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SCHOOL OF COMPUTING AND INFORMATICS

MSc. INFORMATION TECHNOLOGY MANAGEMENT

**Influence of Tablet Use on Collaborative Learning and Problem-Solving Skills
among Primary School Learners: A Case of Kalawa Primary School**

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**A PROJECT REPORT SUBMITTED IN PARTIAL FULFILMENT OF THE
REQUIREMENTS FOR THE AWARD OF MASTER OF SCIENCE DEGREE IN
INFORMATION TECHNOLOGY MANAGEMENT OF THE UNIVERSITY OF
NAIROBI.**

DECLARATION

This research project is my original work and has not been presented for the award of a degree in another University.

Signature:

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Date

This project report has been submitted in partial fulfillment of the requirements for the award of a Master of Science Degree in Information Technology Management of the University of Nairobi with my approval as the University Supervisor.

Signature:

Prof. Robert Oboko

Date

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DEDICATION

This project is dedicated to my Mum Grace, my Sister Nyambura and my Grand Parents Mr. & Mrs. James Kigotho who gave me the strength and courage to carry on though at times the going seemed very tough. You have been great pillars in my life and I wouldn't have come this far without your emotional, physical, Financial and psychological support. You all brought out the best in me to prove that there is always a way when strong will prevail.

ABSTRACT

ICT over the past few years has been regarded as a pillar for quality, effective and successful education systems in the world. This research study report sought to examine what influence the use of tablets for learning would have on primary school learners especially in matters relating to gaining problem solving skills and aiding in collaborative learning. The objectives of the study were: To find out whether the Content Quality of the tablets enhances the problem-solving skills of learners, To assess whether the Software Characteristics of the tablets enhances the problem-solving skills of learners, To establish whether the Hardware Characteristics of the tablets enhances the problem-solving skills of learners, To establish if there is a relationship between collaborative learning and problem-solving skills of learners, To propose an appropriate model of assessing collaborative learning in an e-learning environment. The study adopted a survey design and the data was collected using questionnaires and interviews. The data collected was analyzed through the use of descriptive statistics, tests of correlations and regression analysis and the results presented in tables. The results of the correlations analysis indicate that the content quality, software characteristics and hardware characteristics had a strong relationship with the overall knowledge construction. The regressions analysis on the other hand further confirms the relationship between the variables above and problem-solving skills and collaborative learning. It can therefore be concluded that the use of tablets for learning coupled with the correct content quality the reight hardware and software characteristics improves the performance of learners. The study recommends continued training of teachers and the availing of technicians for routine maintenance and repair of the tablets to ensure that they are available through out.

Key words: Problem solving skills, Collaborative learning, Tablets, ICT

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Abbreviations

ANOVA – Analysis of Variance

ICT - Information Communication Technology

IT - Information Technology

PISA – Programme of International Students Assessment

OECD - Organization for Economic Co-operation and Development

UNESCO – United Nations Educational Scientific and Cultural Organization

CHAPTER 1 INTRODUCTION

1.1 Background to the Study

In the recent years, Kenya has improved its capacities and competencies so as to compete globally with other countries and also reap benefits in the field of Information Communication Technology. (Njagi & Oboko, 2013) This is well spelt out in the Kenya Vision 2030 which has prioritized Information Communication Technology in different areas of the economy key among them, the Education sector. The Kenya national planning strategy document asserts that all learning institutions both at the basic and tertiary levels should provide training in ICT to the students and pupils to meet the future ICT skills and improve the knowledge base of pupils (Gachukia, 2016) Continuous innovations in the education sector have led to a constant change in education pedagogy (Theory and practice of education) so as to keep up with the changes.

The national ICT policy of 2006 has set objectives and strategies in regards to ICT and education with an objective that the government will support use of ICT in schools to improve the quality of teaching and learning and promoting development of relevant content to address different needs in the primary, secondary and tertiary institutions. The policy also seeks to integrate e-learning resources and the existing education resources to facilitate dissemination of knowledge and skills. (Farrell, 2007) To integrate ICT in education, Kenya has continued to invest in ICT with an aim of improving children's' learning outcomes. (Benjamin, Evelyn, Dunston, & Kibukho, 2015) This saw the introduction of the Digital Literacy Programme in 2013 by the government of Kenya, which is a program aimed at incorporating the use of digital technologies in learning using tablets. The decision was reached with the vision and context that technology has now defined our world and there is need to prepare our children for today's realities. Kenya Institute of Curriculum Development (KICD) was mandated to come up with a curriculum to integrate into the tablets which will be uploaded as an important resource for e-learning in primary schools.

In the 21st century, education has the role of not only imparting learners with knowledge but with critical skills such as Life and Career skills, Learning and Innovation skills which include (Creativity and innovation, critical thinking and problem solving, Communication and Collaboration) and Information Media and Technology Skills. (Anderson, 2010)

1.1.1 Collaborative Learning

In the 21st century, the need for the society to work and reason together on issues affecting the society has shifted the importance from individual efforts to group work and from independence to community (Marjan Laal, 2012) The same shift has taken effect in the education sector where the focus has shifted from teacher centered teaching setting to a collaborative state in which other processes based on students activities and interaction with the learning content take place. (Laal, Naseri, Laal, & Khattami, 2013)

Collaborative learning refers to a method of instruction in which learners with varying level of performance work together to attain a common goal. In this method of learning, each learner is responsible for the success of the group as well as their own individual success (Marjan, Mozghan, & Zhina, 2014)

The collaborative learning approach has its benefits in the education sector. These benefits are in the social, psychological and academics spheres of learners. (Laal & Ghodsi, Benefits of Collaborative Learning , 2012)

Collaborative learning impacts learners socially by helping them gain social skills such as respect, problem solving and important working habits such as self-reliance, organization and responsibility. Introduction of ICT to collaborative learning ensures that learners have access to more materials which they discuss among themselves and helps learners become more critical and helps them in building good relationships with others. Collaborative learning makes the students more motivated to learn (and especially with the introduction of ICT) and it is easier for them to work collaboratively with computers than using the traditional materials and the process becomes more practical. Interestingly, ICT in the collaborative learning process promotes the integration of learners with disabilities in the learning process making the process inclusive. (Valcarcel, Basilotta, & Salamanca, 2014)

On the academic front, Collaborative learning, causes higher level of thoughts since learners are actively involved in the process of learning as opposed to passively listening to the instructor. In the collaborative learning setting, the learners listen to one another, discuss the problems presented, get feedback from one another and solve the problem together which results to improved problem solving skills. The discussions and debates that take place in the collaborative learning environment helps in clarification of the ideas and promotes critical thinking. Collaborative learning also helps learners monitor one another, identify errors and learn how to

correct these errors which makes learners take full responsibility for their learning hence improves classes through higher achievement, good communication skills and improved class attendance. (Laal, Naseri, Laal, & Khattami, 2013)

Collaborative learning also has an impact on curriculum development and implementation in that, through the use of collaborative learning, teachers spend less time transmitting information thus they have more time to evaluate the learners, offer the necessary support to the learners and follow the learning process more keenly. (Valcarcel, Basilotta, & Salamanca, 2014) & (Laal & Ghodsi, *Benefits of Collaborative Learning*, 2012)

1.1.2 Problem solving skills

The Programme for International Student Assessment (PISA) in 2012 defined problem solving as the capacity of a student to engage in cognitive processing to understand and tackle problem situations where a solution is not immediately clear. It includes the willingness to engage with such situations to achieve and individual's potential as a constructive and reflective student.

With the introduction of ICT in the basic education sector, researchers are now more focused on the effectiveness of these tools on specific learning outcomes and their influence on the 21st century skills which are critical in the modern world. Characteristics of the ICT tools

1.2 Statement of the Problem

Information Communication technology is seen by many sub-Saharan African countries as a way of improving education outcomes, however, very few studies in the region have shown evidence that ICT increases student learning and equips students with skills such as problem-solving skills and contribution of ICT towards collaborative learning. (Benjamin, Evelyn, Dunston, & Kibukho, 2015) Review of literature on ICT and E-learning in the sub-Saharan Africa (With an Emphasis on Kenya) reveals that not much is known on how stakeholders can assess the learning outcomes such as Problem-solving skills in learners in an e-learning environment and measuring collaborative learning especially in the basic education sector.

