles and doing tests, like test-yourself mathematics. The project helped me improve my academic progress."* - Albert, Class 8, Anajali School, Kibera. A teacher who also attended the trainings said that: *"Since the students attended tablet computer trainings, they have shown great improvement, particularly in English, and this has influenced their other subjects, as noted by various teachers."* – Lawrence Wanji, a teacher, from Tumaini Church and Hope Academy Elementary School, Kibera.

The first group of thirty students who were randomly selected went through the project and they continued visiting the library to use tablets for their revision. The school head teachers were requested to forward the performance of the children before the project started which were used as the baseline for evaluation. The pupils sat for their KCPE examination in the year 2013 and their performance showed tremendously improvement, as seen in the table below:

Marks of Children who were selected randomly for training

No.	Name	Name of School	Marks Before Training	Marks After Training
1	AA	Anajali Primary	370	404
2	BA	Anajali Primary	365	397
3	CA	Anajali Primary	280	304
4	DA	Anajali Primary	380	411
5	EA	Anajali Primary	295	398
6	AN	Ngei Primary	380	406
7	BN	Ngei Primary	320	368
8	CN	Ngei Primary	321	347
9	DN	Ngei Primary	311	325
10	EN	Ngei Primary	195	267
11	AS	Soda Primary	325	360
12	BS	Soda Primary	311	350
13	CS	Soda Primary	310	347
14	DS	Soda Primary	210	254
15	ES	Soda Primary	185	245
16	AL	St. Charles Lwanga	297	310
17	BL	St. Charles Lwanga	220	267
18	CL	St. Charles Lwanga	210	219
19	DL	St. Charles Lwanga	249	290
20	EL	St. Charles Lwanga	230	242
21	AC	St. Christine Education Centre	320	337
22	BC	St. Christine Education Centre	298	302
23	CC	St. Christine Education Centre	231	295
24	DC	St. Christine Education Centre	295	337
25	EC	St. Christine Education Centre	298	316
26	AW	Lang'ata West Primary	370	407
27	BW	Lang'ata West Primary	367	403
28	CW	Lang'ata West Primary	385	401
29	DW	Lang'ata West Primary	359	395
30	EW	Lang'ata West Primary	369	388

To dig deeper into the analyzes of children performance, we have used statistical methods to examine school marks, specifically t-test method, which allows to determine if two sets of data are significantly different from each other. We used with method to analyze variance (ANOVA) and we choose this method as our sample was 30 cases only (the t-distribution is normally used when n is 30 or below).The study is comparing the mean score before and after the use of tablets. The t-Test distribution (statistics) is used to analyze the variance (ANOVA). Table below reflects performance through statistical analyses.

t-Test: Two-Sample Assuming Equal Variances

	Marks Before Training	Marks After Training
Mean	301.8666667	336.4
Variance	3740.11954	3410.868966
Observations	30	30
Pooled Variance	3575.494253	
Hypothesized Mean Difference	D	
Df	58	
t Stat	-2.236743006	
P(T<=t) one-tail	0.014581256	
t Critical one-tail	1.671552763	
P(T<=t) two-tail	0.029162511	
t Critical two-tail	2.001717468	

For the results to be valid, we need to make sure that the assumptions for the t-test hold, namely that the difference measures are normally distributed or at least reasonably symmetric.

Let x = the difference in performance after the tablets project. The null hypothesis is:
 $H_0: \mu = 0$; i.e. any differences in performance is not due to tablets.

We can make the following calculations using the difference column D:

$$t_{obs} = -2.236743006$$

$$t_{crit} = \text{TINV}(\alpha, df) = \text{TINV}(.05, 58) = \pm 2.001717468$$

Since t_{obs} is beyond t_{crit} we reject the null hypothesis and conclude with 95% confidence that the difference in performance before and after the project is due to the use of tablets. Alternatively we can use the p value to perform the analysis as follows:

P-value = 0.029162511 < 0.05 and so once again we reject the null hypothesis.

