VIEWS ON ENVIRONMENTAL AND CLASSROOM FACTORS AFFECTING ADOPTION OF INFORMATION AND COMMUNICATION TECHNOLOGY IN SCHOOLS: THE CASE OF THE LAPTOP PROJECT IN KENYA

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DEDICATION

I dedicate this project to my fiancé Brian. Thank you for always believing in me.

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ABSTRACT

This study researched the environmental and classroom factors affecting the adoption of ICT in schools with regard to the Kenyan One Laptop per Child project that the government intends to roll out in primary schools. The objectives of the study were to establish the environmental and classroom factors affecting the adoption of ICT in Kenyan schools and investigate the expectations of key stakeholders regarding the project. The study aimed to inform the implementation policy of the Kenyan program. The study followed the systems theory that ICT in education should be studied through a multi-sectorial approach that considers all key stakeholders as integral to successful integration of ICT in schools. The study used secondary data through an extensive literature review of national ICT programs for schools from other countries to identify success stories and challenges facing the programs to extract recommendations for the Kenyan project. The study utilized a mixed research design to obtain primary data of qualitative and quantitative nature. 143 students from five schools in Embakasi Constituency, Nairobi County were surveyed and key informants drawn from teachers, parents, education officials and civil society actors involved in ICT education programs were interviewed. The key findings of the study were that more preparations are required to effectively integrate ICT in schools, specifically in terms of infrastructural e-readiness, curriculum development and pupil and teacher preparation. Key recommendations include incentives for teachers to adopt technology and a reconsideration of the current one-to-one approach targeting Class 1 pupils to a more cost-effective and equitable model such as shared computer laboratories.

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LIST OF ABBREVIATIONS and ACRONYMS

E-books	:	Electronic Books
E-learning	:	Electronic Learning
ICT	:	Information, Communication Technology
ICT4E	:	Information Communication Technology for Education
ITU	:	International Telecommunications Union
KICD	:	Kenya Institute of Curriculum Development
KCPE	:	Kenya Certificate of Primary Education
MOEST	:	Ministry of Education, Science and Technology
OLPC	:	One Laptop Per Child
UNESCO	:	United Nations Educational Scientific and Cultural Organization

DEFINITION OF TERMS

ICT - Used in this paper to describe various one-to-one computing technologies used in schools such as laptops, desktops, Internet-enabled online learning.

ICT4E - An abbreviation used to describe ICT projects related to education.

One-to-One Computing - This refers to the protocol of providing each individual student with their own computer for educational purposes.

One Laptop per Child - This is the largest and most well-known one to one computing program.

Ubiquitous Computing - Is a form of ICT integration into the curriculum where every student gets a computer for use in school and at home. Students obtain computer literacy, along with traditional subjects.

A universal computing project refers - To the large scope of laptop projects, such as projects intending to give all students in particular countries or regions laptops.

Environmental factors - As used in the study refer to factors within the school and with other actors in the education sphere, the community, and society at large.

Classroom factors - As used in the study refer to factors within the classroom such as infrastructure, pedagogy.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Study

The rapid pace of technological development has resulted in increasingly sophisticated and ubiquitous Information Communication Technologies (ICT). The fast-paced, globalizing world requires its global citizens to navigate computers and other ICTs with ease. Professor Simon Peyton-Jones states the case for ICT for Education (ICT4E) as such: "*Children are taught physics and biology because we live in a physical and biological world. We now live in a digital world and children should be taught how it works*" (Brittain, 2011)[1]. The various efforts in countries around the world, from the United States of America and the United Kingdom, to Kenya and Rwanda, are cognizant of the need to equip children with ICT from an early age. The Kenyan government has stated its commitment to rolling out a national laptop program of 1.3 million laptops in public primary schools in line with Vision 2030's goals of Kenya becoming a digital nation (Ndonga, 2014). Education Cabinet Secretary Professor Kaimenyi reiterated the commitment while releasing the KCPE results on 29th December 2014 as he assured Kenyans that the Jubilee Laptop program was on course; with KSh. 17 Billion set aside in the 2014-2015 budget for laptops purchase, development of digital content and construction of computer laboratories in schools (K24 News, December 29th 2014). Kaimenyi stated that the government was working to ensure digital learning was

[1] Source: http://www.computing.co.uk/ctg/analysis/2110259/education-remains-mired-uncertainty. Accessed 11th September 2014.

embedded into the curriculum, with learners from Class 1 to Class 8 able to use laptops on a one-to-one basis hence ensuring equitable access.

The oft-cited benefit of laptop projects is that the technology improves learning outcomes and academic performance. Friedman (2006) posits that nations need to effectively integrate ICT in their education systems because the knowledge economy is fluid and can affect a country's economy. Harvey (1993) proposed that effective use of ICT in education would be a key factor in determining the future success of a country. The Kenyan government emphasizes that the laptop initiative as laid out in the Jubilee campaign manifesto is crucial to the achievement of Vision 2030. President Uhuru Kenyatta, has reiterated numerous times that the project was not merely a shallow campaign promise of goodies, but a planned, strategic maneuver to equip Kenyan students with 21st century skills: "As far as child-friendly initiatives go, nothing promises greater gains in our time".[2]

Proponents of one-to-one computing suggest early preparation of students for an increasingly digitized working and living environment as one of its major benefits; but opponents disagree that early introduction to computers reaps major benefits for children. A report aired on local news channel NTV in December 2014 indicate that opposition to the Kenyan laptop program stems mainly from its perceived high costs relative to more urgent needs such as poor classroom infrastructure and lack of electricity in most primary

[2] Source: The Daily Nation newspaper of September 3rd 2013. Accessed 13th December 2014 at: http://mobile.nation.co.ke/news/Procurement-of-primary-schools-laptops-underway-Uhuru-Kenyatta/-/1950946/1978140/-/format/xhtml/item/1/-/q6j4n/-/index.html.

schools.[3] An Ipsos Synovate Poll found that 80% of polled Kenyans viewed the program as a misplaced priority as primary schools were not ready for the project due to lack of electricity (Kiberenge, 2014). The government emphasizes the necessity of the program in laying a foundation for an ICT-savvy generation, but opposition stems from public perception that it is frivolous spending for a developing country facing serious educational challenges (Olick, 2013).

Prior experience with ICT in education has demonstrated that integration of ICT into the traditional school curriculum, especially in developing countries, is not always a smooth process (Tabb, 2008). High costs, infrastructural issues, improper training and familiarization of teachers and students, inappropriateness of the technology to local conditions and other factors hinder ICT adoption and integration efforts in developing countries. Cristia et al., (2012) suggest that middle and higher-income countries may benefit from laptop projects provided they lay a good foundation, but poor countries should aim lower. Selwyn and Facer (2013) quote the Indian government stating that '*it would be impossible to justify an expenditure of this scale on a debatable scheme when public funds continue to be in inadequate supply for well-established needs*". The Indian education secretary Sudeep Banerjee stated that India needed classrooms and teachers more urgently than fancy tools, adding that laptops were "pedagogically suspect" (Selwyn and Facer, 2013).

[3] Source: NTV, December 22nd 2014. *Laptops or Classrooms? Pupils at Kanjuul Primary School in Laikipia Study Under Trees.* Accessed 10th December 2014 http://ntv.nation.co.ke/news2/topheadlines/laptops-or-classrooms-pupils-at-kanjuul-pri-school-in-laikipia-study-under-trees/

One Laptop per Child (OLPC) founder Nicholas Negroponte has constantly fought against the perception that poor countries have no business investing heavily in laptops. Negroponte strongly believes that the OLPC program is essential to bridge the yawning digital divide existing between the developed and developing world, and children should not be denied an opportunity to interact with technology due to their economic status (Valiente, 2010). One Laptop per Child projects from other countries, especially developing countries with conditions almost similar to Kenya's, hold valuable lessons on how to successfully implement, what challenges to expect and how to tackle them.

1.2 Problem Statement

Research on integration of technology in education prior to launching large-scale laptop projects is scarce, not just in Kenya but in other implementing countries as well. The dearth of research disadvantages one-to-one computing projects manifold: governments are oblivious to public demands even as they spend large amounts of taxpayers' money, while stakeholders are not sure what exactly to expect from these projects and how to contribute. Without research, both government and citizens lack the necessary knowledge about the intricacies and complexities of projects of such magnitude, and may find it difficult to initiate and sustain them.

The purpose of this study is to investigate the environmental and classroom factors affecting adoption of ICT in schools with a focus on the envisioned laptop project. The goal is to investigate key stakeholders' views about the laptop project in Kenya. Key stakeholders identified in this study are: students, teachers, parents and the community at large, education officials and civil sector actors in the education sector. The study seeks

to understand the core issues related to one-to-one computing projects for primary school students, primarily: the views of stakeholders on ICT adoption and integration in primary schools. The study will also investigate stakeholders' understanding of the benefits and costs of ICT for primary school students. This information will be key to understanding students' capabilities in learning with ICT and how suited younger pupils are to adopting ICT in schools. The overall goal of the study is to provide insights on future implementation of one-to-one computing projects for students in the Kenyan primary school setting.

1.3 General Objective

To examine the environmental and classroom factors affecting the adoption of Kenya's primary schools laptop project from the viewpoints of key stakeholders in Embakasi region of Nairobi County.

1.3.1 Specific Objectives

1. To establish environmental factors affecting the adoption of the one laptop per child project in the study area.
2. To establish classroom factors affecting the adoption of the one laptop per child project in the study area.
3. To investigate the expectations of key stakeholders on the One Laptop per Child project in the study area.
4. To inform the implementation policy of Kenya's One Laptop per Child project.

1.4 Main Research Question

What are the environmental and classroom factors affecting the adoption of Kenya's primary schools laptop project?

1.4.1 Specific Research Questions

The study seeks to answer the following questions:

1. What are the environmental factors affecting the adoption of the one laptop per child project in the study area?
2. What are the classroom factors affecting the adoption of the one laptop per child project in the study area?
3. What are the expectations of key stakeholders on Kenya's primary schools laptop project?
4. What policy recommendations can we derive from the study to ensure successful implementation of Kenya's primary schools laptop project?

1.5 Justification for the Study

Research on e-readiness in Kenyan schools is a prerequisite for successful integration of ICT in the classroom. Existing research on laptops in classrooms focuses on the developed world where e-learning is an established trend, and findings are not always applicable to a developing country (Toyama, 2010). Therefore as the country remains poised to embrace e-learning, there is a dearth of research to guide the process. The study is therefore important as its findings will be useful for policy makers and practitioners on policy design. The comprehensive literature review in this study explores the lessons

Kenya can learn from the developed world and from developing countries that have already implemented large-scale laptop projects to guide our first major deployment of laptops in schools. The study will also contribute to the body of knowledge on ICT in schools that is bound to grow as the field takes hold in Kenya. Overall, the study will try to identify thematic areas of concern pertinent to policy formation for large scale ICT integration in schools and open new avenues of inquiry on OLPC projects.

1.6 Scope and Limitation of the Study

The biggest limitation of the study arises from the difficulty of studying an ongoing project. The Kenyan primary schools laptop project is currently underway, meaning that things change from day to day. This may present problems in keeping up with current data and adjusting the research to track and incorporate new changes. The study tackles this by keeping track of trends through newspaper articles, news reports and other media concerning the laptop project and adjusting the study to reflect these changes. Further, the study is also geographically limited in the Embakasi region of Nairobi County given the vast amount of resources that would be required to cover the entire country.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section explores the history of computer introduction and integration in education in the West and the various ICTs in education efforts in Third World countries. It delves into implementation of OLPC in countries that have already taken up such initiatives, focusing on reactions from students, parents, teachers and the public. The literature review makes reference to studies conducted on OLPC projects to gain perspective on stakeholder views, environmental and classroom factors affecting such projects. The review focuses on various ICTs for Education (ICT4E) experiments, the successes and failures, and the challenges of implementing and integrating ICT in education.

2.2 Theoretical Literature

There are various theories on ICT in education, each with a unique approach to the issue. This study will be guided by the Systems Theory. A system is defined as any set of things that affect one another within an environment and form a larger pattern (Von Bertalanffy, 1976). In systems theory, the activities of each system affect each other and are interdependent. Change in one part of the system affects the other parts. Systems theory as applied to ICT in education views the education process as a mechanistic system, and learning as a unique, individual process for each learner. Lim (2002) posits that a holistic, socio-cultural approach should always be utilized when studying ICT in schools. The author points out that ICT cannot be studied in isolation, since many players are involved

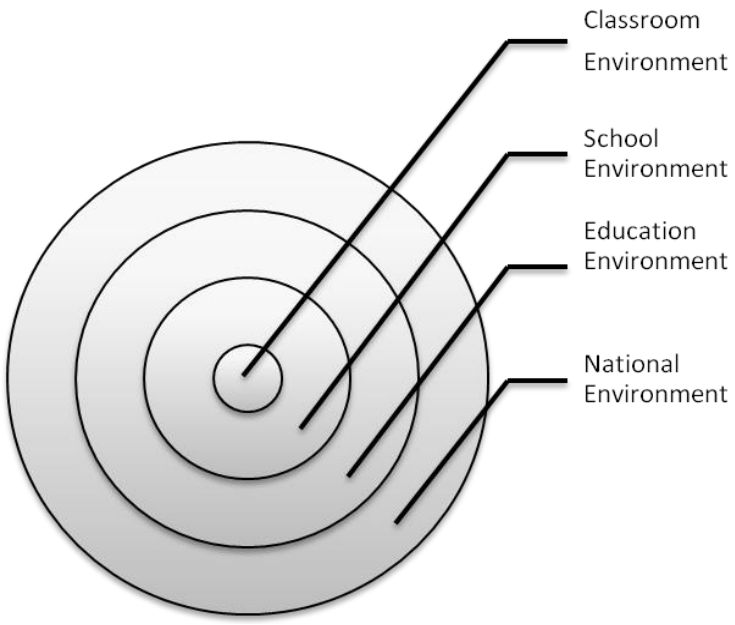
in the implementation of ICT in school. He suggests the need for researchers to study the "*whole configuration of events, activities, contents and interpersonal processes taking place in the context that ICT is used*" (Lim, 2002: 2). According to Papert (1993), ICT has impacted learning in ways its original promoters neither expected nor anticipated. ICT integration therefore affects the curriculum, which has to change to accommodate the new technologies and learning methods. Teacher-pupil interaction also changes as the roles of students and teachers adjust from traditional teacher-centric to new student-centric or technology-centric methods.

Technology has redefined the world and permeated all spheres of life, careers and workplaces have changed from the pre-ICT era, and new professions have been created. Technology has therefore necessitated re-evaluating and re-defining what education is, and what its goals are (Windschitl and Sahl, 2002; Lei, 2012). For instance, literacy can be re-defined to include not just the ability to read and write, but to do so using ICT technology. Navigating today's complex work environment requires skills such as critical thinking, problem-solving, creativity, innovation and communication, skills absent from many traditional curriculums (Windschitl and Sahl, 2002). To remedy this educational challenge, Penuel (2006) introduces a new paradigm of learning termed ubiquitous computing. This paradigm argues that providing ubiquitous access to wirelessly connected computers for students is transformative because it provides an anytime, anywhere learning environment, enabling students to acquire the skills they may lack in a traditional classroom.

Sen (2010) while discussing the impact of mobile technologies on development talks about the various impacts of artefacts on peoples' capabilities. The process of learning has evolved, with artefacts transforming from traditional chalk-and-board to laptops, tablets, smart-boards and other forms of ICT. Wurst, Smarkola, and Gaffney (2008)) emphasize that it is crucial for governments to understand the critical role technology can play in transforming economic and social conditions, especially in poorer countries (LDCs). Oosterlaken (2012) argues that technology expands human capabilities so long as it is embedded into social structures. Wright and Wilson (2005) however argue that technology by itself cannot drive development, dismissing the idea that it can as "technological determinism".