A further analysis of the available literature reveals that most of the frameworks and research work done in eLearning especially in evaluating the effectiveness of ICT tools in learning outcomes such as problem-solving skills and aspects such as collaborative learning is biased towards secondary schools and institutions of higher learning. It is therefore important that as the

government implements the digital literacy program, a model is developed to ensure that the effectiveness of the program is measured especially in developing the problem-solving skills of children and how it will facilitate collaborative learning in the public primary schools.

1.3 Objectives of the Study

The study will be guided by the following objectives:

1. To find out whether the Content Quality of the tablets enhances the problem-solving skills of learners.
2. To assess whether the Software Characteristics of the tablets enhances the problem-solving skills of learners.
3. To establish whether the Hardware Characteristics of the tablets enhances the problem-solving skills of learners.
4. To establish if there is a relationship between collaborative learning and problem-solving skills of learners.
5. To propose an appropriate model of assessing collaborative learning in an e-learning environment

1.6 Significance of the Study

The digital literacy program is one way of revolutionizing education in the country and a way of incorporating ICT in education in Kenya. The aim of this study is to find how the program will influence children in gaining skills more specifically, Problem solving skills and come up with a framework which will help stake holders assess the same. The study also aims to find out how the digital literacy will influence collaborative learning in our primary schools and develop a frame work of assessing the same.

As pointed out earlier, the study will also contribute to literature on assessing Problem solving skills in our primary schools and assessing Collaborative learning in our schools since much of the available literature is biased towards Secondary schools and Institutions of higher learning.

CHAPTER 2 LITERATURE REVIEW

2.0 Introduction

This chapter will discuss the collaborative learning theories, Problem solving theories and ICT impact models and their relationships to one another. The chapter will also discuss these relationships from the global perspective, African perspective and the Kenyan perspectives in the empirical Literature review.

2.1 Collaborative Learning theories

This section will look into the theories that have informed and support the collaborative learning approach to teaching and learning.

2.1.0 The Social Constructivist Theory

This theory explains that human beings generate knowledge and meaning from their interaction between experiences and their reflexes or behavior patterns. This is an indication that learning takes place through cognitive process. However, this view is on an individual level. Collaborative process, plays a critical role in triggering and individual's cognitive process. The social Constructivist theory argues that people's knowledge structures which are referred as schema's control a person's attention, actions and learning. The assumption therefore is that individuals look for logical connections in understanding to maintain a connection between their knowledge structures and their contexts a process referred to as equilibration. Individuals have various interconnected schemas which are informed by their previous experiences and learning. These structures provide individuals with various tools and means to approach different situations and for solving different problems and accomplishing tasks. (Dillenbourg, 1999)

In some situations, individuals may not be able to understand a new situation based on prior knowledge, the individual has to reconstruct their knowledge structures to better understand the new situation. This reconstruction is based on a process referred to as assimilation and accommodation. Assimilation is a situation where individuals renew their knowledge structures in reference to a new experience, incorporating new information to earlier structures. Accommodation on the other hand is the situation where the new experience is not compatible with earlier knowledge. This means that the individuals have to change their schemas to create new knowledge. (Valtenon, 2011)

A key process that concerns learning is the cognitive conflict which links closely to the search for meaningful coherence, assimilation and accommodation. Cognitive conflicts can be defined as situations where a new situation or experience does not relate to earlier knowledge. The cognitive conflict is collaborative in that it involves other peoples' views and ideas or could be new experiences that demand for new ways of acting. This implies that, in every situation, there is need for individuals to update their knowledge structures since every situation is unique. Cognitive conflict is therefore a triggering factor that leads to updating of knowledge structures. (Valtenon, 2011)

New situations together with individual knowledge structures create a good environment for cognitive conflicts. When a learner is unable to understand a new phenomenon, one has to ask questions, find out new information or reflect and evaluate their knowledge structures. The learner has to have some knowledge to deal with the new phenomenon to enable them understand and interpret it. Without prior knowledge, one is not able to understand the phenomenon and the cognitive conflict is not meaningful and calls for strong support of the learners. (Valtenon, 2011) & (Dillenbug, 1999)

Collaborative learning methods therefore provide good possibilities for cognitive conflicts and for negotiation of various perspectives for solving the conflicts. This is through the externalization process which refers to situations where learners illustrate their knowledge structures. Through externalization, learners conceptions and misconceptions are accessible to other learners in the class which leads to cognitive conflicts. The process is also crucial in that it brings up possible cognitive gaps (situations where the learner needs to know) and it promotes students reflective thinking, and they are made aware of their knowledge structures and possible conflicts that may arise from their understanding of issues. Collaborative learning also enables learners use their peers as learning resources through asking questions and this enhances a learners' awareness of their knowledge structures, reveals cognitive gaps and may lead to cognitive conflicts. (Weinberger, 2003)

2.1.1 The Social Cultural Theory

The other theory that supports collaborative learning is the Social-Cultural theory. The theory emphasizes the importance of social cultural activities and the relationship between individuals

and the environment. A critical part of learning is the interdependence between individuals and the social processes which result in the development and use of conceptual and material tools such as language, software and formulas. These tools are culturally and historically found with each generation modifying and developing them according to the social cultural environment in which they are working in. (Valtenon, 2011) Individuals access these tools by engaging in the practices of their communities and they help in mediating the interaction between the individuals and the social contexts. People are therefore able to develop these tools further which places learning in the cultural and historical context. (Dillenburger, 1999)

Learning takes place in two levels, that is the intrapersonal level and the interpersonal level. The process first takes place on the interpersonal level which is the social level between individuals and the artifacts brought about by the conceptual and material tools in the individuals' environment. This is an indication that the first level of the learning process starts from the environment in which the individual is working or living in. The second level is the intrapersonal level which is the individuals' comprehension of the issues around them. Both the interpersonal and intrapersonal levels inform each other mutually. Through this process, people are able to carry out actions without assistance from other parties. This process is referred to as internalization and it makes use of the conceptual, material and psychological tools. (Vigotsky, 1978)

The internalization process has been criticized as a model that explains learning as a two-way process in which external factors are transmitted to learners. Critics argue that learning can be explained as a culturally mediated practical inter-subjectivity through which both the learner and the teacher play a crucial role in the learning process by creating a learning environment based on their prior knowledge and ideas. (Valtenon, 2011) This brought about the use of the term appropriation which brings out a more active role of the learner and continued interaction between the interpersonal and intrapersonal levels. The term has been defined in three different ways (Rogoff, 1995) as follows:

- 1) External factors are imported.
- 2) External factors are imported and fitted to the intention of the new owner – appropriation of cultural resources and tools

- 3) Participation – which is a learner taking part in an activity hence they become part of the activity and in this case the world is not an external entity in the learning process.

The first two definitions have a close relationship with internalization while participatory appropriation emphasizes the active role the learner plays as part of the social world. Appropriation is described as a dynamic approach that lays emphasis on thinking, remembering and planning as an active process that is directly linked to events and activities that learners take part in. Participation demands from the learners an effort of comprehension and contribution and in addition being able to bridge the gaps between different ways of understanding the situation. This involves adjustments between the participants and expanding their understanding through which learners reach a common understanding and they accomplish the set goals together. (Rogoff, 1995)

Appropriation and participation are well supported by the concept of the Zone of Proximal Development (ZPD) which is defined as the distance between the tasks that a learner can accomplish on their own and the potential level that the learner can carry out under the guidance of an expert or through collaboration with able peers. Through the support and experienced person, peers or learning materials, learners are able to learn. That is Participate and Appropriate. (Dillion, 2004) Different communities organize themselves around some common interest, activities or knowledge and they have shared ways of working, activities and norms which give the community members a sense of belonging and identity. New comers take part in the community with the guidance of experienced persons bringing along with them their prior knowledge skills and ideas. These new comers take part in community practices and they learn as the participate. During the learning process, they move to understand the community and they bring along their personal effort and knowledge which leads to development of the community. (Valtenon, 2011)

The two theories above explain the learning process as a process that informed by an individual's prior knowledge and experiences together with the individual's interaction with his/her environment and culture. The two theories bring out the collaborative learning aspect by arguing that in situation where individuals are not able to handle situations based on their prior knowledge of the subject or experiences, they may have to involve other people who are more

knowledgeable than they are. This may also require individuals to go a step further and look for more information on the subject at hand on their own through the use of technology and technological tools such as computers and PDAs'. The interaction between individuals and others plus their environment helps individuals to gain more knowledge and build their knowledge such that in future they are able to handle challenges on their own and also to guide others in handling similar challenges hence participating in the collaborative learning process.

