Influence of Use of Learning Strategies in Information Communication Technology on Standard Seven Pupils' Academic Self-Concept in Bungoma County, Kenya

Fred Juma Wakasiaka (Corresponding Author)

Department Of Educational Psychology

Kenyatta University

P.O Box 43844-00100

Nairobi, Kenya

E-mail: wakasiaka@gmail.com

Dr. Chrispus Wawire

Department Of Educational Psychology

Kenyatta University

P.O Box 43844-00100

Nairobi, Kenya

Dr. Edward Kigen

Department Of Educational Psychology

Kenyatta University

P.O Box 43844-00100

Nairobi, Kenya

Abstract

Despite introduction of Information Communication Technology in schools by Government

of Kenya, minimal research has been done on influence of learning strategies in information communication technology use on academic self-concept of pupils. Poor trends in academic achievement are associated with pupils' low academic self-concept as an outcome of continued use of traditional learning strategies. The purpose of the present study was therefore to investigate the influence of learning strategies in the use of information communication technology on pupils' academic self-concept. Multimedia Learning Theory, Collaborative Learning Theory and the Self Theory of Personality Development formed the theoretical framework of the study. A causal comparative *ex post facto* research design was used. The study employed mixed methods research by integrating qualitative and quantitative research. The study was done in Bungoma County. The target population was Standard Seven pupils in public primary schools in Bungoma County. A sample of 375 pupils was involved. Purposive sampling was used to select schools with computer program as treatment group and simple random sampling for schools using traditional learning strategies as comparison group. Independent and dependent variables were learning strategies and academic self-concept respectively. Data was collected through an adapted questionnaire with Academic Self-concept Scale and Learning Strategy Rating Scale for learning strategies. Oral interviews and non-participant overt observations were used to collect qualitative data from pupils and teachers who handled learners in the laptop computer programs. The reliability and validity of the instruments was established through a pilot study in 2 sampled schools which were not included in the main study. Data management and analysis was done using both inferential and descriptive statistics using Statistical Package for Social Sciences program. Pearson product moment correlation and t-test were used for inferential statistics. Results showed that significant differences in academic self-concept existed between pupils using traditional learning strategies and those using learning strategies in the use of ICT (t = 3.990, df = 238, p< 0.05), (t= 4.256, df = 238, p< 0.05) and (t= 2.014 df=251, p<0.05). Apart from Individual Learning Strategy in the use of computer, Child-to-Child and Child-teacher learning strategies were found to have significant relationships with academic self-concept [r(186)= 0.300, 0.275 and 0.311, p< 0.05]. Recommendations for adoption of learning strategies in information communication technology use in classroom teaching and learning, policy development in education and curriculum development were made. Further research using pre-test and post-test experimental design with control group using samples at other levels of education and on individual subject academic self-concept was recommended.

Keywords: Learning strategies, academic self-concept, academic confidence, information communication technology

1. Introduction

Academic self-concept is defined as student's self-perception of academic ability formed through individual experiences and interactions with the environment (Cemal, 2021). It relates to how well one learns or how well one does at school. Understanding ASC is vital in the learning process because it is a predictor of academic achievement. Nyagah (2016) found that ASC is a good predictor of academic achievement. Improving academic performance is the main goal of educational institutions globally. ASC can be influenced by learning strategies among other factors. Learning strategies (LS) are steps taken by learners to enhance

their learning. A learning strategy is an individual's approach (organization and skills) to complete a task. All that learners do to accomplish learning tasks are LS. Utilisation of Information Communication Technology (ICT) in the learning process like use of computers has specific learning strategies that involve manipulation of the digital devices like laptops. Hong Shi (2017) found that the more learning strategies a learner uses, the more the learner feels confident, motivated and self-efficacious. The three variables are part of or related to academic self-concept (ASC). It can be detected that learning strategies can influence or be associated with changes in ASC which can be measured through academic confidence, perception of achievement and capability. Theoretically, positive ASC is a good recipe for increased academic achievement which is the ultimate goal of any learner in a learning institution. This means that learners who have positive views of their academic abilities are more likely to engage in activities that promote academic achievement. Such achievement related activities include; early preparation for tests, completing homework and actively participating in class during lessons (Valentine et al., 2004).

According to Kwena (2007), learners should be equipped with skills to enable them feel good about themselves cognitively, socially, physically and emotionally. It was observed in the same research that self-confidence and positive self-image (self-concept) helps learners make proper judgments when faced with social and academic challenges. Research on self-concept or the perceived competence also shows that among the students of the same capability, those with low-academic self-concepts are not persistent enough (Fredrick et al., 2012).