The above information points out that ICT is a significant contributory factor in the raising of standards of achievement of pupils in schools. This is because the pupils who participated in the project achieved better results than pupils who were not trained. Students that made good use of the tablets in accessing the curriculum of all subjects tended to have better achievement in the subject than other pupils. The pupils' marks continued to improve as they regularly used the tablet computers and it is evidently seen in the table above. Also Socio-economic circumstances and prior performance of pupils were critical before training but improved after training. The students who visited the library often improved in the use of ICT resources and achieved better results in English, Mathematics and Science than those who did not use the resources.

The pupils also improved writing skills, grammar, presentation, spelling, word recognition and volume of work. Also their age-gains in mental calculations and enhanced number skills improved tremendously for example the use of decimals. The pupils also acquired better data handling skills, increased ability to read, interpret and sketch graphs improvements in conceptual understanding of Mathematics (particularly problem solving) and Science (through use of simulations).

The tablet computers motivated pupils to learn. This is because ICTs such as videos, television and multimedia computer software that combine text, sound, and colourful, moving images are used to provide challenging and authentic content that will engage the pupils/students in the learning process. The tablet computers with Internet connectivity increases the learner's motivation as it combines the media richness and interactivity of other ICTs with the opportunity to connect with real people and to participate in real world events.

Mean Scores for Schools which Participated in the Training

No.	Name of School	2010	2011	2012	2013
1	Anajali Primary	243.53	242.17	287.49	337.51
2	Ngei Primary	245.13	242.87	350.17	356.25
3	Soda Primary	190.45	193.35	220.17	290.25
4	St. Charles Lwanga	193.95	221.89	240.81	363.68
5	St. Christine Educ. Centre	242.46	246.72	262.58	268.46
6	Lang'ata West Primary	351.95	342.35	360.55	363.16

The mean scores show improvement of the schools where the participants were drawn from especially for the two years when the pupils were being trained i.e 2012 and 2013. They also continued using the tablets in the library during library lessons, tablet hour and on Saturdays during free time. This can partially be attributed to the improvement of the participants.

The pupils have also developed their information technology skills. Their exposure to these electronic gadgets and how they operate continues to enhance their appreciation of innovation and technology development, as most of them had not used a computer before. Knls Kibera Library serves multicultural communities in the slum and it's a home to over a million people, where schools are under-resourced and most do not have electricity.

The library's popularity has risen sharply. The project has increased community use of the library, with many children wanting to use the tablets to access the digital educational materials and games, which include puzzles and stories. This has captivated the interest of children to constructively use most of their free time in the library.

After teachers attended a three day workshop organized by knls Kibera library, they realized that while some of their concerns were justified, the benefits were greater than their expectations which included:

- The educational materials are customized and teaching process to suit individual students and classes.
- Ability to allow self-pacing for student learning.

- Puts responsibility for learning in the hands of students to control their learning experience.
- Students with learning disabilities, shy, slow, and other reticent behaviors often bloom using technology.
- Learning materials are often updated by elimu
- It's a tool for research, discussion, practice, and demonstration of mastery to allow students and teachers to come at studies from different perspectives.
- Stimulate imagination and curiosity, improving research skills.

The children and youth were introduced to the library system and many of them have become frequent users of the services provided by the library. This has increased the number of library users from a daily attendance of 50 to 350 people per day both children and adults. The ICT based learning promoted the Kibera library and became a centre for local development within the slum settlement.

The project created a mutual relationship between the children and the staff. The children are free with the staff and consult the staff for more information frequently. Also there was greater visibility and awareness of Kibera library due to the interest generated by the project.

The children have gained confidence and are able to navigate the tablets on their own whenever they visit the library and eLimu developed the curriculum contents in partnership with Kenya Institute of Education and Moran Publishers. This eased the work of the librarian because she was left with the work of recruiting the children and marketing the library. The project also assisted knls to develop good partnership with eLimu whereby eLimu also brought in volunteers to assist in training.

In less than a year, the Kibera Tablets Project taught over 120 children how to use the tablets to search for information online and to access eLimu's educational materials contrary to the 50 children who were targeted and planned for when beginning to implement the project.