2.2 Problem Solving Frameworks

This section looks into the frameworks that inform the process through which learners gain problem solving skills.

2.2.1 The PISA Problem Solving Framework

The PISA framework for assessing problem solving competence identifies three aspects of problem solving as shown in the table below:

<p>NATURE OF THE PROBLEM SITUATION</p> <p>Is all the information needed to solve the problem disclosed at the outset?</p>	<p><i>Interactive:</i> not all information is disclosed; some information has to be uncovered by exploring the problem situation.</p>
	<p><i>Static:</i> all relevant information for solving the problem is disclosed at the outset.</p>
<p>PROBLEM-SOLVING PROCESS</p> <p>What are the main cognitive processes involved in the particular task?</p>	<p><i>Exploring and understanding</i> the information provided with the problem.</p>
	<p><i>Representing and formulating:</i> constructing graphical, tabular, symbolic or verbal representations of the problem situation and formulating hypotheses about the relevant factors and relationships between them.</p>
	<p><i>Planning and executing:</i> devising a plan by setting goals and sub-goals, and executing the sequential steps identified in the plan.</p>
	<p><i>Monitoring and reflecting:</i> monitoring progress, reacting to feedback, and reflecting on the solution, the information provided with the</p>

	problem, or the strategy adopted.	
PROBLEM CONTEXT In what everyday scenario is the problem embedded?	Setting: does the scenario involve a technological device?	<i>Technology</i> (involves a technological device)
		<i>Non-technology</i>
	Focus: what environment does the problem relate to?	<i>Personal</i> (the student, family or close peers)
		<i>Social</i> (the community or society in general)

Table 2.1: Main features of the PISA problem-solving framework: Adopted from (OECD, 2014)

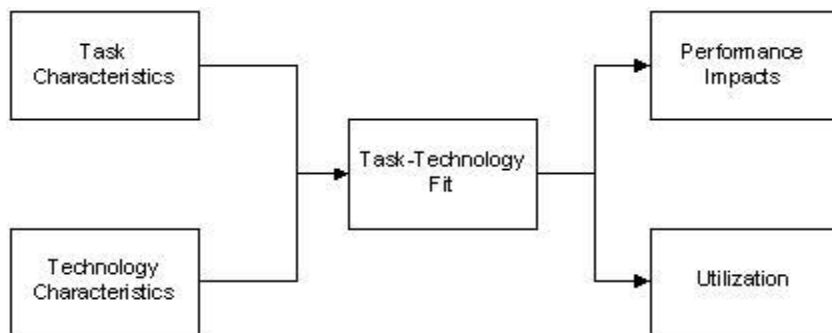
1. **Nature of the Problem Situation:** This is determined by whether the information availed to the pupils at the onset is sufficient to solve the problem or whether the interaction with the problem situation is an important part of the solving activity.
2. **Problem Solving Process:** the cognitive domain of problem solving is divided into four areas:
 - i. **Exploring and Understanding:** This refers to exploring problem situation through observation, interaction with the problem, looking for information and identifying obstacles and showing an understanding of the provided information and information discovered during interaction with the problem
 - ii. **Representation and formulation:** This is the use of tables, graphs, symbols or words to represent aspects of the problem situation and formulating assumptions about relevant facts in a problem and the relationships between them to build a coherent mental representation of problem situation.
 - iii. **Planning and Execution:** This basically involves devising a plan by setting goals and sub-goals, and executing the sequential steps identified in the plan.
 - iv. **Monitoring and Reflecting:** This involves monitoring progress, reaction to feedback and a reflection on the solution, the information provided with the problem or the strategy adopted.
3. **Problem Context:** this is classified into two dimensions the first being Technology or Non-Technology and the Personal or Social Dimensions. The technology dimension

refers to situations where the problem involves technological devices while the Non-technology dimension refers to situations where the problem does not involve technological devices. The Personal focus refers to situations where the problem situation involves only the pupil while the social focus is a situation where the problem situation is in a societal or community setting.

2.3 ICT Influence Assessment Model

This section will look discuss the TTF framework which is widely used to evaluate the effectiveness of ICT tools in various tasks.

2.3.1 Task –Technology Fit Model



Source: Goodhue and Thompson, (1995)

The Task-Technology Fit model is defined as the extent to which the use of technology helps individuals to perform his/her tasks (Goodhue & Thompson, 1995). In the context of this research, technology will refer to the tablets that have been issued to the learners to facilitate the learning process.

The Task-Technology Fit theory holds that the use of information technology is likely to have a positive effect on the performance of an individual. (Goodhue & Thompson, 1995)

2.4.1 ICT and Collaborative Learning

Development of ICT in Education points at a relationship between collaboration learning and ICT. In integrating ICT and education, there are various barriers that the teachers have to overcome for a seamless integration of technology into the teaching and learning process. One of these barriers is the teachers' beliefs concerning teaching and learning. It is assumed that

integrating ICT into the teaching and learning process will require that teaching and learning methods are based on constructivism and collaboration. (Valtenon, 2011)

2.4.2 Problem Solving Process

According to (Khazaal, 2015), several problem-solving ways have been proposed. These ways have common general steps that can be followed in solving problems. Problem solving requires several skills ranging from analytical skills, creativity and skills that allow the learners to integrate theories and ideas into practical applications. (Stary & Weichhart, 2012) Several studies have been conducted on Assessment of Problem solving skills in an E-learning Environment in institutions of higher learning. One such study was conducted by Khazaal in 2015 targeting Engineering students at Wasit University in Iraq. From the study, the researcher found out that for e-learning to be effective, students must first be introduced to basic problem-solving skills in class for them to be able to apply this knowledge later to tackle problems given to them in future. The study further found out that, when working in groups, students achieve better results and are able to solve problems faster as group collaborations enable them to share ideas with one another and also learn of different strategies of problem solving with one another.

Assessment usually involves gathering of evidence of students' achievement of learning usually through the use of examinations, tests and assignments. Some researchers also argue that assessment is a form of research whose main objective is to find out what students know, what they have understood and what they can do. (Ndebele & Maphosa, 2013) In South Africa several studies have been conducted in regards to assessment in e-learning. Ndebele and Maphosa, propose an assessment model the Outcome Based Education as one way of transforming assessment in South African institutions of higher learning. The assessment, should start with the outcomes.

The development of curriculums and learning modules starts with the skills, knowledge, attitudes therefore the assessment is more focused on what the learner has achieved in comparison to the learning outcomes instead of focusing more on what is presented on the delivery of the content. (Ndebele & Maphosa, 2013)