From the definition, academic self-concept is determined by individual experiences and interactions with the environment. Learning environment is a factor influencing learning and learning outcomes. Use of Information Communication Technology (ICT) like use of laptop computers or other digital devices is one of the factors in the environment that are responsible for ASC, especially for learners who hardly access computers for academic use. Use of ICT is a motivating factor to such learners, which increases academic self-efficacy. Academic self-efficacy, a component of ASC, refers to individuals' convictions that they can tackle a task or assignment successfully to some predetermined levels (Bong & Einar, 2003). In the current times, use of ICT has found a place in education, especially the use of computers in the learning process. Computer programs for classroom instruction and simulations are now available for learning institutions in various subjects in schools. Laptops and other digital learning devices are being used as learning tools.

Similarly, research suggests that enriching learning environment with ICT devices especially laptops and other digital learning devices like tablets, has positive effects (National Research Council, 2002). These positive effects will include academic achievement and academic self-concept. Such research results propelled the USA Federal Government to inject six billion dollars in educational technology to obtain high academic achievement in the years 2003 and 2004 (Johnson, 2004). This government recognized the potential of educational technology to enhance learning outcomes. A technologically-rich learning environment influence academic self-concept of learners. Continued research on how learners use the mobile technology like use of laptops and their effect on learning outcomes like academic self-concept is necessary.

Learners use computers like laptops in various ways. Some gain confidence or are motivated when working alone on the computer (individual-child learning strategy), others are motivated when they work with fellow learners (child-to-child learning strategy), while others gain confidence when working with a teacher around them (child-teacher learning strategy). These are learning strategies used by learners with ICT tools. The present study considered the influence of learning strategies in ICT use on academic self-concept among pupils in primary schools. Their academic self-concept was studied comparatively with those using traditional learning strategies where there no laptops or ICT in class.

Bick (2005) found that learners who made use of ICT tools like laptops as learning devices were found to think at higher levels, work together more and become much more involved in the learning process. This depicts increased academic confidence which is a component of academic self-concept. Working together in class means collaboration during the learning process, which is a child-to-child (CTC) learning strategy. Involvement in the learning process includes engagement with tutors and individual learning which is a description of child-teacher learning strategies and individual learner learning strategies. While this research was done in the USA, similar research could be done in other areas like Kenya, where the present study considered as the locale, to test the same influence of learning strategies in ICT use on academic self-concept of pupils.

One Laptop Per Child program was launched to support children in learning around the world especially those from developing countries. This program developed cheaper laptops that has enabled thousands of learners especially those from developing countries to access technology for learning. The program has greatly promoted the learning process (Warschauer, Shelia, & Cotton, 2012). Based on this approach, the present study considered the influence of use of such laptops as an ICT tool on pupil's academic self-concept.

The child-teacher, child-to-child and individual-child learning strategies are exposed in constructivist approach. This approach basically involves teachers inviting learners' questions and ideas, welcoming and motivating them to take initiative. In this constructivist approach, students are encouraged to take leadership, seek information and present ideas. Teachers in this approach, align their teaching pedagogies with students' background, aspirations and needs. This depicts a child-teacher learning strategy which the present study considered.

Similarly, the relationship of such kind of approach to learning with academic self-concept of learners can be considered for further investigation among different populations. OLPC principles of connectivity and saturation are in line with constructivism and OLPC interest of technologically driven change. If all children have these tools in their hands and they can communicate with one another, ICT organizations project a massive shift in skills, competencies, creativity and innovations among population in a short while. When learners are given time to interact with ICT devices, child-to-child, child-teacher or individual learning strategies   are involved, that calls for further inquiry.

Kenya and Rwanda have partly adopted computer programs in schools. Rwanda has deployed over 110,000 laptops to over 400 primary schools. OLPC Kenya includes a number of small deployment communities including Asilong in West Pokot, Kibwezi, Mombasa-North,

Nairobi, Bungoma and East-Coast project near Lamu (OLPC Rwanda, 2012).

Areepattamanni and Freeman (2008) posit that academic self-concept has the greatest potential of being directly influenced by the regular classroom teacher and should therefore be of main concern. The interaction between the teacher and the learner is a factor that influences ASC and it is also a learning strategy used by learners in the learning process. The present study investigated influence of learning strategies in the use of ICT on pupils' on ASC.