In addition to the systems theory, Cole (1995) proposes a system of "ecological circles" to describe the interdependence of various components in a system. These ecological circles can be applied to the integration of ICT in the education system. Figure 1 describes the holistic environment in which learning takes place using Lim's socio-cultural approach towards the study of ICT in schools. The concentric circles demonstrate each level and the actors involved.

Figure 1: Ecological Circles Illustrating the School Environment



Source: Author, 2015.

The innermost circle is the classroom environment where ICT is being utilized by students and teachers. This circle describes the general learning environment such as the curriculum, methods of assessment, physical layout of the classroom, etc. The next circle, representing the school, takes into account factors such as the location and type of school, type of students, and interaction of ICT between students and teachers. The next circle represents the education system, and key issues to be considered here include policies on ICT training for teachers, curriculum and examination in the new system, and implementation of ICT on a large scale. This area is particularly important as implementation of ICT requires a systematic overhaul to accommodate technology. Of special importance is teacher training as teachers are the ultimate implementers and facilitators of the new teaching methods and their acceptance may determine the success

or failure of such projects. Finally, the outermost circle represents society at large and public perceptions and expectations on ICT implementation schools, including expectations from parents, family, the communities neighbouring the schools and tax-paying citizens who fund school projects.

2.3 Empirical Literature

2.3.1 Overview of OLPC in Education

The OLPC initiative is the first and most famous 'universal' laptop projects (Negroponte, 2007). Founded in 2005 by Nicholas Negroponte of the Massachusetts Institute of Technology (MIT) Media Lab, it introduced the radical idea of 1:1 educational computing. 1:1 initiatives propose that the best way to integrate education efficiently with technology is to ensure each child receives his/her own device (Valiente, 2010). The OLPC laptop is designed especially with developing countries and children in mind. Negroponte refers to the project as "an educational project, not a laptop project," emphasizing that direct access through 1:1 computing is crucial because it provides for collaboration, connectivity and creative approaches to learning (Mangiatordial and Pischetola, 2010). He places major emphasis on the children being left to explore the devices on their own, with minimal intervention from teachers, believing that children are more apt to learn through the process of discovery than through traditional teacher-led instruction.

OLPC is also unique as the child becomes the sole owner of the laptop, spends more time with the device, takes it home from school and shares it with family members, spreading access to and awareness of technology. OLPC reiterates that meaningful learning takes

place in all spheres, including home (Lei, 2012). The OLPC Mission Statement is that "*OLPC provides a means to an end-an end that sees children even in the most remote of regions of the globe being given the opportunity to tap into their own potential be exposed to a whole world of ideas, and to contribute productively to the world community.*"[4]

2.3.2 Global Experiences of OLPC

This discussion presents an overview of OLPC initiatives and a summary of the major OLPC programs from various parts of the world. In Africa, Rwanda leads in OLPC implementation, aiming to provide all 2.5 million primary school children with laptops (Kiplagat, 2014). At the initial stages of the project implementation, pilot OLPC laptops were deployed in October 2008 through the Give One Get One (G1G1) Foundation and implementation was conducted by the Ministry of Education. A survey of students indicated that the students gained computer and internet skills and benefited from interactive content. They also appreciated the laptops and adapted to technology faster than teachers. So far, Rwanda has deployed 210,000 laptops to 217 primary schools (Cristia et al., 2012). The country is also host to the second international headquarters of OLPC, located strategically in Africa to encourage uptake of the laptops in developing countries (Farrell and Isaacs, 2007).

[4] Source: OLPC Mission Statement, 2010 Accessed 6th May 2015 at: http://laptop.org/en/vision/index.shtml.

Ethiopia was the first African country recipient of OLPC, pioneering the concept of technology "air-drops". OLPC air-dropped and distributed 5000 laptops to 4 schools in remote villages and letting children learn on their own in an extreme form of constructivist learning (Mangiatordial and Pischetola, 2010). OLPC emphasized that teachers were secondary to the laptops in teaching and children learned better by exploring; though they had to include teachers into the program when this mode of teaching failed to produce improvements in test scores (Tabb, 2008). Evaluations found that there was increased motivation for students to go to school. Teachers however reported that they were unable to control classes. This indicated that they practiced instructivist mode of teaching and had difficulty adjusting to constructivist modes. Their reluctance to integrate technology in class restricted use to reading electronic books (e-books) only, hence there was dissatisfaction about integrating laptops; more so because teachers were disappointed that there was no commensurate increase in pay to incentivize them (Nugroho and Lonsdale, 2010).

In Asia, India, Portugal and Turkey implemented ICT initiatives namely: the Aakash project, Magellan Initiative and FATIH (Movement to Increase Opportunities and Technology) with varying degrees of scale and success (Cristia et al., 2012). In Sri Lanka, students were allowed to carry the laptops home, giving the community a sense of ownership. In Nepal, 135 secondary school students who received laptops reported an increase in curiosity, eagerness to learn and a cooperative spirit (Cristia et al., 2012). Teacher surveys indicated that they had a mostly positive attitude towards the laptops, and believed they would help to reduce disparities between private and public schools. There was also an increase in teacher-student interaction, indicating that the teachers had

shifted to a constructivist, student-centered approach. On the negative side, teachers reported a significant increase in workload, and some teachers required longer training periods due to unfamiliarity with that technology.

Compared to Africa and Asia, South America takes a lead in nation-wide laptop programs and bulk orders meant to cater to all primary school children (Cristia et al, 2012). Uruguay, Paraguay, Peru and Brazil are some of the Latin American countries that have launched large-scale laptop programs. Surveys of learning outcomes where OLPC projects have been implemented give mixed results. In Latin America, Brazil was the first country to receive OLPC laptops. After a pilot study in five schools the government extended the project to 300 schools. In Colombia, an evaluation of 100 schools that took part in a large scale Computers for Education program found that though students' computer skills were greatly increased, there was minimal impact on test scores, study hours, perception of school and relationship with peers. The reason for this was that teachers only taught computer skills and failed to wholly integrate ICT into the classroom (Farrell and Isaacs, 2007). Peru was an early and enthusiastic adopter of OLPC program, launching in 2008 with 40,000 laptops in 500 schools. Issues noted in the Peruvian OLPC program include lack of Internet connectivity, which was a major prerequisite for the laptops' full utilization (Cristia et al., 2012).

Still in South America, Uruguay launched a massive OLPC campaign in 2005, becoming the first country to order laptops in bulk (Mangiatordial and Pischetola, 2010). With 400,000 laptops issued to 362,000 students and 18,000 teachers, Uruguay is one of the few countries that have successfully distributed laptops to all primary school children.

The cost of each laptop provided by OLPC is approximately USD250 per child; a fee that includes purchase, maintenance, training and internet connectivity (Warschauer and Ames, 2010). Maintaining the program costs US$21 per child per annum (Erico, 2010). The total cost of the laptop project comes to less than 5% of Uruguay's national budget (Cristia et al., 2012). Teacher training took place before the laptops were issued to the children, making the teachers competent enough to aid the children along in the learning process. However, some teachers still resisted implementation of ICT, with research showing that some teachers do not integrate ICT into their lesson plans (Erico, 2010). Some teachers felt insufficiently prepared to integrate computers because they had not received training.

In Uruguay, the project has witnessed positive impacts and reviews. Because the children are allowed to carry the laptops home, they introduce ICT technology to their families, often for the first time. Students report that the tablets are used by their families for different purposes. For example, siblings use it to obtain and read books or play games and parents use it to videotape and photograph family events, making learning using laptops a family event. Uruguay plans to extend the program beyond primary level to reach preschoolers and secondary school students (Cristia et al., 2012). The country is also keen on sharing its successful implementation strategy on tendering, appropriate software to use, teacher training and monitoring and evaluation with fellow countries aspiring to implement such large-scale projects (Erico, 2010).

2.3.3 Summary of OLPC Experiences

Nugroho and Lonsdale (2010) conclude in their comprehensive literature review of global OLPC projects that OLPC program evaluations are mostly limited to the educational effects of introducing the new technology to classrooms. These evaluations are concerned with educational outcomes as measured by literacy and numeracy skills, test scores, attendance and morale but not the social and psychological effects on the project. In Haiti, Mali and Uruguay, the evaluations that interrogated perceptions found positive attitudes towards the laptops. Community members in Mali and Uruguay had positive opinions of the project, with some parents starting computer classes. For example, in Mongolia, Ethiopia and Peru, student attendant increased significantly. Students in Mongolia, Nepal, Peru and Mali demonstrated attitude changes and were more willing to learn after the laptops were introduced.

In several pilots, teachers showed dissatisfaction with the programs. In Ethiopia, Rwanda, Uruguay, Haiti, Nepal and Birmingham teachers demonstrated unfamiliarity with the constructivist approach to learning that ICT integration requires. They also believed that ICT integration imposed a heavier workload on them. Students in Haiti perceived the OX laptop as a "symbol of opportunity and progress" but there were security issues about the children carrying the laptops to and from school (Nugroho and Lonsdale, 2010). In the Pacific area, communities were concerned about the concept of child ownership.

Cristia et al., (2012) conducted a study in Peru among 319 schools with laptops and concluded that the OLPC program has not led to any measurable academic impact. Though students' computer skills showed improvement, math and language skills did not

improve much. The program also did not impact attendance rates and willingness to do homework. The study attributed the lack of improvement in math and languages to poor teaching methods in Peru schools, suggesting that a pedagogical model incorporating high-quality instruction with computers would improve academic outcomes. This demonstrates the danger of introducing laptops without a firmly established teaching base. Laptops by themselves are not a panacea for education, but can complement a good curriculum and good teachers.

2.4 Stakeholder Experiences

This discussion focuses on how key stakeholders perceive ICT integration in education so as to identify the pedagogical approaches they will use to integrate ICT. Rideout, Foehr and Roberts (2010) recognize that children are at the forefront of the digital revolution, as they lead the charge into a digital world. Reviews generally identify children as faster on uptake of technology compared to teachers and other adults due to their natural curiosity and interest in learning (Penuel, 2006; Ros et al, 2010; Lei, 2012). Prensky (2001) coins the term “digital natives” to describe the younger generation who presumably, having grown up surrounded by advanced technologies, are proficient and at ease with them. Mangiatordial and Pischetola (2010) identify the disparities in technology uptake between adults and children. They attribute it to ICT revolutionizing the way people and information interact. ICTs are ubiquitous now, but new to most adults, unlike children who have grown up in an ICT-infused environment. The intergenerational disparity brings conflict between children exposed to the wide range of possibilities that ICT

presents, and adults who are fixed in their methods and thinking patterns based on analogical instruments.

This attitude, exemplified in Negroponte's wholly constructivist approach, neglects the crucial role adults play in aiding children's learning (Negroponte, 2007). When the devices present a challenge to the children, an adult can troubleshoot, conduct research on the problem and help the child out. In many OLPC projects, full ownership of the laptops by the children means that they are allowed to take the devices home. This forms the basis of the equity argument for OLPC; that is, the projects improve ICT access not just for students, but also for the families and communities in general who get a chance to experience the laptops with the children. In this way, ICT diffusion occurs using the children as conduits who create much larger impacts (Lei, 2012).

Regarding reported experiences by teachers on OLPC projects, the International Telecommunications Union (ITU, 2006) identifies resistance from educators as a major stumbling block to ICT integration. OLPC pilots that failed to centrally involve teachers and offer them training and support reported less positive effects than those that did (Tabb, 2008). Solomon, Resta and Allen (2003) identify administrative support as key to integration, stating that school principals and master teachers must lead by example to garner teachers' acceptance. School heads therefore need to be prepared for the inevitable initial resistance, as the report states that more often than not, teachers and stakeholders such as parents are distrustful of non-traditional, chalk-and-blackboard methods, while other stakeholders such as the taxpaying citizens worry about the high costs of implementing ICT.

Mcgrail (2006) emphasizes the importance of giving teachers greater agency in planning and implementing ICT4E initiatives, curriculum development and integration, and professional trainings and development to make them more at ease with new technology. Teachers need time to learn how to integrate ICT, and a national ICT curriculum is important to ensuring harmonious adoption of ICT in all schools. Without imperatives to fully integrate, teachers may fail to integrate ICT into the classroom (Tondieur, 2007 quoted in Tabb, 2008). Rogers (1995) introduces the notion of early adopters, teachers who adopt new teaching methods faster than their peers. This minority of educators can be used effectively to encourage fellow educators to follow suit. The Kenyan Ministry of Education uses early adopters in its ICT Champions program where a few teachers from every county receive ICT training and are expected to disseminate it to colleagues (Ang'ondi, 2013). These early adopters are also receiving rigorous ICT training in anticipation that they will be "master trainers" to prepare other teachers.

In Kenya, as in many developing countries, learning utilizes a teacher-centered approach. This means that though OLPC adopts a constructivist, learner-centered method of instruction, teachers are still central to integrating the devices and fostering student engagement. Transitioning from teacher-centered to student centered is therefore a long-term affair that requires curriculum review, training and support for teachers. Mcgrail (2006) studies a secondary school with a 1:1 laptop project in place. She found that teachers were ambivalent about integrating laptops in the school due to four major issues:

a) Institution-teacher conflict: teachers may view laptop projects as the institution's project, of which they are mere tools of implementation. They may therefore feel left

out, especially because of the fear of being rendered obsolete by technology. Laptop projects must ensure that teachers feel incorporated into the project.

b) Technology incorporation into the curriculum: Conflict arises due to lack of established digital curriculum; teachers may therefore be unsure of how to use technology effectively in their lessons. In the Kenyan laptop project, a lot of emphasis has been placed on digitization of content, with the Kenya Institute of Curriculum Development (KICD) working hard on creating digital content before the project is launched (KICD, 2014)[5]. Pioneers of technology may be at a loss on how to proceed without previous experience and examples. It is therefore important to have a functional and rich digitized curriculum to make teachers' transition into technology easier.

c) Standardized testing versus technology: Often times, standardized tests such as the Kenya Certificate of Primary Education (KCPE) is paper-based, while content may be digital. This brings about dissonance in teaching and examinations, where teachers wonder whether they are teaching the right things. This uncertainty results in teachers having to make a choice between new technology and the old methods that produced the important passing grades. Teachers may therefore reject technology if it does not work well at first because they are striving to ensure students pass examinations.

d) Professional identity versus technology: Technology brings a new paradigm to teachers, one which they have to adjust to. Teachers may be unsure whether they fit

[5] Source: KICD. (2014), http://www.kicd.ac.ke/images/dsc_0113.jgp. Accessed 23rd February 2014.

above or below technology in this new paradigm. Students' quick uptake of technology may further aggravate teachers' identity loss, creating hostility towards and rejection of technology. Teachers should receive trainings that give them confidence in handling new technology to make them comfortable with the technology. They need to be shown exactly how the technology benefits them and students directly, how it fits into the classroom, and how it makes their work easier.

Besides the students and teachers, there are reported experiences on the OLPC projects from the perspective of the parents. In a study by Pal et al., (2006) where parents were asked if computers should be in schools, homes or both, most chose schools. This is indicative of the common attitude towards education as structured and originating from teachers to students, with parents playing minimal role in education. The parents were also skeptical of the importance of games to children's learning, emphasizing curriculum progression and good exam performance as a bigger concern. Ros et al (2010) note that lessons from developed nations will be pertinent in predicting how technology will affect youth in developing countries, citing the problem of 'over-immersion' into information, communication and entertainment, for example social media addiction. Studies by Penuel (2006) find that most parents' concerns about new technology regard children's exposure to unsavoury material on the Internet such as pornography, child predators and negative peer influence on social media. Reassurance that children will not be exposed to such material can ease parents' concerns. Further, technological adaptations such as Child-Block and Internet-Nanny monitor children's activity on and off-line, and can detect and prevent exposure to harmful content (Lei, 2012).