2.2.3 Conceptual Framework

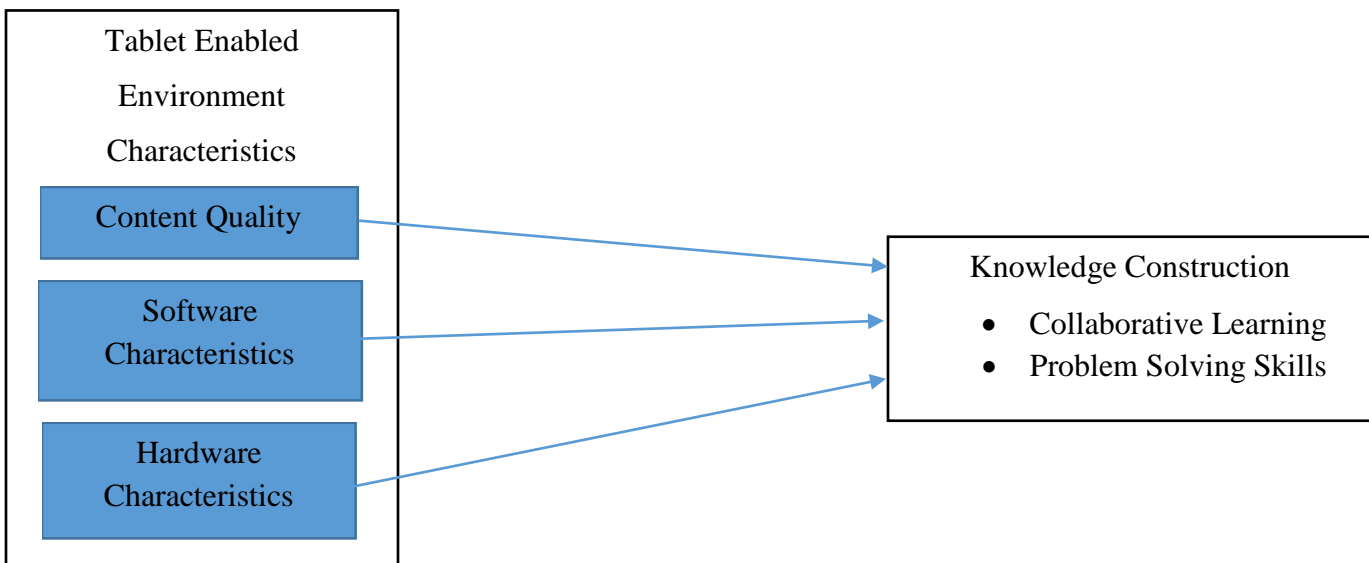
Having analyzed the frameworks above, researcher decided to blend them picking the strongest points from the frameworks. Gaining knowledge is an important aspect of learning which shows the impact that the learning has on the learners especially in gaining important skills such as problem solving and facilitating collaborative learning in the learning environment.

Use of ICT in the learning process is expected to have an influence on the learning outcomes hence the researcher intends to find out the effect use ICT will have on the Problem-Solving Skills and Collaborative learning. Below is the blended framework:

Figure 2.1 The Conceptual Framework

Independent Variables

Dependent Variable



In the conceptual above, the Tablet Enabled Characteristics denotes those changes in the learning environment that are brought about by the introduction of tablets for learning. This Characteristics are:

Content Quality:

This is used to express the quality of information that is provided in the tablet.

Software Characteristics:

This is used to express the influence that the software programmes in the tablet has on the learners' knowledge construction. It is also the capability of the tablet to communicate with the users in ways that they can understand.

Hardware Characteristics:

This is used to express the influence that the physical parts of the tablets have on the learners' knowledge construction. It will examine components such as the memory, processing speeds.

Knowledge Construction:

This refers to acquisition of new knowledge by learners through their interaction with their environment and experiences. This acquisition can be inform of collaboration with peers and the society and also through handling of various tasks that are put before them.

2.3 Conclusion

From the review of the literature discussed, it is clear that assessment forms a key component of the learning process as it shows the progress of learners both at individual level and the group level. Therefore, in implementing any e-learning platform, there should be a clear framework that is to be used in assessing to test whether learners have gained the necessary skills required to solve problem they encounter based on what is learnt in class and also to assess whether learners have gained the necessary skills required to work together in a group and participate in online discussions.

CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the practices and procedures that were used to conduct the research. The main purpose of this study was to find out what influence the introduction of tablets for learning in primary schools will have on the problem-solving skills and collaborative learning of learners. The chapter will discuss Research Design, the Research Approach, the target population, the sampling design, data collection techniques, data analysis and the ethical consideration that were applied in carrying out the study.

3.1 Research Philosophy

Research philosophy refers to the way data about a phenomenon should be collected, analyzed and used. There are three types of research philosophies; first is the Positivist Research. This philosophy lays emphasis on the scientific method which enables researchers to build knowledge through a continuous cycle. The study is not dependent on human actors (Oates, 2006). Interpretivist research on the other hand seek to identify, explore and explain how all players in a given social setting relate to one another and their interdependence. It purposes to bring out comprehension of unique contexts and discovery of how human actors make sense of perceived worlds and how such perceptions change with time and how they are different from one person to another. The study depends on human actors. For this study, the positivism philosophy was applied.

3.3 Research Design

Research design refers to the classification of conditions for collection and analysis of data in a way that is intended to bring together relevance to the research purpose with the economy in procedure. The research design forms the conceptual structure within which a study is conducted and it includes the plan for the collection, measurement and analysis of data (Kothari, 2014). It involves describing the research approach, population; sampling size and technique, project schedule, data collection instruments, and data analysis methods.

This study was in the form of a survey that aimed at understanding what influence the use of tablets for learning will have among primary school learners. The study used Kalawa Primary

School to address the research questions in reference to knowledge construction through the use of e-learning through tablets

3.3.1 Research Approach

There are two broad research approaches which are: Deductive and Inductive approaches. The deductive approach involves the subjecting of a theory to a rigorous test and the researcher is independent of what is being observed. The main purpose is to test the validity of the explanations provided. It involves moving from general observations to specific observations and It can be used for large samples however, the researcher picks a sample of sufficient numerical size. The inductive approach on the other hand is an approach that involves identifying the general principles, structures or process behind a specific observed occurrence/phenomenon. Its purpose is to develop explanations to the phenomenon. It involves moving from specific observations to broader generalizations and theories. Smaller samples are usually appropriate for this approach. For this study, the researcher used the inductive approach where he sought to move from specific observations of Kalawa Primary School in Kitui County to the broader observations.

3.3.2 Target Population

A population refers to a generally large collection of individuals, cases or objects with similar observable traits. A target population refers to the total group of individuals from which a researcher draws a sample from. For this study, the researcher's target was 10 teachers from Kalawa primary school. The area from which the research was carried out is Kitui County in the Republic of Kenya.

3.3.3 Sampling

This research generally targets primary school teachers in Kenya and specifically, teachers of Kalawa Primary School who are Ten (10) in number. The researcher seeks to analyze the impact the DLP has had on the learners' outcomes specifically targeting Problem solving skills and Collaborative learning. Kalawa Primary school was selected given the fact that they are beneficiaries of the CSR program of a Kenyan legal firm, MMC Africa Law. The sampling technique is purposive since the researcher specifically aims to target the teachers of Kalawa Primary School.

3.3.4 Data Collection

Data Collection is the step by step approach of gathering information from various sources with the aim of getting an accurate and a complete picture of the specific area or subject being studied. Data can be gathered using various methods which include: Interviews, questionnaires and observations. Interviews can either be structured, unstructured or semi-structured. On the other hand, Interviews can be administered online, on telephone or on paper. Lastly, observations can either be direct, indirect, in the field or in a controlled set up. The above techniques may be combined given the resources available, study focus or the nature of the technique. For this study, the researcher used questionnaires and also conducted interviews to collect data. These types of instruments were chosen as they would give the researcher all the answers he needed from the teachers and Pupils. Tablets are a new concept in the Kenyan education system therefore some instruments may not be effective. For instance, it was not possible to acquire any information by using observation as one could not clearly tell what is happening by observing the pupils and their teachers.

3.3.5 Validity Measures

Validity measures show the degree to which data instruments succeed in getting the details that it was designed to achieve. For this study, the measure is to ensure that the correct data has been collected. Scrutiny from lecturers and supervisors was effected.

3.3.6 Reliability Measures

Reliability measures show the degree to which a measurement instrument can be relied upon to relay consistent results if procedures are repeated over and over again. Pilot pre-test was used.

3.3.7 Data Analysis

The data analysis process involves coding of data, data entry and the analysis which helps the researcher draw conclusions and recommendations. The questionnaires administered had various aspects of the dependent variable, intervening variable and the independent variables rated by the respondents on a Likert scale of five options ranging from 1 – 5 (1=Strongly Disagree, 2=Disagree, 3=uncertain, 4=Agree and 5=Strongly Agree). The Data obtained from the questionnaires was analyzed using the Statistical Package for Social Science (SPSS) to establish what influence the use of tablets for learning has on problem solving skills and collaborative learning among leaners at Kalawa primary school.