One of the learning strategies considered in the present study is child-teacher learning whose influence on ASC was investigated. A high academic self-concept influences academic behaviours and choices, educational ambitions and the consequent academic achievement (Marsh, 2002).

The use of computers or ICT tools provides a rich environment for learning. Researchers like Trautwein et al., (2006) found that learners with higher ASC were likely to choose more sophisticated learning or educational environments and show greater effort in dealing with learning tasks which may lead to students' overall satisfaction. These learning outcomes are due to academic confidence which is a component of academic self-concept. Direct relationship between the learning strategies and academic self-concept can be investigated in a different locale just like is the case in the present study.

Studies on learners' collaborative processes of learning and learning outcomes in computer-supported collaborative learning environments have increased considerably (Fischer et al., 2002; Weinberger & Fischer, 2006). It has been proven that, when collaborating learners i.e those who follow child-to-child learning strategy are provided with content-specific visualization tools, the processes and outcomes of collaborative learning are improved (Gao et al., 2005). While this is positive, more studies should be done to examine the influence of such learning strategies in the use of laptops or computers on academic self-concept. The present study considered investigating such influence among primary school children, specifically Class Seven in Bungoma West Sub-county.

McInerney et al., (2012) found that academic self-concept, learning strategies, and academic achievement have reciprocal relationships with each other among high school students. The study did not include the use of ICT tools like laptops. The current study focused on the influence of learning strategies on academic self-concept in the use of laptops as ICT tools.

In Kenya, Computer For Schools Kenya (CFSK) sourced over 120,000 personal computers that have were deployed in over 8,500 Public Secondary and Primary Schools, Technical Training Institutes, Teacher Training Colleges, Medical Training Centres and several Universities (CFSK, 2014). Little research has been done on the influence of the use these computers through learning strategies used by learners on the academic self-concept.

Odera (2011) found that in sub-urban schools in Kenyan secondary schools, the use of computers have really increased students desire to learn. They are very motivated and this enables them to learn and understand difficult science topics. Motivated learners show a positive effect of use of ICT on ASC of learners. While this study was done among secondary

school students, the current study focused on primary school pupils in Standard Seven, specifically in Bungoma West Sub-county. The study did not also focus on specific influence of learning strategies in the use of the computers on academic self-concept, which is the main focus of the present research.

In Bungoma County, some public primary schools in Bungoma West sub-county, pupils in Standard Five, Six, and Seven have been using laptops as a learning tool since the year 2011. The schools in conjunction with One Laptop Per Child (OLPC) Foundation had a laptop program for school. Laptops were availed in schools, Teachers were trained to teach and help learners to access and use the digital devices. Pupils access and use laptops to supplement and complement the available teaching and learning aids to enhance learning. Formal curriculum activities from Kenya Institute of Curriculum Development in the various subjects were installed on the laptops for access and use by the pupils. The current research considered influence of learning strategies in the use of these laptops on Standard seven pupils' academic self-concept. Rural primary schools in Bungoma County are a representative of such schools in other counties in Kenya. Most primary schools in rural areas in Kenya have not infused ICT in the learning process, sticking on traditional learning strategies. Majority of these schools perform dismally as is the case in Bungoma West Sub-county. For comparability, it is good to note that, all pupils or students in a particular level of Education in Kenya go through the same curriculum and teachers who are the main curriculum implementers have undergone a similar training. With the laptop program in the schools, research on learning strategies in the use of laptops or ICT tool and their influence on pupils' ASC may be beneficial to stakeholders in Education.

Bungoma West Sub-county has witnessed dismal academic performance in Kenya Certificate of Primary Education (KCPE) for many years despite efforts made by stake holders to alleviate the situation. This dismal performance is associated with low ASC among other factors. KCPE mean scores for the Sub-county for previous five years when the study was done are: 230.28 in 2010, 230.78 in 2011, 238.18 in 2012, 239 in 2013 and 233 in 2014 out of a of total 500 marks (DEO, Bungoma West Sub-county Office).This is an average of 234.248 which is way below average. Knowledge on ASC and learning strategies as considered by the present study may contribute to necessary adjustments in the learning process for better academic performance.