2.5 Challenges to ICT for Education (ICT4E) Projects

Wagner et al., (2004) identified several challenges to ICT4E projects in Africa. The major issues encountered were: project collapse due to lack of political will and funds, donor dependency syndrome and lack of community consultation. Other challenges to access and use of ICT in education are: high poverty levels, slow and limited pace of rural electrification, and lack of hardware and Internet connectivity (Ministry of Education, 2006). Lack of standardized digital content that is aligned to the curriculum and examinations is also a major challenge. Mulwa (2013) notes that though e-learning technology is relevant to schools, its adoption could face resistance from some schools due to the current curriculum's over-emphasis on examinations and the entrenched, teacher-centered, traditional way of teaching and learning.

Toyama (2010) asserts that the OLPC initiatives rely on 'technological utopianism', a belief that lack of technology is a major hindrance to development, yet many other things such as institutional reforms, economics, basic infrastructure, politics and service provision need urgent attention. The case of ICT4E in Africa is particularly intriguing because ICT4E projects are deeply intertwined with economic, social and political factors. Opponents of OLPC argue that positive outcomes have been minimal at best and no revolutionary effects have been felt, citing the lengthy period of time for schools to fully adopt and transition into technology. Other teething problems include lack of power for charging devices, lack of secure storage facilities and unfamiliarity with technology.

Coordination and collaboration challenges also come up as frequently cited issues. ICT implementation projects often incorporate a large number of partnerships between

government, schools, universities, technical support staff and suppliers. Coordinating and sharing responsibilities among all these partners may pose a challenge (Kraemer, Dedrick and Sharma, 2009). Issues such as lack of Internet bandwidth, software adjustments, frequent changes in support staff and routine computer reconfiguration may result in low implementation success. In India, prohibitive costs restrict a 1:1 computing ratio, and children use shared computers in a program dubbed One Mouse per Child (Nussbaum, 2010). Nussbaum refers to the success of this shared computer program as an example that models other than 1:1 are more feasible as they cost less. It is therefore evident that perceptions of OLPC projects differ, with one camp opposed to the project as unnecessary and wasteful; and the other upholding it as necessary and utilitarian.

2.6 Summary of Literature

The literature review demonstrates the varied and widespread attempts globally to integrate ICT in education. Developed countries are ahead of the curve in implementation, scale and cost, having shifted from school computer laboratories to distribution of iPads, tablets and laptops to students, which they then carry home. This shows that a drop in technology costs makes it more affordable to provide each student with their own device, indicating that there is potential for developing countries looking to implement their own 1:1 computing projects. Developing countries can also learn from the challenges that developed countries already implementing wide-scale projects are facing, such as; technology addiction, lack of concentration by students in class, misuse of technology for inappropriate purposes and a lack of marked improvement in academic

performance. By identifying these challenges early on and seeking ways of mitigating the issues, developing countries will be able to refine their own implementation process.

The literature review also brings out the varied challenges and opportunities for different stakeholders. For students and teachers, the shift in the learning process from teacher-centric to learner centric remains the key issue for a culture that has ingrained a fixed pattern of learning for many years. This contributes to the negative perception of ICT as not having a major impact on scores, as learning is still measured using traditional methods. Other stakeholders such as the government are primarily concerned with implementation issues such as cost, training, curriculum shift and monitoring and evaluation of national ICT projects. Parents' major concern is the impact of ICT on their children, especially exposure to the Internet and unsafe materials. There is also a divergence between the perceptions and expectations of the younger stakeholders, that is, students, considered digital natives, and the older generation. While students are primarily excited at the opportunity to use technology in their everyday life, literature indicates that adults may be reluctant, in some cases, even unwilling, to learn about technology and make the changes requisite to ICT integration.

Research on the views and expectations on ICT integration in Kenyan primary schools, especially from the students, teachers and parents' perspective, is scarce. Some of the research gaps include: what exactly are the benefits that the technology will provide for students and teachers? How does the government intend to identify, recognize and tackle the challenges to ICT integration especially in regards to cost and pedagogy shift? What do the stakeholders expect from the project and are their expectations feasible? How do

the various stakeholders in the education sector perceive the class one laptops project? The study will attempt to answer these questions, and provide answers that could inform the implementation of Kenya's laptop program.

CHAPTER THREE

METHODOLOGY

3.1 Introduction

This section discusses the methodology that was applied in the study. The first section describes the research site. This is followed by an overview of the research design in the second section. The third section discusses the unit of analysis, population and sampling techniques. Data sources and collection methods are presented in the fourth section. Section five describes data processing and analysis and the last section presents ethical considerations of the study.

3.2 Study Site

The study site was Nairobi County. The choice of Nairobi County was informed by its diverse respondent base due to its urban population and wide demographic profile that largely mirrors Kenya's diverse ethnicities and cultures. Nairobi also stands to benefit greatly from the project as it has 205 public primary schools[6]. Nairobi County has also set a precedent for implementation of the Laptop project for the rest of the country. It has already trained 760 teachers in ICT ahead of the national laptop project becoming the first county to have ICT-equipped teachers in all primary schools (Okoth, 2014). The training, which began in January 2014, trained a principal, Class One teacher and one other randomly selected teacher from each school. These teachers provided a rich

[6]Source: https://opendata.go.ke/Education/Kenya-Primary-Schools/p452-xb7c accessed December 15th 2014.

respondent base especially as they already have exposure and familiarity with ICT4E. The study was conducted within Embakasi region. Embakasi region is divided into five electoral constituencies, namely: Embakasi North, Embakasi South, Embakasi East, Embakasi West and Embakasi Central.

3.3 Research Design

The proposed study adopted a mixed research design. The study comprised of a survey of primary school students, five Focus Group Discussions (FGDs), and around 24 key informant interviews to assess stakeholders' views on the laptop project. Focus Group Discussions were held with young students in Class One and Two to obtain qualitative data on their opinions regarding the envisioned laptop project that targets them. Quantitative data was collected from older students in Class Seven through closed-ended questionnaires. Class 7 was selected as they are older hence were able to provide detailed information and also for convenience as Class 8 students are usually busy preparing for national examinations hence may be inconvenienced by interruptions. Questionnaires for Class 7 were designed in an easily answerable manner; for example the Likert Scale was simplified as the respondents were young and were not unaccustomed to questionnaires. More qualitative data was collected from teachers, parents and key informants in civil society and the Ministry of Education through a structured interview. An interview guide was used to garner qualitative data about different aspects of the laptop project.

Constructing a proper research design for OLPC projects was challenging. For instance, different stakeholder groups hold differing views. The research design mitigated these challenges by recognizing the uniqueness of the study and the novelty of the research

topic. The study framed questions and responses in a bias-free manner. Emerging themes were analysed to reflect on and answer the questions posed about peoples' views and expectations on the laptop project.

3.4 Study Population and Sampling Design

Five schools in Embakasi region were selected for the study. Purposive sampling was done from a list of the schools in the region to ensure a better capture of the demographic, socio-economic and other variations. This promoted diversity in the range of respondents. The study specifically targeted day primary schools funded by the government. From these, five schools were selected from the five different electoral wards. The schools selected for the study were: Donholm Primary School in Embakasi Central, Tumaini Primary School in Embakasi North, Unity Primary School in Embakasi South, Edelvale Primary in Embakasi West and Kifaru Primary School in Embakasi East. FGDs were held with children in Class 1 and 2. These classes were picked as they conveniently captured the targeted demographic characteristics of beginners. Upper Primary students' in Class 7 opinions were collected through survey method.

Structured questionnaires were distributed to 30 randomly selected students in each school for a total of 143 respondents in Class 7 so as to garner a wide range of perspectives on views and expectations of the students about the laptop project. An interview guide was used to gather qualitative data from teachers and parents. Two teachers from each school were interviewed for a total of 10 teachers. Two parents from each school's neighborhood were also interviewed for a total of 10 parents. For each school neighbourhood, the study targeted a parent with a child in Class One while the

other parent was required to have a child in the upper primary school. The study also targeted two Ministry of Education officials and two civil society actors in the education sector, on the key issues mentioned above to gain further insights on the laptop project.

3.5 Data Sources and Collection Methods

The study utilized data from both primary and secondary sources. A comprehensive desk review of existing literature on previous ICT projects provided background information on the range of views and expectations with respect to the laptop project in schools. This data was gathered from published books, journals, government reports, theses, policy briefs, discussion papers, media reports and opinion surveys. To gather primary data, the study used a survey of around 143 students drawn from Class Seven spread across five schools within Embakasi region. Other sources of primary data were from FGDs with students from both Class One and Two, and finally key informants drawn from teachers, parents and other actors in the education sector. The information derived from the review also provided context for interpretation of interview and observational data.

Table 1: Data Needs Table

Research Question	**Data Needed**	**Type Of Data**	**Sources Of Data**	**Instruments**
1. What are the environmental factors affecting the adoption of the one laptop per child project in the study area	Environmental factors affecting Kenya's laptop project e.g. - Implementation policy - Level of preparedness i.e. training and digital curriculum - Security issues on the laptops - Perceived costs - Project prioritization against other needs in the education sector	Qualitative and quantitative	Students, teachers, parents, key informants in civil society and Ministry of Education officials	Questionnaires, FGD guide, Interview Guide

2. What are the classroom factors affecting the adoption of the one laptop per child project in the study area	Classroom factors affecting the adoption of ICT in learning e.g. - Enhanced teacher training on ICT - Provision of supportive infrastructure such as power - Targeting of the project	Qualitative and quantitative	Students, teachers, parents, key informants in civil society and Ministry of Education officials	Questionnaires, FGD guide, Interview Guide
3. What are the expectations of key stakeholders on Kenya's laptop project?	Expectations on Kenya's laptop project e.g. - Sustainability issues - Expected benefits i.e. improved learning outcomes - Misconceptions about the project	Qualitative and quantitative	Students, teachers, parents, key informants in civil society and Ministry of Education officials	Questionnaires, FGD guide, Interview Guide

3.6 Data Analysis

This study used both qualitative and quantitative data. The quantitative data was generated through a survey of 143 students in Class Seven across five schools in the study area, key informant interviews and FGDs. Survey data was analysed using descriptive statistics such as frequency distributions and cross tabulations. This was enriched using data from the FGDs and key informant interviews that were transcribed, and analyzed in view of the emerging themes and patterns relative to the study questions.

3.7 Ethical Considerations

Since a large section of the proposed study targeted the minors, it was necessary to seek informed consent through the school administration and where needed, the parents. All participants were assured of confidentiality and anonymity of responses given. The participants read and understood the consent forms before data collection began. Participation in the study was voluntary. The research questions took utmost care not to infringe on respondents' emotional and psychological well-being.

CHAPTER FOUR

FINDINGS AND DISCUSSION

4.1 Introduction

This chapter presents the findings from the data gathered from respondents involved in the study. It presents data collected in schools from the students' survey, focus group discussions along with data collected from key informants drawn from the teachers, parents, relevant civil sector organisations and the Ministry of Education. The data collected sought to answer the research questions namely: to establish the classroom and environmental factors affecting the implementation of ICT in the classroom with regards to the laptop project and to investigate the expectations of key stakeholders on the laptop project. The overall goal of the study is to provide insights on future implementation of one-to-one computing projects for students in the Kenyan primary school setting. The chapter discusses the findings as follows: characteristics of respondents, classroom factors, environmental factors and expectations of stakeholders.

4.2 Characteristics of Respondents

This section focuses on the characteristics of the respondents with a special focus on the survey respondents including their geographical location in terms of constituency and electoral ward, gender and age. The students in the survey were drawn from five schools in five electoral wards in Embakasi Constituency. The geographical distribution of the students surveyed is shown in Table 2.

Table 2: Distribution of Students According to Electoral Wards

Electoral Ward	Frequency	Percentage (%)
Kayole	29	20.3%
Umoja I	28	19.5%
Umoja II	30	21%
Imara Daima	26	18.2%
Lower Savanna	30	21%
Total	**143**	**100%**

All of the 150 students surveyed were in Class 7.[7] The ages of the students are presented in Table 2.

Table 3: Respondents by Age

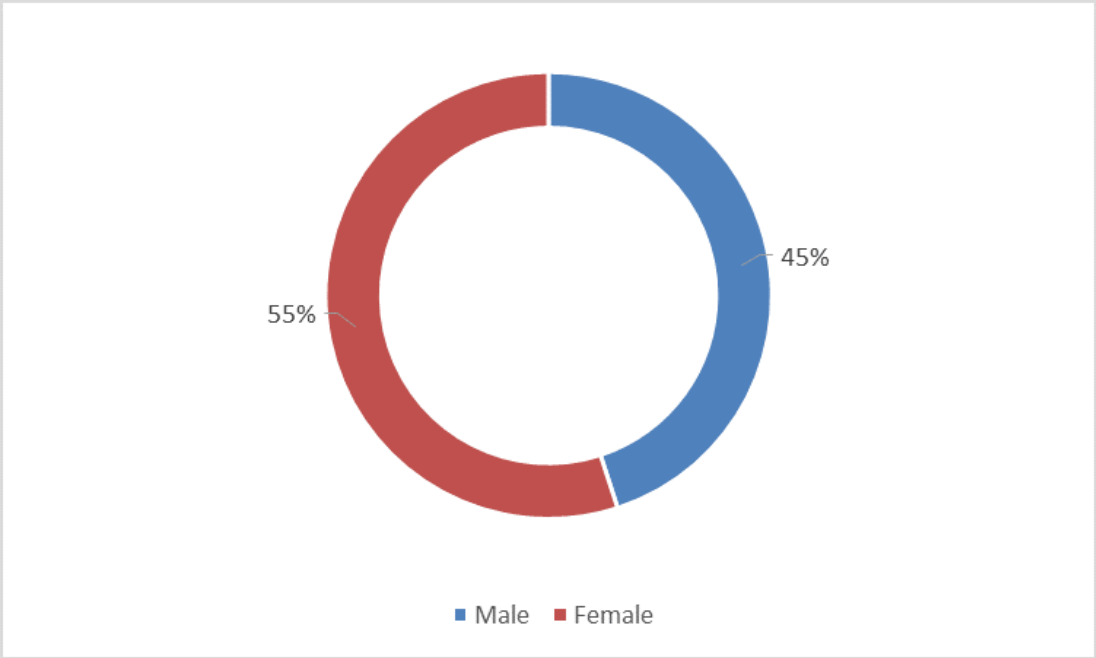
Age in Years	Frequency	Percentage (%)
12	17	12.9%
13	68	51.5%
14	42	31.8%
15	4	3.0%
16	1	0.8%
Total	132[8]	100%

[7]Out of the 150 students surveyed, 7 students failed to return their questionnaires, hence the figure of 143 is based on the response rate.

[8] In the compilation of ages, N=132 because 11 students failed to indicate their age on the questionnaires provided. Students were not required to indicate their age if they declined to write it down as this would violate their right to respond only to the questions they chose to answer.

51.5% of respondents were aged 13 years. 31.8% of students were aged 14 years, while 3.8% were aged 15 years and above. The median age of respondents was 13 years, which is the standard age of students in Class 7. The study established that 54.5% of student respondents were female while 45.5% were male.

Figure 2: Distribution of Survey Respondents by Gender



73 (55%) of the students who identified their age were female while 59 (45%) were male. The majority of students were aged 13 years, with 41 female students, while 27 male students were similarly aged 13. There were 23 female and 19 male students aged 14 years, 9 female and 8 male students aged 12 years and 5 male students aged above 15 years.

Table 4: A Cross-Tabulation Between Age and Gender of the Study Respondents

Age in Years	Gender		Total
	Girl	Boy	
12	9	8	17
13	41	27	68
14	23	19	42
15 and above	0	5	5
Total	**73**	**59**	**132**

Note: The figures in the table are absolute numbers

Although the study strove to achieve gender balance, more female students were involved in the survey compared to male students. In Kayole ward, 14 females and 15 males were surveyed. In Umoja I, 18 females and 10 males were surveyed with the female students participating outweighing the males. Similarly in Imara Daima ward more female students were involved with 16 female students taking part compared to 10 male students. The number of male and female students surveyed in Umoja II and Lower Savanna was equal with 15 students of each gender surveyed in both schools.