3.4 Conceptual Framework Analysis

The conceptual framework analysis was carried out during the study to establish the existing relationship among the variables. With this analysis, the researcher was at a better position to determine the contribution of each independent variable and the intervening variable to the dependent variable. The study adopted a linear regression analysis and a multiple regression equation as follows:

$$KC_i = \beta_0 + \beta_1 CQ_i + \beta_2 SC_i + \beta_3 HC_i + \varepsilon_i$$

Where:

KC : Stands for Knowledge Construction

CQ : Stands for Content Quality

SC : Stands for Software Characteristics

HC : Stands for Hardware Characteristics

B_0 : is a constant, the value of Knowledge Construction when all values are 0

B_1 : denotes the regression coefficient of Content Quality in the Tablets

B_2 : denotes the regression coefficient of Software Characteristics in the Tablets

B_3 : denotes the regression coefficient of Hardware Characteristics in the tablets

β_4 : denotes the regression coefficient of Problems Solving Process using tablets

ε_i : Error time assumed to be a white noise.

3.5 Operationalization of the Variables

Table 3.1 Operationalization of Variables

Construct	Explanation	Operational Definitions
Content Quality	This variable assesses whether the information found in the tablets is up to date and relevant to the learners and the teachers.	Information can be categorized as either Up to date, relevant, easy to use and presented in user friendly manner.
IT software Characteristics	This variable will examine whether the programmes found in the tablets have any effect to the learning process hence influencing the problem-solving skills of learners	IT software has the potential of influencing the learning experience of learners. This will look at what kind of programmes are found in the tablets and how useful they are to the learning process and achievement of problem solving skills and aiding collaborative learning.
IT hard ware characteristics	This will determine whether the feel, connectivity and memory have any influence on Problem – solving skills and collaborative learning.	Tablets provide learners with easier access to learning content. The learners should be able to have tablets with sufficient memory to enable them access more content.
Problem Solving Process	This is the step by step process followed by learners in solving any problems presented to them.	The use of tablets has some influence on the problem-solving process. The use of tablets for learning is an indicator that may contribute to learners achieving problem-solving skills by simplifying

		the problem-solving process.
Collaborative Learning	This variable will establish whether the use of tablets has any effect on collaborative learning and in the long run influencing the knowledge construction of learners.	Prior to the use of tablets for learning, traditional learning methods were used for collaborative learning. This will be an indicator on how the tablet use will influence collaborative learning.

CHAPTER 4

DATA ANALYSIS, RESULTS AND DISCUSSION

4.0 Introduction

This chapter presents the results of analysis, findings, and discussions with reference to the research topic and study objectives. The results are shown in summary tables and analysis charts. Kruskal Wallis test and tests of correlation and regression have been employed to answer the research objectives. The data used in this study was primarily obtained from Kalawa Primary School in Kitui County. This chapter first presents the general information of the respondents.

4.1 Reliability Analysis

Reliability analysis for this study was done using Cronbach's Alpha. This test measures the internal consistency and reliability of any research tool used in a study. For the study to be effective, alpha values have to be >0.6 . Cronbach's Alpha for this study was 0.985 which is equivalent to 98.5% thus this study was effective. The table below shows the results.

Table 4.1: Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.985	.990	45

Table 4.2: Reliability Test Results

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
The information found in the tablets is up to date	187.86	482.476	.069	.987
Do the tablets give accurate information in cases where they are used for computations e.g. in Mathematics	186.86	475.476	.630	.985
It is easy to use tablets in teaching process	186.57	464.952	.901	.984
Information found in tablets is relevant	186.71	466.238	.927	.984
The information output presented in a useful format for learners	186.86	458.810	.904	.984
Using the tablets helps me teach in more effective manner	186.57	464.952	.901	.984
The tablets helps me cover more content with a short period of time	186.57	473.952	.505	.985
Use of tablets help me get a better control of classroom	186.57	464.952	.901	.984

Do you find the tablets helpful in teaching and learning process	186.57	464.952	.901	.984
The tablets have audio visual content which makes learning more interesting and attentive	186.71	466.238	.927	.984
It is easy to access content on the tablet	186.43	472.619	.563	.985
The tablets have sufficient memory which I can use to store data for future reference	186.57	464.952	.901	.984
The tablets are user friendly	186.57	464.952	.901	.984
The tablets have connectivity capabilities such as Wi-fi and Bluetooth which I can use to interact with learners and colleagues	188.00	462.333	.450	.987
Do you teach basic problem-solving skills in class	186.71	474.238	.542	.985
In examining pupils, all the information needed to answer questions is provided	187.43	461.286	.567	.986

Using tablets helps pupils understand questions asked better than when they were not using tablets	186.57	464.952	.901	.984
Use of tablets helps pupils to interpret the information provided with questions better than without tablets	186.57	464.952	.901	.984
use of tablets assist pupils in recognizing the information provided with the questions to their own understanding	186.71	457.571	.861	.984
Use of tablets helps pupils improvise so as to understand question better	187.00	451.667	.784	.985
Using tablets helps pupils plan how they are going to answer or solve a problem presented to them better than when working without tablets	187.00	451.667	.784	.985
Using tables helps pupils work together with the peers and teachers towards solving problems	186.71	466.238	.927	.984

The use of tables has made it easier for pupils to learn and gain skills from one another	186.71	466.238	.927	.984
Using tablets has helped pupils get many ideas on how to solve different problems they face	186.71	466.238	.927	.984
Using tablets helps pupils complete tasks given within a short period of time	186.57	464.952	.901	.984
Use of tablets help pupils work on their own	186.71	457.571	.861	.984
Use of tablets help pupils remember better what is covered in class	186.57	464.952	.901	.984
Tablets help pupils solve problems more easily than without tablets	186.57	464.952	.901	.984
use of tablets has made pupils more active in class	186.57	473.952	.505	.985
The use of tablets has improved the school attendance of pupils	186.71	466.238	.927	.984

With the use of tablets for teaching, I am more satisfied with my role as a teacher	186.71	466.238	.927	.984
Use of tablets in learning has helped in implementing learner centered learning	186.71	466.238	.927	.984
Using tablets, it is easier to monitor the pupils group work and assignment	186.71	466.238	.927	.984
When working with tablets pupils are able to work with less errors	186.71	466.238	.927	.984
Use of tablets help pupils solve tasks given to them	186.86	458.810	.904	.984
Use of tablets has made pupils more creative in their work	186.86	450.476	.758	.985
Using tablets has improved the performance of pupils in examinations	186.57	464.952	.901	.984
They help pupils solve problems accurately	186.71	466.238	.927	.984
They help pupils develop ideas they have to maturity	186.86	458.810	.904	.984

They have helped learners improve their communication skills	186.57	464.952	.901	.984
They have helped learners gain more confidence	186.71	466.238	.927	.984
They make collaborative leaning easier compared to traditional learning method	186.57	464.952	.901	.984
They make learning more practical	186.86	458.810	.904	.984
They improve relationship between learners and their peers	186.57	464.952	.901	.984
The use of tablets for learning help pupils ask more questions	186.71	466.238	.927	.984

4.1.1 Response Rate

The researcher set out to reach 9 respondents (teachers of Kalawa Primary School) and 8 of them filled the questionnaires and returned them. This translates to 88.89% response rate.

4.2 Descriptive Statistics

4.2.1 Descriptive Statistics for Content Quality

		Statistics				
		The information found in the tablets is up to date	Do the tablets give accurate information in cases where they are used for computations e.g. in Mathematics	It is easy to use tablets in teaching process	Information found in tablets is relevant	The information output presented in a useful format for learners
N	Valid	8	8	8	8	8
	Missing	0	0	0	0	0
Mean		3.25	4.13	4.38	4.25	4.13
Mode		4	4	4	4	4

Table 4.3 Descriptive statistics for Content Quality

Most of the respondents with a mode of 4 agreed with the various components of the Content Quality presented to them. These aspects were: the information found in the tablets is up to date (Mean 3.25 and Mode 4), the tablets give accurate information when they are used for computations (Mean 4.13 and Mode 4), The Tablets are easy to use (Mean 4.38 and Mode 4). Information found in tablets is relevant (Mean 4.25 and Mode 4) and the information output presented is in a useful format to the learners (Mean 4.13 and Mode 4) These results are as presented in table 4.3 above.