1.1 Statement of the Problem

Low Academic self-concept of pupils in Bungoma West Sub-county is associated with poor performance of primary schools in Kenya Certificate of Primary Examination (KCPE) in the Sub-County witnessed over time. Other indicators of low academic self-concept in the Sub-County apart from academic performance are: absenteeism, high dropout rates, repetitions, poor retention, poor transition and low completion rates (Bungoma West Sub-county Education Office). This low academic self-concept of pupils is also associated with continued use of traditional learning strategies (where there is lack of or minimal use of ICT) by learners. According to Nyaga (2016) academic self-concept is a predictor of academic achievement among learners. Similarly, Guay et al., (2010) reported that students

perceiving themselves as academically competent obtained higher grades because their academic self-concept led them to be automatically motivated in school. Based on this studies, improving academic self-concept will have commensurate improvement in academic performance. Use of ICT digital devices is a motivating factor that can influence ASC.

As the world advances technologically, some areas like Bungoma West Sub-County lag behind in the use of ICT in the learning process. The Sub-county rural public primary schools are a representative of majority of such schools in the rest of Bungoma County and Kenya as a whole. The schools hardly access ICT devices like laptops for use in the learning process. The continued use of traditional learning strategies in the Sub-County is associated with pupils' low academic self-concept among primary school pupils which is reflected in low academic performance among other indicators. Pupils with low academic self-concept lack the motivation to work hard and excel in academic work. This will mean most pupils will not do well in examinations and secure chances in good secondary schools or miss out completely.

Pupils also experience psychological disturbance and low self-esteem due to the poor results they get every year. It was hypothesized that use of ICT like laptops in the learning process will lift the low academic self-concept among pupils in the Sub-county. This will help them strive to excel in class.

More research is required to focus on the influence of use of ICT in the learning process on the academic self-concept of the learners. Therefore this study intends to find out the influence of learning strategies in ICT use on academic self-concept among Standard Seven primary school pupils in Bungoma West Sub-county. Knowledge from the study may help stakeholders in Education to make necessary adjustments in content delivery in the Sub-county for better results in academic performance and finally improved competitiveness in National Examinations.

1.2 Objective of the Study

  The objective of the study was to find out the influence of use of learning strategies in ICT use on pupils' academic self-concept.

1.3 Limitations and Delimitations

1.3.1 Limitations of the Study

  i. The researcher relied on self-report by pupils and teachers who may have over-estimated the influence of the use of laptops on academic self-concept. To overcome this, the researcher used data collection instrument that is clear, anonymous and respondents were given enough time to respond to the items.

  ii. There was no control over the different intelligence levels of the respondents that influence laptop use and academic self-concept. Intelligence levels affect understanding of questionnaire items and responses.The influence was minimized by incorporating only Standard Seven pupils in public primary schools in a rural area.

iii. The researcher was not able to control for historical events that occur that may have influenced the academic self-concept. To address this, data collection was done across the sample within a short period of time.

iv. Inability to manipulate the independent variable is another limitation. Effect of use of laptops on academic self-concept was only measured after its manifestation. Consequently, changes in the DV may also be attributed to other variables. The limitation was minimized by use of comparison group.

1.3.2 Delimitations of the Study

The study only involved Standard Seven pupils who had been using laptops in their schools and those from a few schools that didn't have the laptop program from the same locale as a control or comparison group. This is to control for influence of class level on the academic self-concept. It was assumed that they had spent the same number of years in school. The study covered schools in rural areas only and not urban schools to control for situational factors like home factors and prior knowledge and skills to laptop use. The schools involved were from Bungoma West Sub-county in Bungoma County because they had laptop program in the sub-county from the year 2011.

1.4 Theoretical and Conceptional Framework

1.4.1 Theoretical Framework

The study made use of three theories as a basis and departure for the study. They included Cognitive Multimedia Learning Theory, Collaborative Learning Theory and The Self Theory of Personality Development. The three theories have been discussed below.

a) Cognitive Multimedia Learning Theory

Cognitive Theory of Multimedia Learning was proposed by Richard Mayer. It is based on a principle known as the "multimedia principle" which states that people learn more deeply from words and pictures than from words alone (Mayer, 2001). The theory is based on three main assumptions: there are two separate channels for processing information (audio and visual). It is sometimes referred to as Dual-coding theory; each channel has a certain limited capacity (similar to Sweller's cognitive Load); learning is an active process of selecting, filtering, organizing and integrating information based on prior knowledge. Use of ICT in the current study provided for both visual and auditory channels of learning. Learning strategies in the use of ICT as levels of independent variables in this study emanate from these channels of learning in Multimedia Theory when learners interact with digital learning devices as ICT materials. This interaction is in the form of Child-to-Child, Child-teacher and Individual-child learning strategies.