Table 5: A Cross-Tabulation between Electoral Ward and Gender of the Respondents

Electoral Ward	Gender		Total
	Girl	Boy	
Kayole	14	15	29
Umoja I	18	10	28
Umoja II	15	15	30
Imara Daima	16	10	26
Lower Savanna	15	15	30
Total	**78**	**65**	**143**

Note: The figures in the table are absolute numbers

In Kayole ward most of the students were aged between 13 and 14 years, with 12 students in both categories. Two students were aged 12 and 15 and above respectively. In Umoja I ward the majority of students were aged 11 while 8 students were aged 8 years. 5 students were aged 12 years while one student was aged 15 years and above. In Umoja II a majority of students were aged 15 years while 9 students were aged 14. 5 students were aged 12 years while 1 student was aged 15 years and above. Imara Daima ward had 13 students aged 13 years, 6 students aged 14 years, 3 students aged 12 and 2 students aged 15 and above. Lower Savanna had 17 students aged 13 years, 7 students aged 14 years, 3 students aged 12 years and no students aged 15 years and above.

Table 6: A Cross-Tabulation between Electoral Ward and Age of the Respondents

Electoral Ward	Age (Years)				Total
	12	13	14	15+	
Kayole	1	12	12	1	26
Umoja I	5	11	8	1	25
Umoja II	5	15	9	1	30
Imara Daima	3	13	6	2	24
Lower Savanna	3	17	7	0	27
Total	**17**	**68**	**42**	**5**	**132**

Note: The figures in the table are absolute numbers

In addition to the student survey, there were key informants interviewed to provide in-depth data to answer the research questions. These key informants included 10 teachers from the five schools in the five electoral wards surveyed and 10 local parents sourced from the 5 electoral wards surveyed. Four of the parents interviewed had Bachelors' degrees, 4 had Diplomas, one was a certificate holder while two were educated to Form Four level. Their professions were diverse and included businessmen and women, accountants, social work and the medical industry. Five Focus Group Discussions (FGDs) were also conducted with students from lower primary: Class 1 and 2 in the five schools in each ward.

An additional three key informants were also interviewed, 2 were from the civil society education technology sphere and one was from the Ministry of Education. The key informants from the civil sector who were interviewed were 29 years and 31 years old

respectively. Both key informants are educated to college level, with Bachelor's degrees. The key informant from the Ministry of Education was aged 43 years, with a Bachelor's degree in Education and is currently spearheading efforts to train teachers in ICT prior to the launch of the laptop project in January 2016.

The response rate of the sampled group is as follows: 150 students from 5 schools in Embakasi constituency were sampled. 143 students filled in and returned the questionnaires contributing to a response rate of 95.3%. 7 questionnaires were missing from the total tally indicating lack of return by students. A Focus Group Discussion (FGD) with 10 children from Class 1 and 2 were conducted in each school to make a total of 5 FGDs. The 10 teachers and 10 parents targeted in each school were all interviewed contributing to a 100% response rate. Two civil sector actors in the field of education technology were interviewed, accomplishing the targeted number of 2. One Ministry of Education official was interviewed, which was half the targeted number of two education officials. Most of the officials contacted were unable to make time for interviews within the research's timeline. The difficulty in interviewing education officials was attributed to their tight schedules as they work on implementing the Laptop project on a national scale by January 2016.

Table 7: Response Rates

Respondents	Target No.	No. of Responses	Percentage (%)
Student survey	150	143	95.3%
Student FGDs	5	5	100%
Teachers	10	10	100%
Parents	10	10	100%
MOE officials	2	1	50%
Civil sector education actors	2	2	100%

4.3 Classroom Factors

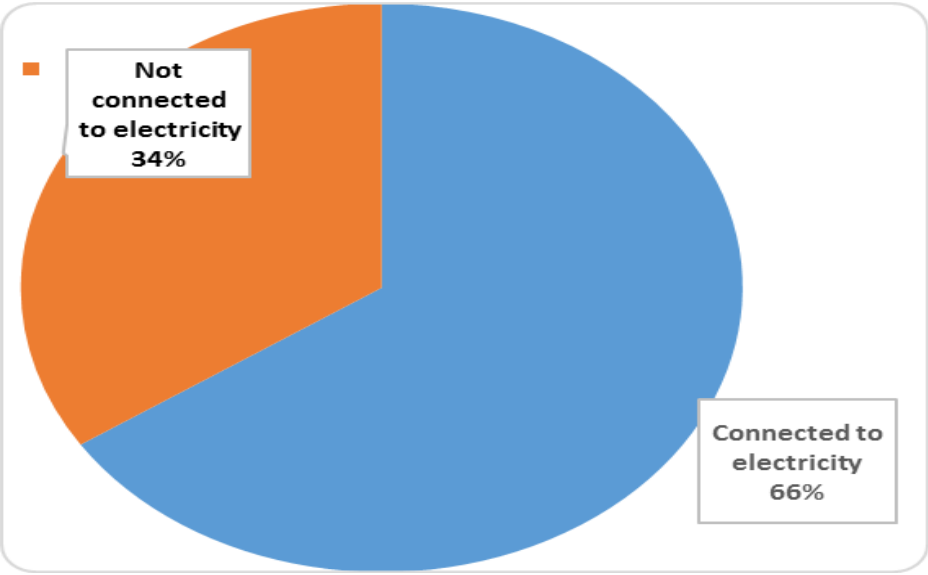
This section discusses the classroom factors that are likely to affect the implementation of the laptop project. Classroom factors as used in this study refer to dynamics within the classroom that will influence the adoption and use of ICT by students and teachers. The research sought to investigate classroom factors including classroom infrastructure of local primary schools, awareness of ICT among students and teachers, teacher training and targeting of the project to Class One.

4.3.1 Classroom Infrastructure

The study investigated several aspects of classroom infrastructure such as electricity connection in the classroom, the current state of infrastructure of local primary schools, availability of furniture and space for children to operate in comfortably and other aspects

of classrooms and schools that will impact the laptop project. A majority of students, (65.7%) reported that they have electrical connectivity in their classrooms, while 32.2% reported that they did not have electricity in their classrooms. Students were asked whether their classes had adequate chairs, desks and space for students to sit comfortably. 60% of students responded positively while 40% indicated that their classrooms did not have adequate chairs, desks and space.

Figure 3: Percentage of Students Reporting on Electricity Connectivity



From the FGDs it was established that the Class 1 and 2 classrooms were connected to electricity. This information was corroborated by observation of the socket and electrical wiring in the classrooms, and in the teacher key informant interviews where they confirmed that the electric sockets were operational. The majority of positive responses to this question can be attributed to the study being conducted in an urban area where most schools are connected to the electric grid and data from the three government and civil society key informants on the work the government has done to equip all schools

with electricity. According to these three key informants, in the last one year the government has accomplished a major component towards preparation for the Laptop project by increasing the number of primary schools connected to the grid from the previous low 15% to 87%. According to the Digischools website, the remaining 13% of schools are to be connected by the beginning of 2016, meaning all primary schools in Kenya, both in rural and urban areas; will have access to electricity, which is a major achievement towards integration of ICT in classrooms.[9] Electrical connectivity is an important part of the laptop project as most devices utilize energy to run and access the Internet. Solar laptops were mentioned by some key informants as a more affordable and implementable alternative to electricity-powered laptops especially in rural areas lacking electricity.

From the FGDs, a majority of students responded that they had enough desks and chairs in the classroom, but indicated that they felt the classrooms were overcrowded. The average number of students per classroom for Class 1 and 2 was 64.4. It is important to establish the nature of accommodations and the classroom setting in which students will be using technology as adequate furniture and space is a key requirement for comfortable use of technology. Students need desks where they will place the laptops, and good spacing ensures less accidents such as dropping the laptops can happen. The Class 1 and 2 students interviewed did not feel that there was enough space for them to move comfortably, indicating that it will be even more crowded if devices are added to an already over-crowded classroom.

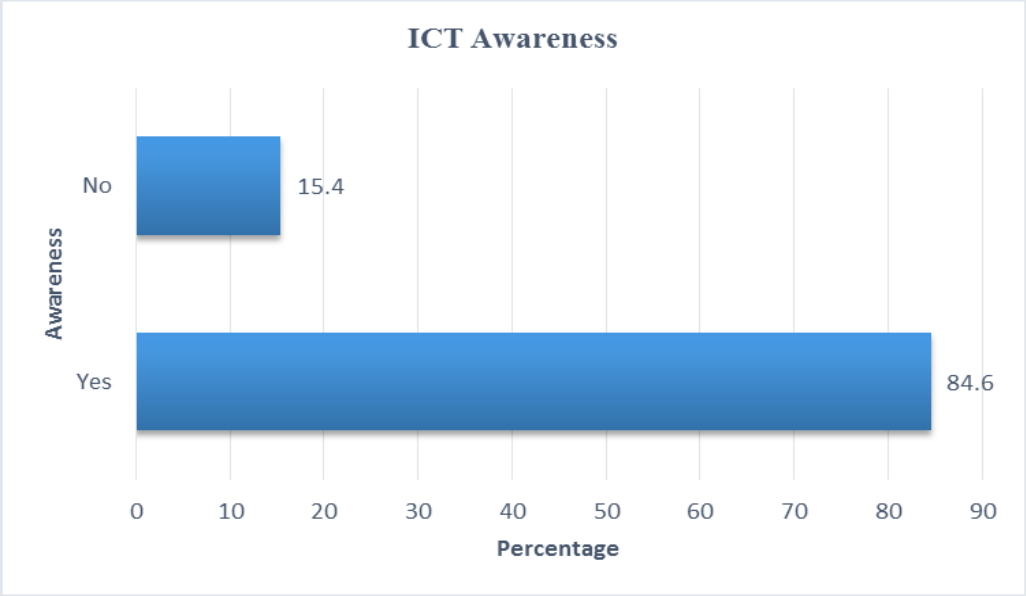
[9]Source: Digischools website: http://digischool.icta.go.ke/progress/. Accessed 5th August 2015.

4.3.2 ICT Awareness and Use among Students

The study sought to establish the existing level of ICT knowledge of students since existing knowledge of ICT will facilitate the process of integrating it into the classroom environment. The students were questioned on whether they were familiar with any form of ICT, what forms of ICT they were familiar with, the areas where they encountered ICT and the frequency of their ICT use. This study also investigated whether they were aware of the laptop project, the activities they would prefer to perform with the laptops and the content they would like to utilize on the laptops.

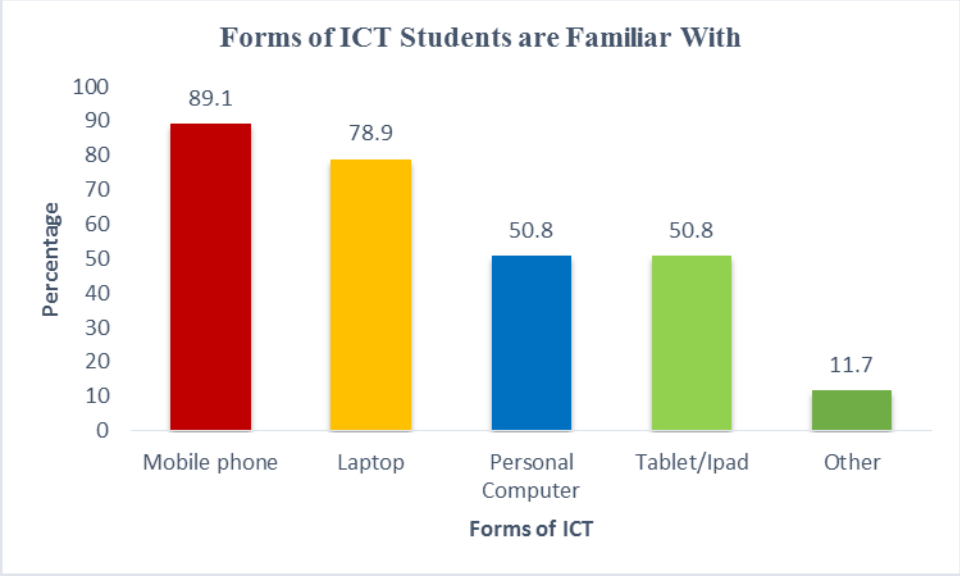
In response to the question of whether they were familiar with any form of ICT, a majority of respondents in the survey, (84.6%), indicated that they were, while 15.4 % responded that they were not. A positive response of 84.6% indicates that a majority of Class 7 students are familiar with a form of ICT.

Figure 4: Graph Showing Percentage of Students Surveyed Familiar with ICT



The study recognized the importance of identifying whether students knew what ICT was and if so, what forms of ICT they recognized and interacted with. Most of the students surveyed recognized the mobile phone as a form of ICT, with 89.1% responses in this multiple response question. This can be attributed to the high mobile phone penetration rates in Kenya. The laptop was the second most recognized form of ICT with 78.9% responses, while the Personal Computer and the Tablet/I-pad tied for third most-recognized form of ICT with slightly half of responses at 50.8%. 11.7% of the respondents indicated that they recognized other forms of ICT but did not identify these other forms of ICT they recognized in the space provided. Only two students listed TV and the Apple I-phone 5 as other forms of ICT that they were familiar with.

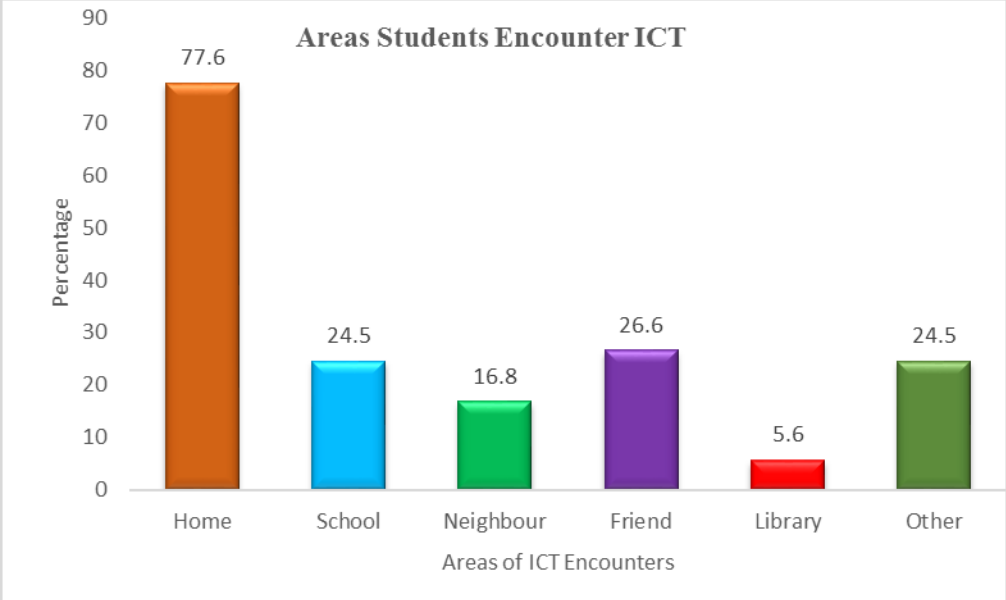
Figure 5: Forms of ICT Students are Familiar With



The students were asked to identify the areas where they frequently encountered ICT and how frequently they used it. This knowledge provides context for student patterns of ICT use which is important in designing ICT programs geared towards them. Most students

reported that they encountered ICT at home, with 111 students reporting that they encountered ICT at home. 38 students encountered ICT with a friend, while 35 students encountered ICT at school. 24 students encountered ICT with a neighbour, while 8 students encountered ICT in the library. 35 students reported encountering ICT in other areas, with most writing down "cybercafé" as an area they visited to use ICT. Other areas listed as areas where students could use ICT were PlayStation areas where students could play video games and church.