The project won recognition and Kenya National Library Service has received funding from non-governmental organization, Book Aid International to replicate the same project in three branch libraries that is: Meru (Eastern Province), Wajir (North Eastern Province) and Kisumu (Nyanza Province in western Kenya. *'The replication of this project was inspired by the successful performance of the Kibera Library Tablets Project that was sponsored by EIFL-PLIP in 2012,' said knls Director, Mr Richard Atuti.*

Challenges at Kibera Community Library during Implementation

The trainings took place on the 1st and 3rd Saturday of every month. Securing school participation was a challenge because most schools conduct extra tuition for students on Saturdays. The Outreach coordinator had a hard task of convincing school heads to release students on Saturdays for the project. This challenge was overcome when the project's importance was explained, and some school heads were enthusiastic about sending children to the library. Some schools even sent teachers along with the children to witness the project firsthand.

Initially, the librarians experienced resistance from the teachers when recruiting the students for the project as a result the librarian had to change tactics by organizing and inviting

teachers for a three days workshop to train them about the tablets and its applications. The teachers, who were against the tablets in the library, raised some these concerns:

- The tablet would “take over” the classroom, putting the teacher second.
- Overvaluing technology and undervaluing face-to-face interaction
- Disrupting students
- Over-stimulation, which may lead to sleep deprivation and inability to focus,
- Learning curve for the teachers (and some of the students).
- Doubts in the process of “transforming the teaching experience.”
- Ability and incentive of students to hack the system.
- Privacy concerns, from student personal data to data collection.
- Increase inactive lifestyle.

After the training the teachers embraced the tablets training in the library and later they started requesting the librarian to include more students in the project.

Irregular and inconsistency attendance: The students would sometimes fail to attend sessions, hence being left behind. This was contributed by the head teachers who were not willing to release them from Saturday tuitions. Some children from these schools came on their own on Saturdays and underwent through the training.

There were frequently new faces in the group who would have to be taught afresh every Saturday. This was attributed by students in the project informing classmates and friends who would then prefer accompanying their friends to the library on Saturdays. In addition children in classes 6 and below wanted to join the project. The project implementers had to be flexible and accept an influx of eager students because it was difficult to turn them away.

Some children were faster in learning and navigating the tablets than others. The children who were a bit slow in learning were identified and given more attention although the tablets in the library are only seven yet the number to be trained was overwhelming.

When the project officially ended in March, 2013 the children requesting whether the project may continue because as they learnt new skills they also received snacks whereby they were so happy since some of them confessed not eating anything in the morning before going to school. The snacks were distributed fairly, sometimes even to all the children in the library, which enhanced student attendance to the library. Some of the children were brought by their parents who insisted that the children be incorporated in the project and be taught on Saturdays in order for them to receive the snacks.

The future of the Project

Kibera Public Library is now known in the community as a space where children can both learn and have fun. The number of registered users went up from initial 102 registered members to 1159 members and to the numbers has continued to rise. The daily attendance went up from 50 clients to over 450 clients. Kenya National Library Service continue to fund the Internet connection and the library conducts a ‘Tablet Hour’, including skills training and practice, quizzes and games, for children on Saturdays although there are no snacks which has made the number to go down. The library also hosts training for teachers in schools in the urban slums when there is availability of funds to deepen understanding of the value of the pre-loaded tablet computers and the Internet to classroom learning. Also librarians were trained and four volunteer teachers in order to assist when working with the children.

CONCLUSIONS

From the students' performance and the feedback generated, the project can be considered a success. The students continue to be equipped with knowledge and trained how to utilize the new skills, and also they are requested to teach their fellow students once they visit the library and tell the community at large about the project hence acts as "ambassadors". The students not only learned the importance of the library and how to use tablets, but also how to work as a team, how to interact with others, networking with other students from other schools and making friends, overcoming shyness and speaking publicly with confidence and expressing opinions. The impact the project had on children is therefore immeasurable, goes beyond learning using tablet computers, and cannot be captured just using quizzes and questionnaires.

In the trainings and game shows conducted, the pace of students' progress was amazingly fast. The outreach assistant and the librarian in charge confidently stated that the project worked well by being ahead of schedule due to the quick grasp of children in tablet use, children confidence in exploring the tablets, querying the trainers and participating in the game shows. In the interviews conducted, the students expressed gratitude at the chance given to them to learn with the tablets.

As a result of the project, Kibera library is now seen as a centre for local development within the slum settlement.

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