4.2.2 Descriptive Statistics for IT Software Characteristics

		Statistics					
		Using the tablets helps me teach in more effective manner	The tablets helps me cover more content with a short period of time	Use of tablets help me get a better control of classroom	Do you find the tablets helpful in teaching and learning process	The tables have audio visual content which makes learning more interesting and attentive	It is easy to access content on the tablet
N	Valid	8	8	8	8	8	8
	Missing	0	0	0	0	0	0
Mean		4.50	4.50	4.50	4.50	4.25	4.50
Mode		4 ^a	4 ^a	4 ^a	4 ^a	4	4 ^a
a. Multiple modes exist. The smallest value is shown							

Table 4.4 Descriptive statistics for IT software Characteristics

Most of the respondents with a mode of 4 agreed with the various components of the IT software Characteristics presented to them. These aspects were: the use of tablets helps teachers teach more effectively (Mean 4.50 and Mode 4), The use of tablets helps teachers cover more content within a shorter period of time (Mean 4.5 and Mode 4), Use of tablets helps teachers get a better control of the classroom (Mean 4.5 and Mode 4). The teachers also find the use of tablets helpful in the teaching in the learning process (Mean 4.5 and Mode 4) The tablets have audio visual content which makes learning more interesting and makes learners attentive (Mean 4.25 and Mode 4) and That it is easy to access content on the tablet (Mean 4.5 and Mode 4) These results are as presented in table 4.4 above.

4.2.3 Descriptive statistics for IT Hardware Characteristics

		Statistics		
		The tablets have sufficient memory which I can use to store data for future reference	The tablets are user friendly	The tablets have connectivity capabilities such as Wi-fi and Bluetooth which I can use to interact with learners and colleagues
N	Valid	8	8	8
	Missing	0	0	0
Mean		4.50	4.50	2.88
Mode		4 ^a	4 ^a	2
a. Multiple modes exist. The smallest value is shown				

Table 4.5 Descriptive statistics for IT Hardware Characteristics

Most of the respondents with a mode of 4 and 2 agreed and disagreed with the various components of the IT Hardware Characteristics presented to them. These aspects were: The tablets have sufficient memory which the teachers can use to store data for future reference (Mean 4.50 and Mode 4), The tablets are user friendly to teachers (Mean 4.5 and Mode 4), The tablets have connectivity capabilities such as Wi-fi and Bluetooth which teachers can use to interact with learners and colleagues (Mean 2.88 and Mode 2) These results are as presented in table 4.5 above.

4.2.3 Descriptive statistics for Problem Solving

		Statistics					
		Do you teach basic problem-solving skills in class	In examining pupils, all the information needed to answer questions is provided	Using tablets helps pupils understand questions asked better than when they were not using tablets	Use of tablets helps pupils to interpret the information provided with questions better than without tablets	use of tablets assist pupils in recognizing the information provided with the questions to their own understanding	Use of tablets helps pupils improvise so as to understand question better
N	Valid	8	8	8	8	8	8
	Missing	0	0	0	0	0	0
Mean		4.38	3.63	4.38	4.38	4.25	4.13
Mode		4	4	4	4	4	4

Table 4.6 Descriptive statistics for Problem Solving

Most of the respondents with a mode of 4 agreed with the various components of the Problem-solving process presented to them. These aspects were: That learners are taught basic problem-solving skills in class (Mean 4.38 and Mode 4), In examining pupils all information needed to answer the questions is provided (Mean 3.63 and Mode 4), Using tablets helps pupils understand questions asked better (Mean 4.38 and Mode 4) Use of tablets helps pupils interpret the information provided with the questions better. (Mean 4.38 and Mode 4), use of tablets helps pupils in reorganizing the information provided with the questions (Mean 4.25 and Mode 4) and that use of tablets helps pupils to improvise so as to understand questions better. These results are as presented in table 4.6 above

4.2.3 Descriptive statistics for Collaborative Learning

		Statistics					
		They have helped learners improve their communication skills	They have helped learners gain more confidence	They make collaborative learning easier compared to traditional learning method of learning	They make learning more practical	They improve relationship between learners and their peers	The use of tablets for learning help pupils ask more questions
N	Valid	8	8	8	8	8	8
	Missing	0	0	0	0	0	0
Mean		4.38	4.25	4.38	4.25	4.50	4.38
Mode		4	4	4	4	4 ^a	4
a. Multiple modes exist. The smallest value is shown							

Table 4.7 Descriptive statistics for Collaborative Learning

Most of the respondents with a mode of 4 agreed with the various components of the Collaborative learning presented to them. These aspects were: That learners have improved their communication skills (Mean 4.38 and Mode 4), The use of tablets has helped learners gain more confidence (Mean 4.25 and Mode 4), Using tablets makes collaborative learning easier compared to traditional learning methods (Mean 4.38 and 4) Use of tablets makes learning more practical. (Mean 4.25 and Mode 4), use of tablets has helped pupils Improve their relationships with their peers (Mean 4.50 and Mode 4) and that use of tablets for learning helps pupils ask more questions (Mean 4.38 and Mode 4). These results are as presented in table 4.7 above

4.3 Correlation

This section looks at the degree of relation between the Independent Variables and the Dependent variables. The researcher conducted the correlation tests in order to check whether linear regression would be appropriate to use for the study. By linear relationship, it means that the relationship can be characterized by a straight line. Pearson correlation was used to measure the degree of association between variables under consideration i.e. independent variables and dependent variable.

Pearson correlation coefficients (r) ranges from -1 to +1. Positive values indicate positive correlation and negative value indicates negative correlation. Therefore, a positive r value shows a positive relationship between the two variables. This means the higher scores on the independent variable are associated with higher scores on the dependent variable. Similarly, as the lesser scores on the independent variable are associated with lesser scores on the dependent variable. A negative r value shows a negative relationship. This means the higher scores on the independent variable are associated with the smaller/lesser scores on the dependent variable. A correlation coefficient of zero indicates there is no predictable relationship between the variables at all. In instances where Pearson coefficient <0.3 indicates weak, positive correlation, Pearson coefficient $>0.3 <0.5$ indicates moderate correlation and Pearson coefficient >0.5 indicates strong, positive correlation.

4.3.1.0 Degree of relation between Content Quality and Collaborative Learning

Symmetric Measures				
	Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Pearson's R	.745	.208	2.739	.034 ^c
Spearman Correlation	.745	.208	2.739	.034 ^c
N of Valid Cases	8			
a. Not assuming the null hypothesis.				
b. Using the asymptotic standard error assuming the null hypothesis.				
c. Based on normal approximation.				

Table 4.8 Degree of Relation between content quality and collaborative learning

From the table above, there is a positive relationship between content quality and collaborative learning thus, an improvement in the content quality will lead to better collaborative learning.

4.3.1.1 Degree of relation between Content Quality and Problem-Solving Skills

Symmetric Measures				
	Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Pearson's R	.545	.152	1.592	.162 ^c
Spearman Correlation	.690	.191	2.335	.058 ^c
N of Valid Cases	8			
a. Not assuming the null hypothesis.				
b. Using the asymptotic standard error assuming the null hypothesis.				
c. Based on normal approximation.				

Table 4.9 Degree of Relation between content quality and problem-solving skills

From the table above, there is a positive relationship between content quality and problem-solving skills thus, an improvement in the content quality will lead to better attainment of problem solving skills.

4.3.2.0 Degree of relation between IT software Characteristics and Collaborative Learning

Symmetric Measures				
	Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Pearson's R	.655	.180	2.121	.078 ^c
Spearman Correlation	.690	.191	2.335	.058 ^c
N of Valid Cases	8			
a. Not assuming the null hypothesis.				
b. Using the asymptotic standard error assuming the null hypothesis.				
c. Based on normal approximation.				

Table 4.10 Degree of relation between IT software characteristics and Collaborative Learning

From the table above, there is a degree of a positive relationship between IT software characteristics and Collaborative learning thus, an enhancement of the IT software characteristics in the tablets will lead to better achievement of Collaborative learning abilities.