Figure 6: Areas Where Students Encounter ICT

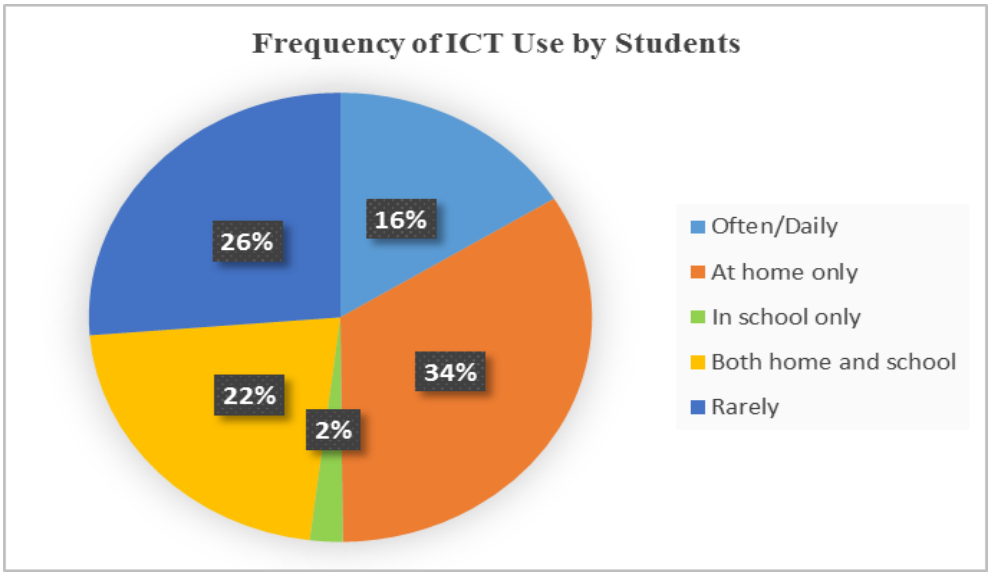


48 (34%) of students surveyed used ICT at home only, making it the area where most students used information communication technology. 31 (22%) students said they were able to use technology both at home and in school, while only 3 (2.1%) students encountered technology in school. 23 (16%) students responded that they encountered technology often, while 38 students (26%) rarely encountered technology.

A majority of the younger students in the FGDs were conversant with the mobile phone. Students from all the five schools who participated in the discussion recognized and had interacted with a mobile phone, mostly at home with their parents' devices. This information corroborates with that obtained from the parent interviews in which a majority identified the mobile phone as the device most of their children interacted with at home. The young students were however less conversant with other forms of technology, with students from only one school identifying laptops, tablets and computers as forms of ICT they were familiar with or had interacted with. Students in the FGDs cited classwork, homework and watching videos as the activities they were most interested in performing on the laptops.

The responses of students indicate that the majority of their encounters with ICT take place at home. From the key informant interviews conducted with parents, it was deduced that their role in their children's ICT use at home was mainly regulatory and as moderators of the content and activities their children performed with devices. They mentioned that their children made use of devices such as mobile phones, laptops and tablets mostly to play games. Some parents had also purchased mobile phones and tablets for their children to use after school, on weekends and during holidays. A majority of parents responded that they preferred if ICT devices were carried home for parental assessment of the day's learning activities and helping out with homework, though a few mentioned that because of safety concerns it would be better if devices remained in school to prevent theft and avoid mishandling on the way home by pupils.

Figure 7: Frequency of ICT Use by Students

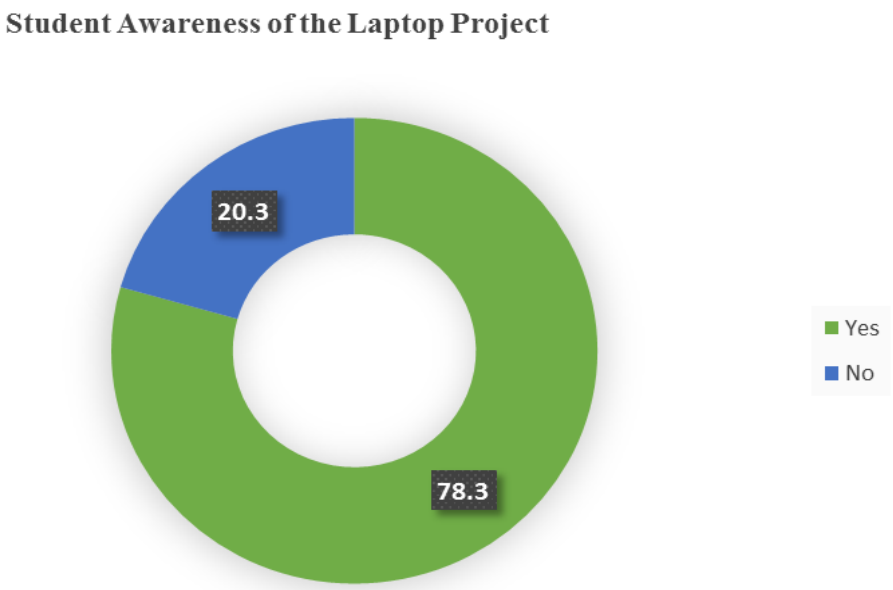


Two questions framed in a different manner sought to establish students' awareness of ICT projects targeted to schools. From the responses to both questions, a majority of students (74%) were aware of the laptop project by the government targeted to Class One students, with 25% indicating that they were not aware of an ICT project targeted to schools. When students were asked to write down the name of the project that they were aware of, a majority of respondents wrote down the laptop project as the project they were aware of. In another question, students were asked whether they were aware of the Laptop project for schools. 78.3% reported that they were aware, while 20.3% indicated that they were not aware of the project. 1.4% did not respond to the question. From both questions we can conclude that a majority of students are aware of the planned laptop project.

All the teachers, parents and key informants interviewed were also aware of the project. This awareness could be attributed to the popular campaign promise made by the

President to issue laptops to Standard One pupils. The widespread awareness could also be attributed to the resurgence of the program in the media at the time the study was conducted and the renewed promise by the government to deliver the laptops to primary schools by January 2016.

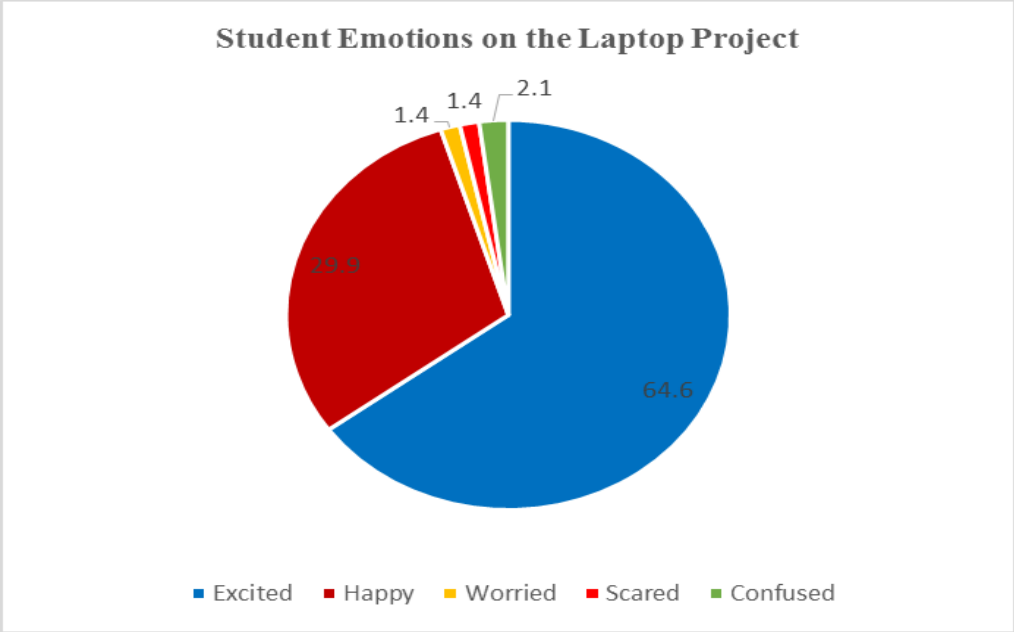
Figure 8: Student Awareness of the Laptop Project for Schools



64.6% of the students indicated that they were excited about the project, while 43 students representing 29.9% of the surveyed students indicated that they were happy about it. All the groups of students from the FGDs were excited about the project and eager for it to commence, with two groups of students stating that they were worried about the delay in the project. The positive emotions about the project indicated high anticipation among the students to be part of the laptop project. The emotions "worried" and "scared" were both selected by 1.4% of the students while 2.1% of students said they

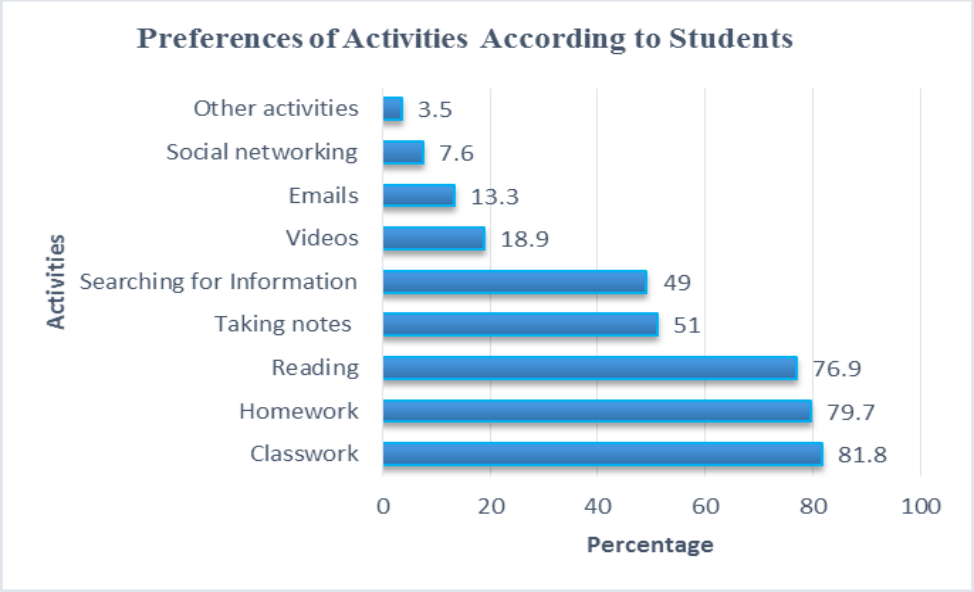
were “confused”. The negative emotions about the project can be attributed to the delays in commencement of the project and the lack of certainty surrounding the project. A majority of students feel positive emotions about the project, indicating that the project will be positively received by students.

Figure 9: Student Emotions on the Laptop Project for Schools



Students in the survey reported classwork as the activity they would most like to conduct with laptops, at 81.8%. They also selected homework as the second most popular activity at 79.7%. Reading was third at 76.9%. Students indicated taking notes as another popular activity at 51%. Performing searches for information was also cited frequently with 49%. The least preferred activities to perform on the laptops were social networking at 7.6%, emails at 13.3% and watching videos at 18.9%.

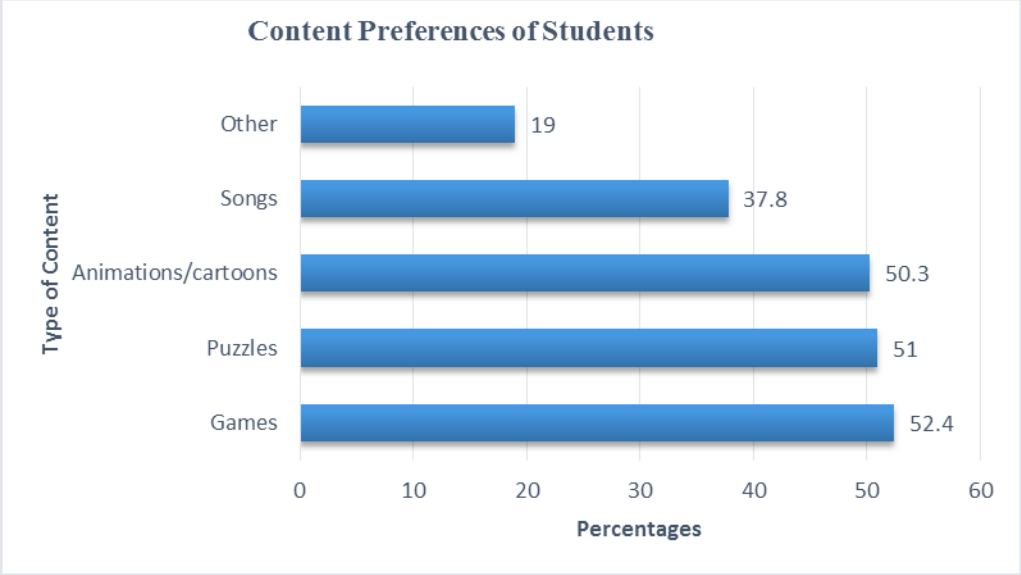
Figure 10: Student Preferences of Activities to Perform on the Laptops



Students were asked to select the types of content they would prefer to use on the devices. This question was crucial in determining the content students would like to see as ICT provides an opportunity to revolutionize traditional text-book learning. The most selected content students would like to have in the laptops was games at 52.4%, corresponding with the notion that the younger generation likes computer games. This selection may also indicate that playing games is a popular method of learning in children. There is therefore need to incorporate games in the learning content as it will make learning more appealing to students. Animations and cartoons were also a popular selection, as were songs at 50.3%. Puzzles were selected by 37.8% of respondents while 18.9% selected other, listing documentaries and the Bible as content they would like to see on the laptops. Incorporating animations, songs and games into content has the potential to create a better and more captivating learning environment for students.

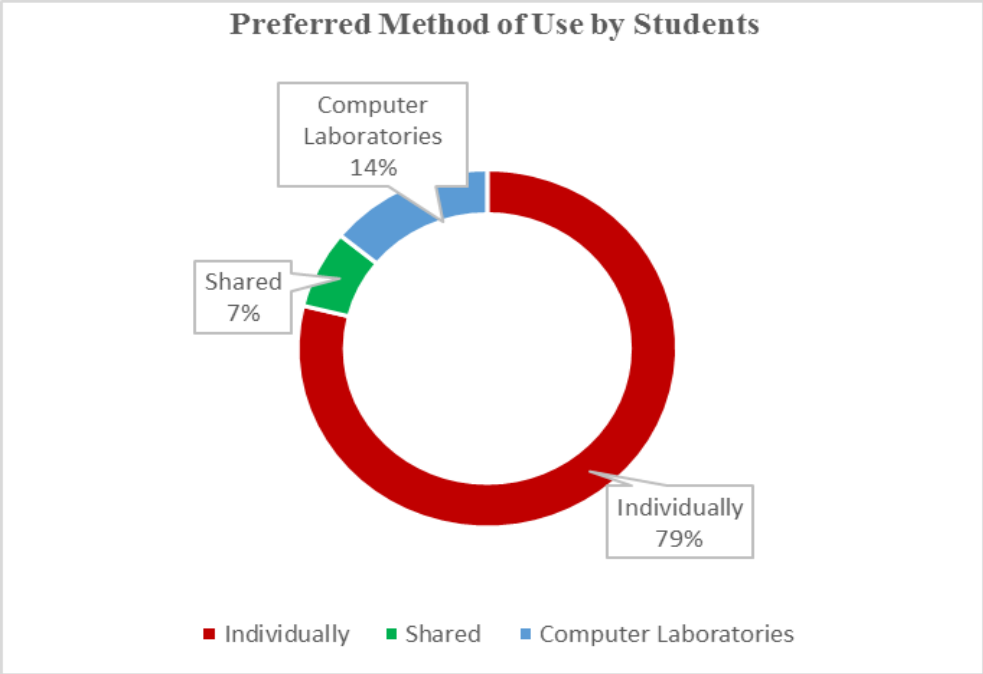
There is need to invest in original Kenyan content that is more diverse that textbooks in the new digital curriculum that will be used in the laptop project. The popularity of games among the students was corroborated by the key informants who considered games a distraction in the classroom when using education technology. One key informant cited games as a major distraction in her experience conducting research into the effects of technology in the classroom.