a) Collaborative Learning Theory

Collaborative Learning Theory was developed from the principles of Jean Piaget. The theory explains situations where two or more individuals attempt to learn or learn together. The approach is closely related to cooperative learning (Mitnik et al., 2009). Child-to-child (CTC)

and child-teacher CTLS learning strategies which are levels independent variables in the study, involve collaboration between the teacher and the learner as well as between the learners themselves as this theory suggests. This relationship makes the theory very suitable for the study. The theory is suitable because, in the use of laptops or ICT, learners collaborate in class in the Child-to-child approach to learning.

b) The Self Theory of Personality Development

The Self Theory was proposed by Carl Rogers (1959) and other humanistic theorists. According to this Self Theory, a person's concept of self comprises of four inter-related self-perceptions: the perceived self, the ideal self, one's self esteem and a set of social identities. Each of the elements plays a critical role in energizing, directing, and sustaining an individual's organizational behaviour. According to Rogers, if a child feels he/she is highly valued and considered as important, growth and development of the person proceeds with a positive self-image with high chances of becoming self-actualised.

This theory was used by Nyaga (2016) in a study that investigated predictors and outcomes of academic self-concept among non-formal primary school pupils in Ruaraka Division, Nairobi County, Kenya. She studied academic buoyancy and perceptions of teachers' expectations as predictors of academic self-concept. It was found that overcoming academic challenges increases academic self-concept of a learner. In the present study, use of technology is one way of overcoming academic challenges and it is very motivating to the learners since technology, like use of laptops, is an enriched learning environment for learners that positively affect the academic self-concept.

1.2 Conceptual Framework

The conceptual framework showing the relationship between variables can be visualized diagrammatically as shown in Figure 1.1 below.
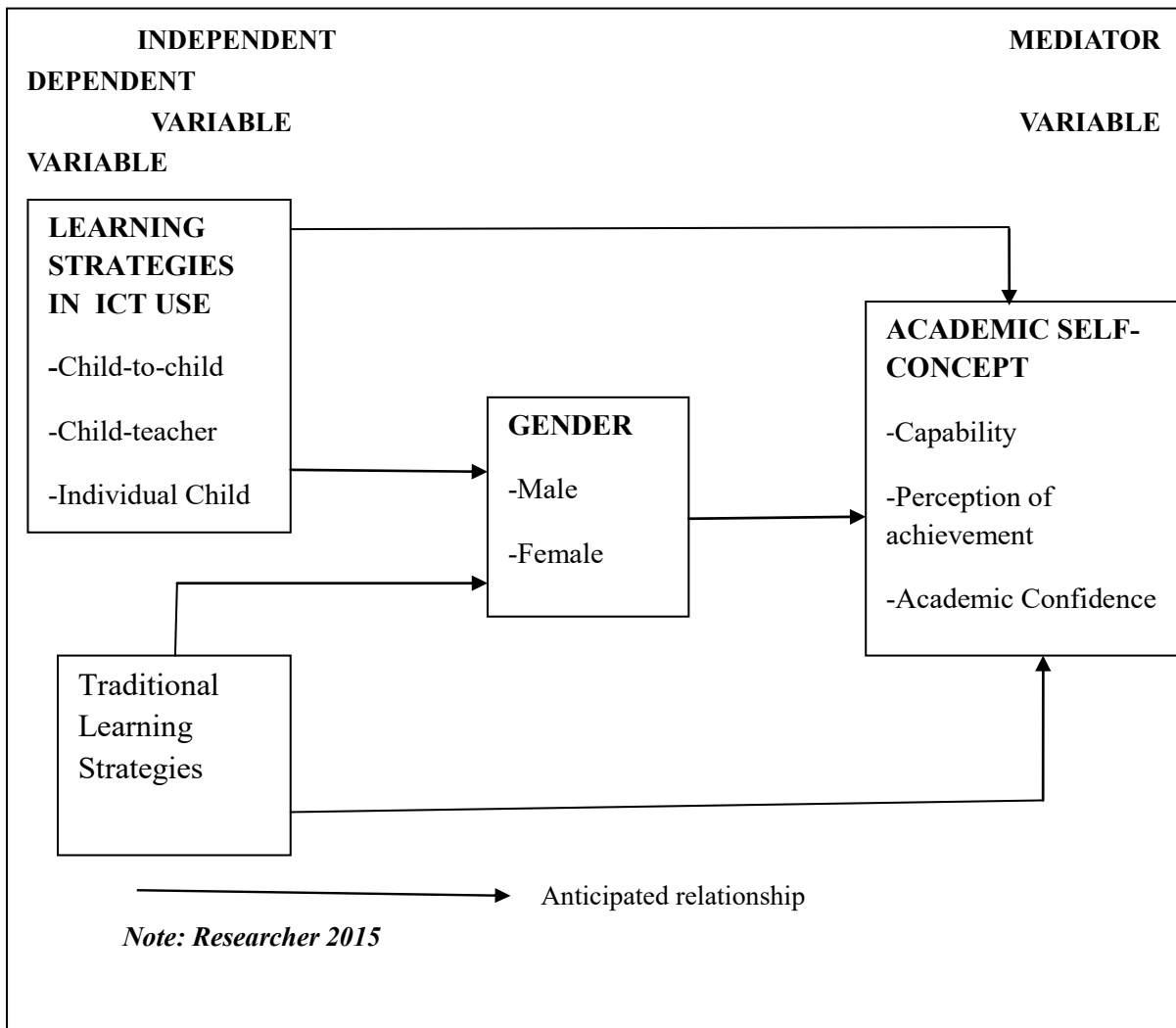
Figure 1. Relationship model of learning strategies and academic self-concept