4.3.2.1 Degree of Relation between IT software Characteristics and Problem-Solving skills.

Symmetric Measures				
	Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Pearson's R	.577	.204	1.732	.134 ^c
Spearman Correlation	.577	.204	1.732	.134 ^c
N of Valid Cases	8			
a. Not assuming the null hypothesis.				
b. Using the asymptotic standard error assuming the null hypothesis.				
c. Based on normal approximation.				

Table 4.11 Degree of relation between IT software characteristics and Problem-solving skills.

From the table above, there is a degree of a positive relationship between IT software characteristics and problem-solving skills thus, an enhancement of the IT software characteristics in the tablets will lead to better achievement of problem solving skills.

4.3.3.0 Degree of relation between IT hardware Characteristics and Collaborative Learning

Symmetric Measures				
	Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Pearson's R	.258	.339	.655	.537 ^c
Spearman Correlation	.258	.339	.655	.537 ^c
N of Valid Cases	8			
a. Not assuming the null hypothesis.				
b. Using the asymptotic standard error assuming the null hypothesis.				
c. Based on normal approximation.				

Table 4.12 Degree of relation between IT hardware characteristics and Collaborative learning

From the table above, there is minimal relationship between IT hardware characteristics and problem-solving skills thus, a change in any of the IT hardware characteristics in the tablets will not result to any significant change in achievement of problem solving skills.

4.3.3.1 Degree of relation between IT hardware Characteristics and Problem-Solving Skills

Symmetric Measures				
	Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Pearson's R	.617	.235	1.919	.103 ^c
Spearman Correlation	.608	.234	1.877	.110 ^c
N of Valid Cases	8			
a. Not assuming the null hypothesis.				
b. Using the asymptotic standard error assuming the null hypothesis.				
c. Based on normal approximation.				

Table 4.13 Degree of relation between IT hardware characteristics and Problem-Solving Skills

From the table above, there is a degree of a positive relationship between IT Hardware characteristics and problem-solving skills thus, an enhancement of the IT Hardware characteristics in the tablets will lead to better achievement of problem solving skills.

4.3.4.0 Degree of relation between Problem-Solving Skills and Collaborative Learning

Symmetric Measures				
	Value	Asymp. Std. Error ^a	Approx. T ^b	Approx. Sig.
Pearson's R	.775	.187	3.000	.024 ^c
Spearman Correlation	.775	.187	3.000	.024 ^c
N of Valid Cases	8			
a. Not assuming the null hypothesis.				
b. Using the asymptotic standard error assuming the null hypothesis.				
c. Based on normal approximation.				

Table 4.14 Degree of relation between Problem-Solving Skills and Collaborative Learning

From the table above, there is a degree of a positive relationship between Problem-Solving Skills and Collaborative Learning hence an improvement in the learners problem-solving skills will lead to better collaborative learning.

4.4 Regression Analysis Results

The study employed regression test to estimate the impact that the independent variables have of the dependent variable. Multiple regression analysis yielded results as shown in table 4.15. R^2 is a term that shows how efficient a term is in predicting the other. The higher the R^2 value, the better it is for the variables to predict one another.

Table 4.15 Model Summary Between Independent Variables

Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.994 ^a	.989	.911	.149	.989	12.748	7	1	.212

a. Predictors: (Constant), The content quality characteristics, IT software Characteristics, IT hardware Characteristics.

4.5.1 ANOVA Result

Table 4.16 Anova Summary

ANOVA ^a						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.423	3	1.141	1.322	.384 ^b
	Residual	3.452	4	.863		
	Total	6.875	7			

a. Dependent Variable: Knowledge Construction

b. Predictors: (Constant), Content Quality, IT software Characteristics, IT hardware Characteristics

4.5.2 Regression Coefficients

Table 4.17 Coefficients of all Independent Variables

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.286	3.624		-.631	.562
	Content Quality Characteristics	.976	.811	.527	1.204	.295
	IT software Characteristics	.548	.951	.256	.576	.596
	IT hardware Characteristics	-.095	.405	-.085	-.235	.826

a. Dependent Variable: Knowledge Construction

$$KC_i = \beta_0 + \beta_1 CQ_i + \beta_2 SC_i + \beta_3 HC_i + \varepsilon_i$$

The coefficients show that content quality in the tablets and Knowledge construction were significant yielding .976 and a t value of 1.104. IT software characteristics were also statistically significant yielding 0.549 and a t value of .576. IT hardware characteristics were statistically insignificant and others factors nor included in this study may affect the variable. However, the significance levels of the variables are all >0.05 thus they can still be used to measure knowledge construction with other factors being considered that have not been included in this study not forgetting the error term.

All the variables were retained since they positively and significantly affect Knowledge Construction. The results show that all the variables yielded a level of significance of >0.05 . This shows that all the independent variables tested have a significant impact on the dependent variable, Knowledge Construction.

4.6 Summary of Findings

The study aimed at finding out whether the use of tablets for learning among primary school learners will have any influence on the gaining of problem-solving skills and collaborative learning.

By looking at the content quality, the study aimed at finding out whether the content quality in the tablets has any effect in the learner gaining problem solving skills and how the same affects collaborative learning. From the descriptive analysis, the mean 4.02 is an indication that a majority of the respondents agreed on the various components of content quality. The correlation analysis done shows a strong relationship ($r^* = 0.745$) between content quality and the overall knowledge construction. This is an indication that a positive change in the content quality would result to a positive change in the gaining of problem-solving skills and a similar change in the collaborative learning experience. The regression analysis on the same confirms that for every change in the content quality in tablets, there results an increase in the knowledge construction in the learners. This is in line with the findings of (Umar, 2015) who argues that the quality of the content that is found technological learning devices has an influence in the knowledge construction of the learners. They found out that, the higher the content quality higher knowledge construction will take place.

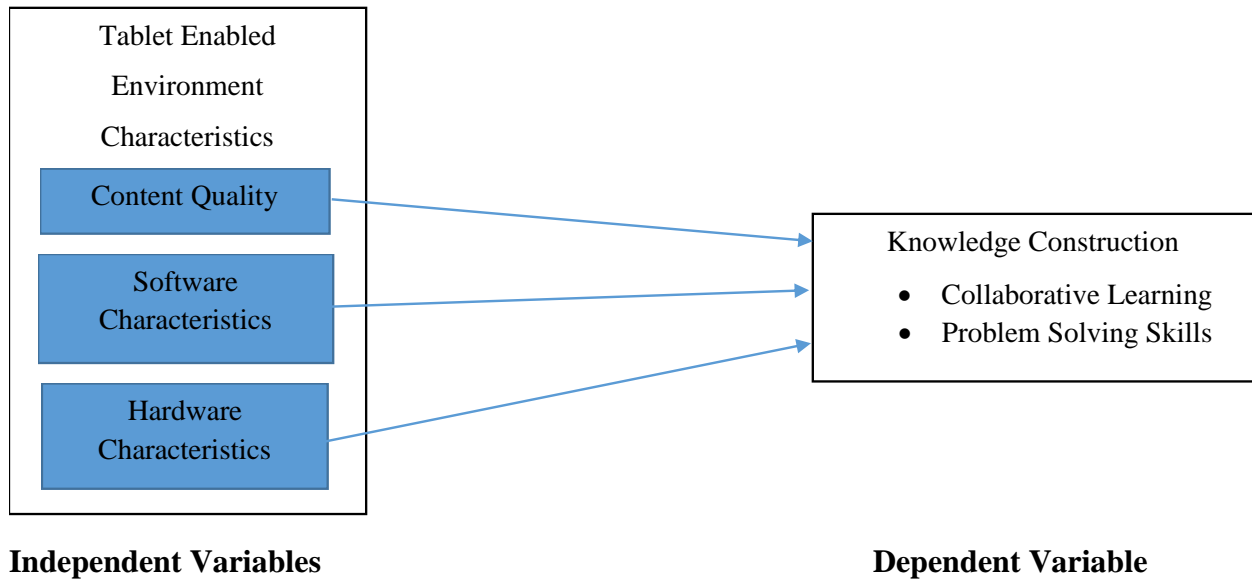
The study on the IT software characteristics aimed at finding out whether the IT software found in the learning tablets had any effect on the overall knowledge construction. From the descriptive analysis, the mean 4.46 is an indication that a majority of the respondents agreed on the various components of IT software characteristics. Further, the correlation analysis carried out shows a strong relationship ($r^* = 0.712$) Between IT software characteristics and the overall knowledge construction. This indicates that an enhancement of software used in the tablets will result to a positive change in knowledge construction. This is in agreement with the findings of (Atta, 2017) who argued that the more enhanced the software of a device is the easier it is for the users to maneuver through which increases their knowledge construction in that they are able to explore

more on their own gaining more knowledge not only on the operation of such devices but also on other issues that may not be covered during trainings.