Figure 11: Types of Content Students Would Prefer to Use on the Laptops



Most students prefer to receive the laptops individually, with 78.3% selecting this as an option. This could indicate an individualistic trait in the students and a belief that individual possession is the best way to use the laptops. Only 14% of students indicated shared computer laboratories where all students can access the laptops equally, while even less students indicated that they would like the computers shared between two or more students (7%). Students in the 5 FGDs also preferred to receive individual laptops and no group chose shared laptops or computer laboratories as an option.

Figure 12: Preferred Method of Use by Students



Teachers and parents interviewed differed with the students on the issue of individual use versus shared devices or computer laboratories as most of the teacher and parent interviewees identified computer laboratories that could be accessed by students from all classes as the best method of implementing ICT in schools. The students' apparent trend towards individuality could be attributed to the fact that the campaign promise by the government which the students are familiar with proposes giving a laptop to each student. The teacher and parent respondents added that the reason for selecting computer laboratories was informed by the belief that computer laboratories would be cheaper and easier to maintain than individual devices for each students which will be costly. Teachers' responses on the best method of ICT integration for improving educational outcomes included; a digital curriculum that is inclusive of all syllabus requirements for efficiency, an implementation method that included creating community awareness and

sensitization about the project's goals, laptops accessible only from ICT laboratories, laptops provided to students for educational research only and under strict supervision by the teachers, laptops that were inclusive of teaching aids and online resource areas, laptops with wholly constituted learning materials and laptops that include enough educational resource sites with reliable and relevant information

While most of the teachers and parents interviewed believed that shared computer laboratories where all students could access computers were the better means of implementation, the three key informants from the civil sector and the Ministry of Education reiterated that the 1:1 ratio was a better means of implementation as it provides each student with unhindered access to a device of their own, making the transition to ICT-based learning easier to accomplish. The key informants from the civil sector and the Ministry of Education's opinion was more closely aligned to the students than the teachers and parents as they asserted that a 1:1 ratio was a crucial component of the new pedagogy. The key informant from the Ministry of Education reiterated:

"The promise made by the government still stands. The devices need to be in-class and with the students for each lesson for the planned integration of ICT in education to work as envisioned." (Key Informant, Ministry of Education).

The key informant added that Class One was a start and the project would grow incrementally as each incoming class received devices. He also added that there was a possibility of devices being shared across all classes. The key informant mentioned that it was unlikely that the students would be allowed to carry the devices home due to security concerns, but was unable to give further clarification on the security arrangements of the

project due to the sensitive nature of the topic. A desk review indicated that the devices will be stored in schools as the government has disbursed funds for primary schools to purchase safes.[10]

All the key informants interviewed were also aware of the project. This awareness could be attributed to the popular campaign promise made by the President to issue laptops to Standard One pupils. The widespread awareness could also be attributed to the resurgence of the program in the media at the time the study was conducted and the renewed promise by the government to deliver the laptops to primary schools by January 2016. To quote a key informant from the civil society:

> "*I am more convinced than ever that kids are suited to using technology and that technology has benefits for kids. Rugged hardware, plastic cases can protect kids' devices. Digitally there is an opportunity to provide content that is not tied to the text-books because this will make it easier to adjust and update digital curriculums better. The process may be cost-saving in the long run."* (Key Informant, Ministry of Education).

All the groups of students from the FGDs were excited about the project and eager for it to commence, with two groups of students stating that they were worried about the delay in the project.

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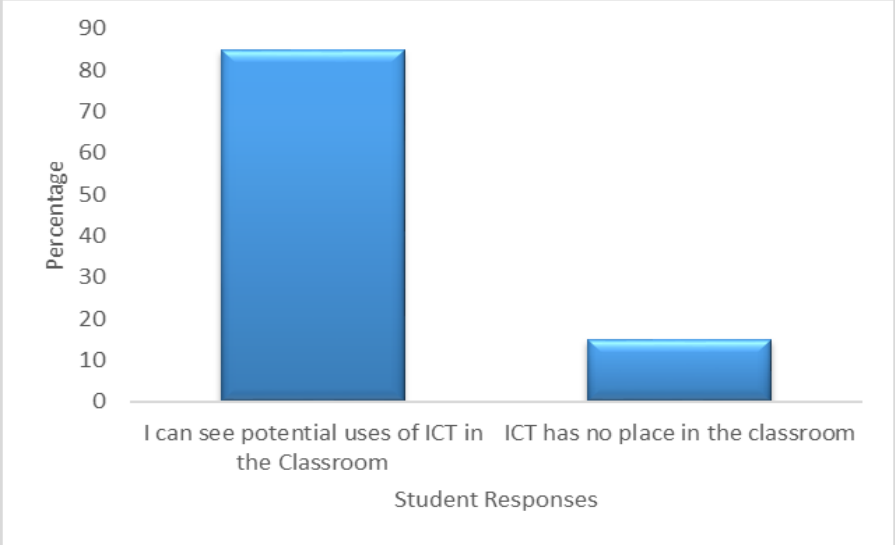
[10] Source: http://www.icta.go.ke/digital-learning-programme-execution-plan-unveiled/. Accessed 5th August 2015.

4.3.3 Learning Outcomes

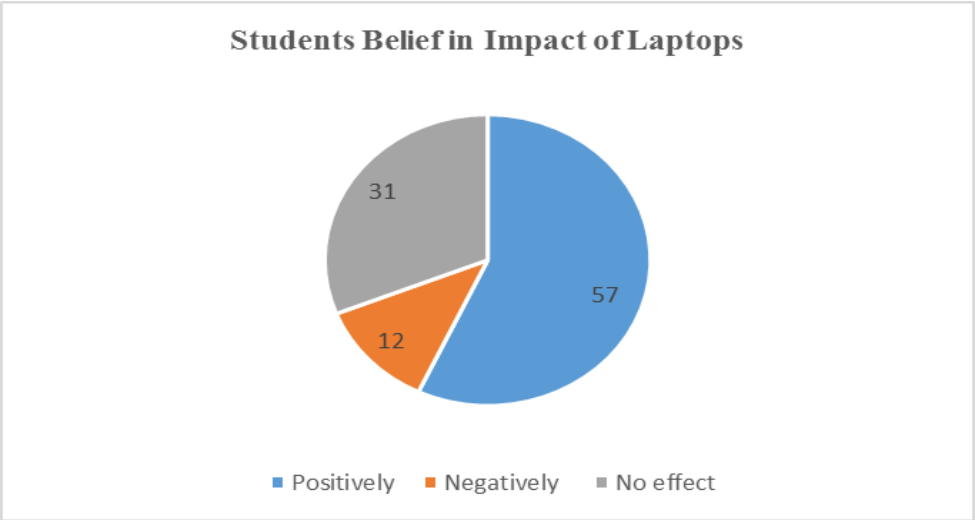
A majority of students, 85%, indicated that they could see potential use of ICT in the classroom, while 15% responded that ICT had no place in the classroom.

Figure 13: Students' Opinions on the Use of ICT in the Classroom



57% of students believed the laptops would impact positively on their learning and examination grades while 31% believed it would have no effect. 12% believed it would have a negative effect on their learning and grades.

Figure 14: Students' Belief about Impact of Laptops on Learning and Grades



The groups in the FGDs all stated that the laptops would positively impact their learning. According to the teachers interviewed, introduction of laptops will improve learning outcomes due to excitement of students and teachers about the new technology. Half of the teachers interviewed believed that learning would improve, but only slightly. All the parents interviewed also agreed that learning outcomes would improve, except one parent who did not foresee any improvements due to the laptops. The key informants believed that positive learning outcomes would not necessarily be immediate but would be more apparent after one or two years of implementing ICT in the classroom. One key informant suggested that performance may in fact drop at the initial stages due to the transition process, but would pick up once the new methods of learning took hold.

A key informant asserted that technology would reap benefits for education if implemented correctly with user friendly content and properly instructed teachers who will not let the devices gather dust in the store. Among the benefits cited by the key informants were*:* cognitive skill improvement, increased interest in learning and teaching,

automating manual processes and eliminating errors, increasing engagement between the student and the instructor, making discovery and exploration easier and better test results. Other benefits of using ICT in class that were mentioned by teachers and parents include easing teachers and learners research for learning material, saving time, improving the learning process, empowering teachers with ICT skills through rigorous training, improved students' grades and reduced recurrent cost of stationery for schools and parents.

4.3.4 Teacher Training on ICT Use in the Classroom

The five teachers interviewed who underwent training on digital learning did not feel prepared to teach using ICT. Their training covered the basics of integration of ICT in the classroom, use of media to enhance lesson plans, typing skills, operating software such as Microsoft Word and Power-point and surfing the Internet to search for educational material in the form of videos and pictures. They reiterated that teacher training needs to incorporate technology on a regular basis and become part of all teachers' training curriculum. Some of the teachers' opinions included: teachers need to receive advance ICT training for them to properly tackle the digital curriculum, teachers training will enhance their skills but only if it is well-done, teacher training needs to be regular and more intensive, there is need to frequently and uniformly train all teachers to advanced levels to improve service delivery and teachers should be trained on how to embrace teamwork for better results.

The key informant from the Ministry of Education clarified that teacher training was a continuous process and that the initial training would be reinforced by several other

trainings as the laptop project took off. He confirmed that there were expert master trainers on the ground conducting teacher trainings on ICT for select teachers from all over the country, termed ICT champions, who would in turn train other teachers in their respective schools. He added that curriculum development was also an on-going process, with a substantial amount of indigenous digital content already developed by multiple stakeholders, vetted by the Kenya Institute for Curriculum Development (KICD) and ready for classroom use.

4.3.5 Targeting of the Project to Class One

While the student survey indicated that students preferred the laptops to be restricted to one class only, the teachers and parents interviewed suggested that the laptop program should be extended to other classes for uniformity. Respondents asserted that the project should be extended to other classes for continuous exposure and practice by pupils and teachers. Most of the respondents were of the opinion that the rest of the classes should also receive laptops so as to be fair to them and to avoid the possibility of unrest among students. The interviewed teachers also felt that students ICT skills were very low, especially at Class 1 level, and this would have a negative effect on ICT integration in learning.

In contrast to parent and teacher opinions, the two key informants from the civil society and those from the ministry of education asserted that Class One was the best level to start the program. A key informant reiterated that the program's targeting was purposely intended to develop critical skills at an early age:

> *"Introduction of computers in early childhood is best as this is when they are at the right age to apply basic skills and concepts learnt from early childhood education (ECD)."* (Key Informant, civil society organization).

One key informant with experience in implementation of ICT at lower primary level and upper primary level cited Class 1 as easier to direct and less prone to distraction, adding that teachers had a difficult time maintaining control of the Class 7 students with technology in the classroom as they were frequently distracted, played games instead of using computers to learn, and were noisy and over-excited in lessons involving use of technology.

4.4 Environmental Factors

Environmental factors are the elements beyond the classroom and the school sphere that are likely to have an impact on the implementation of the laptop project. For successful learning to occur, the laptop project must be considered in the context that the classroom arena does not operate singularly but is under the influence of external factors. These external factors include other actors in the education sphere, the community, and country. The study utilized the systems theory to investigate several environmental factors regarding ICT in education such as the level of preparedness to adopt technology in the classroom, security concerns regarding laptops in school, misconceptions about the project and prioritization against other needs in the education sector.

4.4.1 Implementation Context of the Project

The laptop program has been rebranded twice since its revival in June 2015. The initial rebrand gave it the official title of the Digital Literacy Programme, and a more recent unveiling on 4th September 2015 was under the banner of DigiSchool. The revamped project has brought together various stakeholders to ensure the success of the project by the stipulated January 2016 date, with three ministries working forming a consortium to work on the project. These are: Ministry of Information, Communications and Technology, Ministry of Education, Science and Technology and Ministry of Industrialization and Enterprise Development. The new multi-level implementation committee is administered on three tiers: an oversight committee comprising the Attorney General, cabinet secretaries from the implementing three ministries as well as the Ministry of Devolution and Planning and the National Treasury; the second tier is the inter-ministerial committee made up by principal secretaries from several ministries and the third tier is the technical implementation committee chaired by the ICT Authority and comprising of technical officers from the implementing agencies and stakeholder institutions including Teachers Service Commission (TSC), Kenya National Union of Teachers (KNUT) and Kenya Primary School Heads Association (KEPSHA).

Each ministry has its defined roles. The Ministry of Education, Science and Technology is tasked with the development of curriculum content for use on the digital platform, identification of beneficiary schools, training of teachers and capacity building for all relevant education stakeholders. The ministry will also work on conversion of all KICD digital content to an open-source format to allow delivery across multiple platforms such

as tablets, laptops and desktop computers. The Ministry of Industrialization and Enterprise Development will work to create local partnerships to ensure local assembly of devices while the Ministry of Energy and Petroleum will ensure all primary schools are connected to electricity. The Ministry of Information, Communications and Technology will be responsible for coordination and oversight of all ministries involved in the project.

The multi-stakeholders approach intends to achieve: the entrenchment of ICT in teaching, learning and education management processes in primary schools, equipping schools with appropriate ICT infrastructure, developing capacity of teachers and other stakeholders to use ICT, development of digital content for transmission of 21st century skills, promote universal access to ICT in primary schools and a sustainable and affordable digital programme for the Kenyan education system[11]. Sustainability is one of the key components of the programme, with four areas identified to promote sustainability: financial sustainability, partnering with key manufacturers to set up a local IT assembly plant, capacity building and change strategy.

During the unveiling by the Cabinet Secretary for the Ministry of ICT which is currently spearheading the project through the ICT Authority, the DigiSchool programme officially released the Expression of Interest for goods and services for the project. These included learners' digital devices, teachers' digital devices and projectors and routers. The project cost according to the DigiSchool website is KShs. 17 Billion for the first phase which will see 1.2 million devices delivered to all public primary schools in two years. In the

[11]Source: DigiSchool Website: http://digischool.icta.go.ke/about/vision/, accessed 9th July 2015

June 2015 budget reading, the government set aside the Kshs.17 Billion required for the project.

Achievements of the programme so far include selection of 150 schools slated to participate in the pilot project commencing in September 2015, with 9 schools drawn from special education schools, development of digital content for Standard 1, 2 and 3, training of 150 master trainers who have in turn trained 61,000 primary school teachers throughout the country (a head teacher, a champion teacher and one teacher to make 3 trained teachers per school). Teachers in the remaining 5,000 schools will receive training through an update curriculum which takes into account gaps in the previous training and updated manuals and guides. The programme has connected 87% of the 22,175 public primary schools to electricity and is working with the Ministry of Energy and Petroleum, specifically the Rural Electrification Authority (REA) to connect the remaining 13% of schools by December 2015. The programme has also made strides in setting up monitoring and evaluation systems through development of e-readiness measurement tools and school mapping tools. The e-readiness tool has already been used in a survey that took place in July 2015 in 8 schools in Nairobi which were visited by a technology and infrastructure team. The tools will be used to monitor and assess 11,000 public primary schools.[12]

The revamping of the project with a clause requiring local assembly of devices stipulated in the expression of interest has spurred local companies and institutions to engage in the project. The government has further incentivized local companies by promising tax

[12]Source: DigiSchools Website: http://digischool.icta.go.ke/progress/, accessed 11th July 2015.

incentives for project partners. Local universities have expressed interest and are already working on creating local devices and assembly lines. University of Nairobi, Kenyatta, Jomo Kenyatta and Moi universities have expressed interest, with Moi University students releasing a prototype original Kenyan laptop and University of Nairobi being appointed the digital learning hub. Kenyatta University announced in August 2015 that it had partnered with local technology manufacturers "BRCK" to create a center for device design and manufacture, curriculum design, teacher training and deployment of digital learning solutions.[13] BRCK is the first company in Kenya and East Africa to design and engineer original technologies, with its BRCK device that is designed to work in harsh environments with intermittent electricity. The BRCK device is currently sold in 54 countries and has an 8-hour battery life and ability to connect to the Internet through any available means such as Ethernet cables, Wi-Fi and 3G and 4G devices[14]. The partnership may therefore have a head start in local assembly of devices through their tested and proven local solutions.