The study on the IT hardware characteristics aimed at finding out whether the hardware components of the tablet have any effect on the overall knowledge construction of the learners. This brought out an interesting finding in that hardware characteristics have a positive correlation with only one aspect of knowledge construction which is Problem solving skills. This is through a correlation of 0.61 while the correlation of hardware characteristics with Collaborative learning was at a minimal rate of 0.258. This is an indication that the enhancement of Hardware characteristics of the tablets would have minimal influence on the collaborative aspect of the Knowledge construction while it would have a bigger influence on problem solving skills aspect of knowledge construction.

The other issue that the researcher sought to find out was whether Problem solving skills had an Influence over Collaborative learning. With a Mean of 4.35, majority of the respondents agreed that with the components of problem-solving skills and Collaborative learning. An analysis of the correlation between the two yielded a result of $r = .775$ which is an indication that problem solving skills has a high level of influence on collaborative learning. This is an indication that for every increase in the achievement of Problem-solving skills achieved by learners, the better the collaborative learning and the vice versa is true. These findings are in line with the findings of (Orr, 2015) who from their research concluded that knowledge construction is enhance when learners work on a problem given to them together than when each works on their own.

The fitted model for the study remains as it is below:



CHAPTER 5

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter includes the summary of key findings, conclusion, recommendations of the study and suggestions for further work.

5.1 Summary of Findings

The study aimed at finding out what effect content quality, IT software characteristics and IT hardware characteristics will have on the dependent variable knowledge construction (collaborative learning and Problem-solving skills). The data collected for the study was analyzed using SPSS version 20.

The study established that problem-solving skills were highly influenced by all the independent variables while collaborative learning was not influenced by the IT hardware Characteristics. This is an indication that for us to ensure that there is more knowledge construction, we must enhance the Content Quality in the learning tablets, enhance the Software characteristics and also enhance the hard ware characteristics to ensure that learners achieve better problem-solving skills as they learn in the e-learning environment.

The study also finds that the use of tablets for the learning process is one of the sure ways of supporting the learner centered mode of learning moving from the teacher centered mode of learning which has been in use for the longest time due to lack of sufficient resources. There is need for more investment in the project to ensure that by the end of the project implementation, all learners will be having their own tablets to ensure that the country reaps full benefits from the project.

From the study, the researcher also established that other than learners gaining problem solving skills and the tablets aiding collaborative learning, the use of tablets for learning helps learners gain other skills and values that may not be taught in class but are critical in having an all rounded individual. These skills and values include, respect for one another, communication and

sharing of resources which are critical in ensuring harmonious living among people both in school and outside the school environment.

5.2 Conclusions

The research aimed at investigating the influence of the use of tablets for learning on problem solving skills and collaborative learning using class six teachers of Kalawa Primary School as the sample size. From the findings, the study establishes that content quality, tablet IT software characteristics and Tablet IT hardware characteristics has some influence on either problem-solving skills or collaborative learning and in the end, having an influence on the overall knowledge construction of learners. From the above findings, it can be concluded that the use of tablets for learning is beneficial to learners in that it will help them gain knowledge which is one of the ultimate goals of the Kenya's Education System.

Another conclusion that can be drawn from the study is that the use of tablets for learning is a step towards the right direction in ensuring that the country moves from Teacher centered learning to learners-oriented mode of learning.

5.3 Recommendations

From the Study above, the following is recommended.

- I. The role of the teacher in the development of learning content is very critical and therefore, teachers should be involved every time content is being developed to ensure that it is relevant to the learners.
- II. There should be regular training of teachers on the use of tablets to ensure that they keep up with changing technology.
- III. On maintenance and repair, it is important to ensure that the schools get access to qualified technicians to ensure that the tablets are well maintained and faulty ones are repaired. This will ensure that the tablets are available and working at all times for the learners to keep enjoying the benefits of the tablets.
- IV. In terms of further research, there is need to research on the influence the integration of the tablets will have on other key 21st Century skills to ensure that learners have gain all

skills necessary for the 21st century especially with the high competition brought about by Information Technology.

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Appendix 1

Questionnaire for Teachers

Dear respondent,

We are conducting a research on the possible influence of use of ICT in the learning process in Collaborative Learning and on Problem Solving skills.

The main aim of this study is to understand how the transition of the process has been. We shall be able to know the benefits of the Digital Literacy Programme and its effects on collaborative learning and problem-solving skills which are important aspects in the learning process and outcomes.

Data collected is meant for research only therefore all answers given remain very confidential.

The questions require you to indicate your response(s) by marking a tick in the spaces provided alongside.

Gender: Male Female

For how many terms has your school been using tablets for learning? _____

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Content Quality Characteristics						
1	The information found in the tablets is up to date					
2	Do the tablets give accurate information in cases where they are used for computations e.g. in Mathematics					
3	It is Easy to use the tablets in the teaching process					
4	Information Found in tablets is Relevant					
5	Is the information output presented in a useful format for the learners					
IT Software Characteristics						
6	Using the Tablets helps me teach in a more effective manner					
7	The tablets helps me cover more content within a short period of time					

8	Use of the tablets help me get a better control of the classroom					
9	Do you find the tablets helpful in the teaching and learning process					
9	The tablets have audio visual content which makes learning more interested and attentive					
10	It is easy to access content on the tablets					
IT Hardware Characteristics						
11	Tablets have sufficient memory which I can use to store data for future reference.					
12	The tablets are user friendly					
13	The tablets have connectivity capabilities such as <i>Wi-Fi</i> and Bluetooth which I can use to interact with the learners and colleagues					
Problem Solving						
14	Do you teach basic problem-solving skills in class					
15	In examining pupils, all the information needed to answer questions is provided					
16	Using the tablets help pupils understand questions asked better than when they were not using tablets					
17	Use of tablets help pupils to interpret the information provided with questions better than without tablets					
18	Use of tablets assist pupils in reorganizing the information provided with the questions to their own understanding					

19	Use of tablets helps pupils improvise so as to understand questions better					
20	Using tablets help pupils plan how they are going to answer or solve a problem presented to them better than when working without tablets					
21	Using tablets helps pupils work together with their peers and teachers towards solving problems					
22	The use of tablets has made it easier for pupils to learn and gain skills from one another					
23	Using tablets has helped pupils get many ideas on how to solve different problems they face					
24	Using tablets helps pupils complete tasks given within a short period of time					
25	Use of tablets helps pupils work on their own					
26	Use of tablets help pupils' remember better what is covered in class					
27	Tablets help pupil's solve problems more easily than without tablets					
28	Use of tablets has made pupils more active in class					
29	The use of tablets has improved the school attendance of pupils.					
30	With the use of tablets for teaching, I am more					

	satisfied with my role as a teacher.					
31	Use of tablets in learning has helped in implementing learner centered learning					
32	Using Tablets it is easier to monitor the pupils group work and assignments					
33	When working with tablets pupils are able to work with less errors					
34	Use of tablets help Pupils solve tasks given to them					
35	Use of tablets has made pupils more creative in their work					
36	Using tablets has improved the performance of pupils in examinations					
37	Tablets help pupils solve problems accurately					
38	The use of tablets helps pupils develop the ideas they have to maturity					
Collaborative Learning						
39	The use of tablets has helped learners improve their communication skills					
40	The use of tablets has helped learners gain more confidence					
41	The use of tablets make collaborative learning easier compared to traditional methods of learning					
42	The use of tablets makes learning more practical					

43	The use of tablets has helped improved relationships between learners and their peers					
44	Use of tablets for learning helps pupils ask more questions					

Thank you for Your Time