4.4.2 Level of Preparedness

The study sought to research issues surrounding curriculum and content readiness within the framework of ICT integration. Key informants were interviewed on whether they felt they were adequately prepared to make the switch to a digital curriculum. All the key informants interviewed from the Ministry of Education and the civil sector were of the

[13]Source: http://www.brck.com/2015/08/announcement-collaboration-with-kenyatta-university-for-digital-literacy/#.VfW3jvmqqko, accessed 11th July 2015.
[14] Source: https://www.brck.com/, accessed 20th July 2015.

opinion that Kenya was ready to make the transition to an ICT-based curriculum and learning process.

> "*The pace at which our education is changing is not fast enough to keep up with the pace of the rest of the world. Our current classroom infrastructure with its set-up of a teacher and four walls is restrictive and does not allow for exploration. To aggravate the problem, the teacher-student ratio is not enough to directly cater to each child's needs. Technology can solve all these problems and open up avenues of exploration while at the same time equipping children with skills and knowledge for the 21st century.* (Key Informant, civil society organization)

Though some of the key informants were of the opinion that schools were well-prepared to adopt ICT in learning, others had a different opinion on the curriculum readiness and classroom readiness. Teachers responded that the digital curriculum was not ready, and if it was, they were untrained on its use, hence expected challenges in integrating it in the classroom.

4.4.3 Project Prioritization Against Other Needs

On the questions of the perceived costs of laptops versus other pressing education needs such as classrooms, desks, books and teachers, most of the parents and teachers interviewed were of the opinion that the government's prioritization of devices over other needs was misplaced. Most of the teachers felt that more classrooms need to be built first before money is invested in the laptops, while some parents also agreed that there was a severe shortage of classrooms that needed to be tackled before large amounts of money are invested in devices. All the teachers interviewed responded that the government

should prioritize hiring more teachers and increasing the salaries of current teachers thereby incentivizing them to perform better. Key informants from the civil society sector and the Ministry of Education's opinion on this differed however, as they asserted that an investment in technology was not misplaced but a timely intervention that would enhance learning regardless of the circumstances it was implemented in.

> "*It's sad that kids learn in terrible classrooms, and a lot of work definitely remains to be done especially about sanitation in schools. But that doesn't mean we have to tackle only one issue at a time. A connection to technology will not bar them from wanting to learn. I would definite invest in the technology which will provide access to an unlimited world and give them exposure and improve their learning and education"* (Key Informant, civil sector organization).

The most commonly anticipated challenge quoted by stakeholders was the cost of initiating and running the project. Several respondents from the interviewed teachers and parents held that there would be a challenge in consistently and efficiently running the project due to the high costs of technology, with many respondents terming the project a luxury considering the numerous challenges in education such as dilapidated classrooms, few teachers and recurrent teacher strikes over low pay. Respondents also doubted whether the project would run smoothly considering the inconsistency of power supply in the country.

The issue of maintenance of devices also came up, with respondents citing the scarcity of qualified technicians to support the project by installing, repairing and maintaining devices to ensure smooth running of the project. The issue of maintenance expert was

important as most of the respondents believed it will be necessary for each school to have a resident expert to deal with problems as they arise especially at the beginning before teachers become well-equipped to handle device problems. The cost of running the program is therefore expected to rise when electricity costs, maintenance costs and cost of hiring of experts are added to the project budget. Along with the cost of maintaining the devices, the cost of maintaining a consistent and organized supply of devices was quoted by teachers as an issue to be considered, as schools often have new students registering mid-term, or old students transferring to other schools. A national database of students and devices will therefore have to be established and keenly monitored to keep up with transfers and movements of students between schools and to purchase devices in line with demand.

The study also investigated the project's prioritization of one-to-one devices rather than shared devices which may be a less expensive option. Sustainability challenges were an issue, as respondents queried how the project would be maintained for incoming Class Ones for every year. Sustaining the project is expected to be costly so sufficient funds should be secured and set aside before commencement of the project. Devices will need replacement due to normal wear and tear, damage by students and teachers and increased enrolments. One teacher interviewed put it as thus:

> "*The cost of the project is too high. Sustaining it may be difficult especially as the government already has financing issues and is unable to increase teachers' salaries.*" (Key Informant, Teacher).

The key informant from the Ministry of Education reiterated the government's commitment to implementing the laptop project and added that funds had been set aside in the budget specifically for this purpose and an inter-ministerial committee of experts from the Ministry of Education, the Ministry of ICT and the Ministry of Industrialization formed to ensure the project was efficiently delivered and in due time. Part of the budget will be allocated towards maintenance and there has to be 24 hour support to troubleshoot issues. Master trainers will take care of most of the issues that arise and also create manuals and guides on troubleshooting and fixing common issues.

The Ministry of Education key informant confirmed that trained technicians will be posted to schools to help with teething problems and eventually, experienced teachers will be able to take over this role, thus ensuring continuity and sustainability of the project in all schools. Speaking on the matter of costs, he agreed that the project's initial costs would be high, but the benefits outweigh the costs:

> "*The cost is high especially compared to other needs, but every investment has a cost. The cost will keep reducing over time, compared to recurrent costs such as paying teachers' salaries."* (Key Informant, Ministry of Education).

He also confirmed that solar powered devices were being considered as an alternative and that the procurement process would be partial to solar-powered devices to save on electricity costs and in line with the government's environmental conservation policy.

4.4.4 Security Concerns

Security challenge was mentioned by all the teachers and parents interviewed. Considering the poor infrastructure in most public schools, most of the respondents believe the schools will be an easy target for thieves, especially if it is public knowledge that they have the devices. They also believed that students would be targeted by thieves if they carried the devices home with them, creating a multiplicity of security challenges especially with the young students in Class One already prone to misplacing or breaking fragile electronic devices. Solutions offered to the security challenges by respondents included installation of safes fitted with alarms in schools, building perimeter walls topped with electrified fencing, hiring security guards to keep watch over schools especially at night, public awareness against robbery to be created and improved security in and out of schools in case students carry them home for further learning. Key respondents mentioned using the devices only in school, ensuring that every activity on the device is logged, installing and activating tracking software, discussing acceptable use policy for parents and the community members to give them a sense of ownership of the project, community sensitization and establishing penalties where the community pays if laptops are stolen and insurance to cover the devices against theft, breakage and other losses.

4.5 Perceptions and Expectations of Key Stakeholders for the Project

The study sought to identify the perceptions and expectations of stakeholders regarding the project and determine the anticipated benefits and challenges of the project. How the stakeholders perceive the project and what they expect from it is significant as it defines their reception of the project. The study investigated what stakeholders' expected from the project, what challenges they anticipated would arise during implementation of the project, and how these challenges would be tackled. These expectations are contributing aspects to the overall environmental factors that have an impact on the project.

4.5.1 Students' Perceptions and Expectations

A majority of students surveyed, 93%, agreed with the statement that they could learn basic technology skills from laptops. 86% agreed that use of laptops would enhance their understanding of lessons. 95% agreed that laptops would promote new methods of learning by students while 84% agreed that students should be allowed to carry laptops from school to home for further learning. 64% of students surveyed agreed that laptops would improve student-teacher interaction. Only 45% agreed that students of all ages should be given laptops to use in the classroom.

Table 8: Statements of Expectations of Students on the Laptop Project

Statements on Expectations	Agree %	Disagree %	No opinion%
Students can learn basic technology skills from laptops.	93	3.5	3.5
Use of laptops enhances understanding of lessons by students	86	10.5	3.5
Students of all ages should be given laptops to use in the classroom	45	50	5
Students should be allowed to carry laptops from school to home for further learning	84	15	1
Laptops can promote new methods of learning by students	95	1	4
The laptops will improve teacher student interaction in class	64	26	10

76% of students surveyed felt they were prepared to integrate ICT in the classroom as they were comfortable and familiar with laptops. 92% of students agreed with the statement that they were excited to use laptops, and 73% agreed with the statement that it was important for teachers to integrate laptops in the classroom. Contrasting with the previous statements, only 51% of students felt that teachers were comfortable and familiar with using laptops. 65% of students surveyed agreed with the statement that parents were optimistic about the laptop project.

Table 9: Statements on Views of Students on the Laptop Project

Statements on Views	Agree %	Disagree%	No opinion%
Students are comfortable and familiar with using laptops.	76	16	8
Students are excited about using laptops.	92	4	4
It is important for teachers to integrate laptops in the classroom.	73	20	7
Teachers are comfortable and familiar with using laptops.	51	14	35
Parents are optimistic of the laptop project	65	17	18

4.5.2 Teachers' Perceptions and Expectations

Most teachers felt that ICT will take over their role in the classroom, and this perception could result in resentment, and ultimately, a rejection of the project by teachers. Teachers were concerned about reduced learner attention especially at the beginning of the project due to "overexcitement and peculiarity of ICT". Support for teachers during the period of transition and implementation of ICT in the curriculum will assist them as they adjust from a teacher-centric to student-centric model of teaching and contribute to the success of the project. Various studies find that ICT often fails to fit into currently existing teaching culture and in many instances, undermines the teacher's sense of efficacy (Olson, 2000). This is demonstrated in the teachers' responses on the question of their perceptions of the laptop project. Some of the responses from teachers included:

"Some teachers may lose their jobs if their role is replaced by technology since using the laptops, one teacher will be able to teach many learners various subjects at one go. The government will not recruit more teachers until retirement of those currently in action as technology becomes a regular feature of education." (Key informant, Teacher).

"Internet will be the main information resource rendering teachers only to be lesson moderators or irrelevant." (Key Informant, Teacher).

"Education is not a priority in the new learning methodology with ICT. The role of teachers will be overshadowed." (Key Informant, Teacher).

"Gadgets will be prioritized over teachers; less teachers will get jobs." (Key Informant, Teacher).

According to another key informant:

"Training of teachers to use the tech is going to be difficult as they have to learn not to use the technology just to revise or as a digital version of a textbook. In my experience incentives may be necessary to encourage them to fully integrate it though they might be expensive." (Key Informant, civil society organization).

The teachers interviewed were of the opinion that parental opinions on technology may cause differences between schools and parents. They suggested that parental concerns about technology might pose a challenge for the laptop project especially due to parents' fears about children being exposed to inappropriate material through technology. Teachers interviewed also expressed worry that parents might view

teaching using laptops as a waste of time, especially if it did not result in immediate improvements in test scores. Teachers were also concerned about government policy on time spent on gadgets as opposed to traditional curriculum which may cause differences in teaching methods. Most teachers interviewed expressed reluctance to shift teaching methods citing that they were familiar with the traditional teaching methods that they had received training on and practiced for a long time. It was reported that some teachers have a negative opinion on technology and may be opposed to integrating it in the classroom.

Teachers also anticipated that administrative conflicts may pull down the project especially as most schools are result-oriented and the technology involvement may bring down student grades. The teachers were worried that if the technology did not cause an appreciable increase in knowledge and performance of students it would be a waste of time better spent teaching using traditional, proven methods. They were also concerned that the time for implementing the project may be limited as the current curriculum is time-bound, new methods of teaching may be more time-consuming and stressful for both teachers and students. All of these concerns are valid, especially as noted earlier by some key informants that the project might take a few years to begin bearing fruit in terms of performance. It is important to notify parents and administration of the proposed curriculum shift to prevent teachers from being blamed in cases of students' grades dropping. The shift from an exam-based, performance based educational system to a knowledge and practice- centered pedagogy will also require a national conversation and a community approach as the old system is deeply entrenched in the society.

Other challenges teachers expect to tackle while integrating laptops in the classroom include incorrect perceptions by students and parents about the role of technology in education, misuse of technology by teachers and students, breakdown of devices, lack of replacement of broken-down or spoilt gadgets, data system failures, breakdown of many gadgets at a go causing a crisis, few software and hardware maintenance experts available to deal with the gadgets, deviated attention of learners, lack of digital curriculum that is aligned with the current KCPE curriculum, data systems freezing or hanging due to many concurrent log-ins, system failures, power blackouts, lack of familiarity with the new devices, low learner ICT skills and weak mastery of the learning methodology by teachers.

4.5.3 Parents' Perceptions and Expectations

Parents voiced expectations that pupils life skills would be enhanced by use of ICT in the classroom, and that over time, learning will gradually transition to home-based systems where teachers remotely taught students over computers through e-learning methods. Some parents voiced fears that education value would decline due to most knowledge being sourced from the internet and creating a generation of students who are addicted to "Googling" information instead of thinking critically.

Exposure to inappropriate content was a major concern for all stakeholders interviewed, especially parents who were wary of social media site use by children. Parents and teachers also cited pornography and immoral content as a major concern. Online safety was cited by the key informants as a crucial component of curriculum development.

According to the informant from the Ministry of Education, the devices will be equipped with child- safety computer programs that will restrict access to inappropriate content. Young users' access will be restricted to approved content only and any Internet access will be through approved child-safe websites. The parents interviewed also cited distraction of students, degradation of learner morals due to accessing social sites, poor eye-sight of students due to longer periods looking at screens, obesity due to low physical activity by students, laxity by both students and teachers due to over-reliance on technology, irrelevant use of gadgets, exposure of students to negative, violent or indecent content, inability of teachers to exercise control over the learners in class, immorality by students using the gadgets to watch or take immoral photos, videos, laziness and overdependence on internet sources for research, addiction to technology and difficulties using ICT at the beginning of the project especially in rural areas where ICT usage is very low.

4.5.4 Civil Society Perceptions and Expectations

Key informants from the civil society cited the following anticipated challenges in implementation of the project: the high cost of implementing the project, for example electricity costs can become a burden to teachers and parents. The informants however added that many of the solution providers are working to provide solutions to these problems such as solar-powered devices and low-cost devices. Informants were of the opinion that the teacher workload will double at first but eventually the workload will lessen as technology becomes embedded into most of the learning processes. Language barriers was also cited as a possible challenge, in the current content for example there is

no mother-tongue language curriculum yet most of the Class Ones are familiar with mother-tongue language only.

Maintenance is also expected to be a challenge but on the positive side it will create employment for Kenyans. Devices may also cause laziness in teachers due to the assumption that the content is preprogrammed hence they do not need to put effort into lesson plans. On the positive side, technology can be used to assess teachers' lesson plans and achievement of lesson objectives, and even to reduce teacher absenteeism through systems that record attendance and duration of classes. Technology may pre-empt the need for students to socialize and interact, causing limited socialization or complete anti-socialization unless the devices are shared. According to the informants, collaboration therefore needs to be preprogrammed in the devices to maintain social interaction in the classroom.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter presents a summary of the major findings, conclusion and recommendations, and suggests possible areas for further research. This study sought to: establish classroom factors affecting the adoption of the one laptop per child project, establish environmental factors affecting the adoption of the one laptop per child project, investigate the expectations of key stakeholders of the project in the study area and inform the implementation policy of the project. The study was conducted in Embakasi region of Nairobi County and utilized a mixed research design consisting of student surveys of 143 students from five schools, focus group discussions with lower primary pupils from five schools and key informant interviews of teachers, parents, civil society actors and education officials to obtain quantitative and qualitative data from key stakeholders regarding the laptop project.

5.2 Summary of Findings

5.2.1 Classroom Factors and the One Laptop per Child Project

Classroom factors affecting the project investigated by the study included issues of electricity connectivity, classroom infrastructure such as availability of desks and chairs, classroom spacing and availability of room for students to operate machinery. The study established that classrooms in the study area were well-equipped with electrical infrastructure in readiness for the laptop project. Classroom infrastructure such as chairs

and desks were also found to be adequate for students, but students were overcrowded in the classrooms and there was little room for students to efficiently use the devices.

The study found that students were exposed to technology, especially mobile phones, with most of them using technology at home. This corresponds to the notion of the younger generation as digital natives as discussed in the literature review. Games were identified by students as the device content that most appealed to them while key informants cited games as a major distraction that may prevent students from learning. The study indicated that Class One was an appropriate starting point to introduce technology as the digital natives were ready to use devices from an early age.

Teachers were found to be inadequately prepared to integrate technology into the classroom and will require regular trainings and practice to adapt to a leaner-centric model of teaching as opposed to the teacher-centric model currently practiced in schools. The study also found a strong recommendation for the project to be extended to other classes to expose more students to technology and promote equity in schools.

5.2.2 Environmental Factors and the One Laptop per Child Project

The study brought out key issues on the environmental context in which the project is being implemented including the progress made so far in implementation of the project, level of preparedness, security concerns and project prioritization. The study found that the project has been revamped under a multi-stakeholder approach that involves several ministries working together on implementation. The current approach emphasizes local production of both hardware and software to customize the project to local needs while boosting local manufacturing capacity and creating employment.

The study investigated e-readiness in terms of curriculum and content with the conclusion that the curriculum was yet to undergo the major transformation needed to make the switch to the learner-centric mode of learning that ICT use requires. The study also indicated that though work on local content for devices was underway, there was insufficient creation and diffusion of content to key stakeholders, and teachers and students were not sufficiently prepared to adopt the content to their needs hence may face challenges at the onset of the project.

The study found that the major challenge affecting the project was the high cost of purchasing devices along with the cost of sustaining the project. Stakeholders questioned the wisdom of investing billions in devices when the education sector was facing a multiplicity of challenges including recurrent teacher strikes due to pay issues, teacher shortages and poor infrastructure. Security of devices was also identified as a challenge as schools currently lack the proper security infrastructure to keep the devices safe. The study also brought out differences in opinion about the one-to-one method of laptop use as set out by the government. While students indicated that they preferred one-to-one individual use of devices, key informants in the study indicated that a shared mode of usage such as computer laboratories was preferable especially in consideration of cost factors.

5.2.3 Expectations of Key Stakeholders on the One Laptop per Child Project

The study identified several perceptions and expectations from key stakeholders that form part of the environmental factors affecting the project. The major expectation from students was that the project would enhance their learning and teaches them useful skills, and their perception of the project was majorly positive as they felt prepared to integrate ICT in the classroom and were excited to begin the project. In contrast, teachers' perception of the project was negative, and a major fear cited by teachers was that the project would take over their role and render them obsolete. Teachers expressed reluctance about the pedagogical shift from teacher-centric to learner-centric and emphasized that they were not trained and prepared to make the change. They also perceived the computers as a distraction in the classroom that would make it difficult for students to concentrate on lessons and felt that the burden of integrating technology was largely placed on them yet they had not received sufficient training and incentives for the extra work expected of them.

Parents' perceptions of the project were mostly positive as they expected enhancement of learning and acquisition of life skills by students. They however voiced concerns on the negative aspects of technology and a major theme that emerged here was fear that technology, especially internet access, might expose children to immoral content in the form of pornography. As the major conduits through which children currently access technology at home, parents cited games and distraction as another major issue that they have encountered in their children's interaction with technology.

5.3 Conclusion

Of all education technologies, one-to-one laptop programs have the best potential to revolutionize education. They directly reach individual students and enable them, under the guidance of teachers, to access a limitless range of information beyond the traditional classroom/textbook domain. Computer programs will make it more efficient for teachers to monitor individual learners' progress, identify their strengths and weaknesses and target remedies suited to each learner's pace. Head-teachers and education officials will be able to monitor teachers' attendance and performance using computer software where teachers register their lesson plans, attendance and duration of classes. If properly implemented, the project will enhance student and teacher attendance and consequently, performance.

The findings of this study are important to stakeholders integrating technology in the classroom. The findings demonstrate that students in the new generation termed digital natives, are conversant with most new forms of ICT and are ready to adopt technology in the classroom. There is need to adopt technology early so as to fully integrate new pedagogical methods for learners from a young age. ICT may increase school attendance as it attracts students and makes learning exciting for them. The majority positive response of "excited" and "happy" by sampled students regarding the laptop project is evidence of the motivation ICT can stimulate in learners.

Teachers need to be considered as a major part of the consultative process of ICT adoption as they are responsible for implementing the pedagogical shift to learner-centric methods. Comprehensive teacher training of both in-service and pre-service teachers in

ICT and new pedagogies will make the integration process smoother. The transition from teacher-centric to learner-centered teaching methods may be difficult for Kenya where the teacher-centered tradition is deeply entrenched. The shift challenge may be further complicated by the pervasive belief among teachers that technology will replace them, as evidenced by the sampled teachers who voiced this fear. Policy makers would be remiss if they did not address this fear by assuring teachers on their importance in the new model of learning and emphasizing the irreplaceability of the human touch that teachers provide which cannot be substituted by machines.

5.4 Policy Recommendations

The study makes the following recommendations for policy. The government should establish and codify into policy clearly defined guidelines for procurement, acquisition and implementation of the project. This will prevent a recurrence of the procurement issues that caused delays in the project. A regularly updated information portal on the laptop project will also keep stakeholders accurately informed on the status of the project and clear misconceptions among citizens. The findings suggest that trainings for teachers and students should be user-experience oriented, simple and easy to understand for them to be accepted by students and teachers. Trainings should also cover a multiplicity of computer systems such as Windows and Android operating systems to avoid confusion when users are presented with a different system from what they were trained on or are used to. Policy makers should develop comprehensive curriculums adapted and suited to Kenyan learners, especially as some of the Class One students will be transitioning from learning in mother-tongue to English and Swahili.

The study also identified a lack of change in teaching methods as a major barrier to integration of ICT in the classroom. Teacher resistance to technology combined with practicing traditional teacher-centric models of learning results in unused machines gathering dust in school stores. Key informants from the civil sector with experience implementing ICT projects in schools suggested incentives for teachers as a means of getting them on board and sustaining their commitment to integrating ICT. Incentives and rewards for teachers who successfully integrate technology into their lessons also compensate them for the extra workload associated with the initial shift to ICT and a learner-centric model. The incentives quoted by key informants ranged from mobile airtime, data bundles for Internet access, upgraded gadgets, public recognition of great work done and appointments as school ICT Champions. ICT integration is a gradual process and the workload declines as technology becomes embedded into daily processes and users become more accustomed to it. The need for incentives will therefore wear off as users recognize the benefits ICT accords them and are more willing to utilize it.

5.4.1 Recommendations for Further Research

The study recommends that a baseline survey and a needs assessment should be carried out in primary schools prior to the implementation of the project to identify the knowledge and skills required by users and the appropriate technologies for delivery of these needs. A comprehensive analysis of the structures and outcomes of ICT projects for schools in other countries that have implemented them, especially countries with similar conditions is also recommended. A study of the classroom and environmental factors affecting the implementation of the project in rural school setting would also be useful in

comparing e-readiness in urban versus rural areas. As the project gets underway, there is need for constant monitoring and evaluation studies to assess the impact of the project and analyse its strengths and weaknesses. Other areas of further research are: investigating the pedagogical shift from teacher-centric to learner-centric methods by teachers and students, investigating the acceptance and use of digital content in the classroom and analyzing the impact of ICT use in Kenyan classrooms on test scores and learner achievements.

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APPENDICES

Appendix 1: Informed Consent Form

Dear Respondent,

Thank you for agreeing to participate in this research. As part of the requirement for MA Development Studies degree at the University of Nairobi, it is required that a student should carry out research in the relevant area of the study, aimed at addressing societal challenges, putting into practice what has been learnt on coursework and adding to the body of knowledge. My study seeks to investigate the One Laptop per Child ICT project in Kenya. The findings of this research will help policy makers in drafting relevant approaches to the project implementation.

You are requested to participate in the study by answering the questions on the attached questionnaire. However, you may respond only when you want to, as a response is not compulsory. Your participation is completely voluntary and you can refuse to participate at any time without stating any reason. All information retrieved during the course of this study will be treated as strictly confidential. Data that may be reported on in the research report will not include information that identifies you as a participant in the study. Your informed consent form will be filed in a safe place and it will only be accessible to the researcher. Your time and effort in answering the questionnaire honestly is highly appreciated.

Approval

I hereby confirm that the researcher, Ms. Peggy Kalie has informed me of the nature of this study. I have received, read and understood the consent form. I understand that my identity will remain anonymous during the analysis, processing of data and reporting of the study. I am free to withdraw from the study at any point, without giving any reason for my termination of the interview. I will have sufficient opportunity to ask questions.

I, ……..declare myself prepared to participate in the study

Participant’s / Guardian’s signature: ……. Date: ……...

I, Peggy Kalie, hereby confirm that the participant has been informed in full of the nature and the manner in which the study will be conducted.

Researcher's signature: …….. Date: ……..

Appendix 2: Key Informant Interview Guide

A: Basic Information

1. Gender of respondent
2. Age of respondent (years)
3. What is your highest level of education?
4. What is your occupation?

B. Views on the laptop project for schools

1. What is your opinion on the role of technology (e.g. laptops) in education?
    a. Perceptions of the planned class one laptop project in Kenya. Probe for: Level of preparedness e.g. training of teachers, supportive infrastructure e.g. electricity / power, students skills to handle the programme.
    b. Software/hardware issues. Probe for: Digital curriculum readiness, Hardware maintenance
    c. Anticipated benefits of using laptops.
    d. Perceived costs of laptops versus other pressing education needs e.g. classes, desks, books, teacher shortages.
    e. Targeting of the project: Why Class One? Is this the best option?
    f. Challenges regarding the project: What challenges do you anticipate and how will they be tackled?
    g. Safety issues regarding the laptops: e.g. break-ins, security breaches. How will these be tackled?
    h. Misconceptions about the project: Probe for: Sources of information about the project and project timeline, the role of teachers in a digitized classroom.
    i. Project prioritization against other needs in the education sector e.g. building more classrooms, hiring more teachers: Probe for: Alternative models of implementation e.g. computer laboratories in schools.
    j. Other perceptions (name them)

2. Expectations from the planned laptop project in Kenya. Probe for:
   a. Sustainability issues regarding the project.
   b. Improved learning outcomes.
   c. Enhanced teacher training on ICT.
   d. Provision of supportive infrastructure to support the programme.
   e. Rolling out to other classes.
   f. Provision of sufficient numbers of computers e.g. in case of emergencies, breakdowns, increased enrollment of students.
   g. What are the negative effects of laptops on education (if any?)
   h. Other expectations (name them)

3. What do you think is the best method of laptop integration for improving educational outcomes?

4. Teachers: Probe for:
   a) Are you aware of training of teachers on laptop use?
   b) Did you receive any training on laptop use? If so, where was the training? How many teachers were in the training? What were you trained on and how?
   c) What skills and competencies did you gain from the training that will help you integrate laptops in your classroom?
   d) What challenges do you expect to tackle while integrating laptops in the classroom?

5. Ministry of education officials: Probe for:
   a) What preparations has the Ministry undertaken to roll out the laptop project? Probe for: school environment preparation in terms of connectivity, security, teacher preparedness, existence of digital content etc.
   b) What are the channels of communication on the project for stakeholders and the public to stay updated? How regularly do you keep the various stakeholders updated on the project?

c) What challenges has the ministry faced while preparing to implement the laptop project and how is the Ministry tackling them?
d) What are the perceived benefits of the project?
e) How soon can we expect the project to officially launch in schools?
f) What is your assessment of the ability of schools and teachers to integrate the laptops in education?

6. Parents: Probe for:

a) What kind of ICT does your child use at home?
b) What is your role as a parent in facilitating ICT use at home by your children? Probe: Educational and social use of ICT at home by children.
c) Do you think the laptops should stay in school or be carried home? Give a reason for your answer.

Appendix 3: Focus Group Discussion Guide

A: Basic information

1. Name of school: .....
2. Class: .....
3. Average ages of group: .....
4. Genders of respondents: Number of boys Number of girls_____

B. Discussion Topics

1. What forms of ICT are you familiar with? Probe: Mobile phones, Personal Computer, laptop, tablet/iPad
2. If you are familiar with ICT, where do you encounter and use it? Probe: At home, at school, at a neighbor, with a friend, at the local library.
3. How often do you use ICT at home or in school? Probe: at home, at school, weekend only/monthly/special occasions.
4. Are you aware of any ICT projects targeted for schools?
5. Are you aware of the intended laptop project for schools?
6. What kinds of activities should students perform with laptops in the classroom? Probe for: Classwork, homework, reading books taking notes, watching videos, etc.
7. Does your classroom have electricity?
8. Does your classroom have adequate chairs, desks and space for students to sit comfortably?

9. What would you like to be included in laptops to be provided to pupils in class one to make learning more interesting? Probe: Games, puzzles, cartoons/animation, songs.
10. How do you think the laptops for schools should be best used? Probe: Individually where each student gets their own, shared between two or more students, computer labs where all students can access laptops equally.
11. How do you think laptops may impact your learning and grades? Probe: negatively, positively, no impact.
12. How do you feel about the laptop project for schools? Why do you feel this way? Probe: Excited, worried, happy, scared, and confused.

Appendix 4: Student Questionnaire

A: Basic information

1. Name of school: .....
2. Class: .....
3. Age of respondent: .....
4. Gender of respondent □ Girl □Boy

B: General Assessment of Information Communication Technology (ICT) Use by Students

1. Are you familiar with any form of Information, Communication and Technology (ICT)?

   □ Yes □ No

2. If Yes in Q1, tick all the forms of ICT that you are familiar with:

   □ Mobile phone

   □ Personal Computer

   □ Laptop

   □ Tablet/iPad

   □ Other (specify)

3. If you are familiar with ICT, where do you encounter and use it? Tick all that apply

   □ At home

   □ At school

□ With a neighbor

□ With a friend

□ At the local library

□ Any other (specify).....

4. How often do you use ICT at home or in school?

□ Often (Daily basis)

□ At home only

□ In school only

□ Both at home and in school

□ Rarely (weekend only/monthly/special occasions)

□ Any other (specify).....

5. a) Are you aware of any ICT projects targeted for schools?

□ Yes

□ No

b) If yes, give the name and description of the project below

.....

6. Are you aware of the intended laptop project for schools?

   Yes

   No

7. What kinds of activities should students perform with laptops in the classroom? (Tick all that you think apply)

   Classwork

   Homework

   Reading books

   Taking notes

   Searching for information

   Watching videos

   Emails

   Social networking

8. Does your classroom have electricity?

   Yes

   No

9. Does your classroom have adequate chairs, desks and space for students to sit comfortably?

   Yes

   No

10. What would you like to be included in laptops to be provided to pupils in class one to make learning more interesting?

    □ Games

    □ Puzzles

    □ Cartoons/Animations

    □ Songs

    List any others you can think of: .....

11. How do you think the laptops for schools should be best used?

    □ Individually where each student gets their own

    □ Shared between two or more students

    □ Computer labs where all students and classes can access laptops equally

    Other ways (specify).....

12. Please rate the degree to which you believe laptops may impact your learning and grades.

    □ ICT may negatively affect my learning and my examination grades

    □ ICT will have no effect on my learning and my examination grades

    □ ICT may positively affect my learning and my examination grades

13. Tick the best answer according to you from the below choices about ICT in the classroom

    □ ICT has no place in the classroom setting

    □ I can see potential uses of ICT in the classroom

14. How do you feel about the laptop project for schools? Tick the box closest to how you feel.

    □ Excited

    □ Worried

    □ Happy

    □ Scared

    □ Confused

15. Tick the box that is closest to your opinion on the following statements:

Statements on Views	**Agree**	**Disagree**	**No opinion**
Students are comfortable and familiar with using laptops.			
Students are excited about using laptops.			
It is important for teachers to integrate laptops in the classroom.			
Teachers are comfortable and familiar with using laptops.			
Parents are optimistic of the laptops project			

Statements on Expectations	**Agree**	**Disagree**	**No opinion**
Students can learn basic technology skills from laptops.			
Use of laptops enhances understanding of lessons by students			
Students of all ages should be given laptops to use in the classroom			
Students should be allowed to carry laptops from school to home for further learning			
Laptops can promote new methods of learning by students			
The laptops will improve teacher student interaction in class			

Thank you for taking the time to fill in this questionnaire.