Figure 1 presents study variables and the anticipated relationships. Learning strategies in the use of ICT (child-to-child, child-teacher and individual-child) and traditional learning strategies used by learners have been identified as independent variables. Academic self-concept is the outcome or dependent variable. Being a causal comparative research design, it is assumed that by the time the researcher carried out the investigation, the independent variables already influenced the dependent variable (academic self-concept).

2. Review of Related Literature

2.1 Relationship between Learning Strategies in ICT and Academic Self Concept

Learning strategies in the use of ICT or laptops include   child to-child (CTC), child-teacher (CTLS) and individual learning strategy (ICLS). The strategies' relationship with ASC is in some studies inferred through students change in behaviour; academic confidence, perception of achievement and capability.

Most researches refer to CTC and CTLS learning strategies as social presence or collaborative learning. It is where learners consult each other or their tutors, discuss and follow each other as they engage in a learning task. Self-concept and social presence are both motivational-related factors that play an important role in students' learning (Yamada et al, 2009 in Yamada et al, 2019). The former one relates to students' perception of themselves and the latter one relates to students' perception of the relationship with others.

In the past decades, the studies of learners' collaborative processes and learning outcomes in computer-supported collaborative learning environments have increased considerably (Weinberger & Fischer, 2006). It has been proven that, when collaborating learners are provided with content-specific visualization tools, the processes and outcomes of collaborative learning are improved (Gao et al., 2005). "Collaborative knowledge construction" is one of the terms that are commonly used in research to describe learners' cognitive processes during collaborative learning (Fischer et al., 2002). In collaboration, learners interact among themselves and also with their tutors. This depicts CTC or CTLS learning strategies adopted by learners.

Tzung-Jin et al., (2013) investigated how a mobile collaborative augmented reality (AR) simulation system affects learners' knowledge construction behaviors and learning performances. This collaborative knowledge construction is a CTC learning strategy. In this study, experimental approach was employed in preliminary, treatment and post-test investigations. Control and experimental groups were selected and used in the experiment. Preliminary study recruited undergraduate students from a University located in Singapore. The criterion of being a participant was that he/she had not learned elastic collision before. A sample size of 40 undergraduate students was used. The treatment group was composed of 8 males and 12 females whose ages ranged from 21 to 26 years old. In addition, none of them had any prior experience of using AR technology. This technology is a computer-based or ICT-aided learning.

The control group comprised 7 males and 13 females whose ages ranged from 21 to 24 years old. Generally this looks a small sample, but because it a within subject variables relationships can be drawn. To ensure the two groups of students had equivalent prior knowledge before the treatment, t-test was conducted in terms of their pre-test scores. The result showed that, the learners from both groups had no statistical significant difference in their pre-test scores indicating that the two groups had analogous prior knowledge regarding the topic of elastic collision before the start of treatment. Post-test scores showed that there was a significant difference in learning performances and knowledge construction between the control and treatment group. Treatment group used the new computer-aided technology while the control group used the traditional system.

The present study specifically focused on ASC as learning outcome. It should also be noted that previous researches demonstrated that there is a strong relationship between academic performance and ASC. The two have direct proportional relationship.

The second strategy under ICT learning strategies is child-teacher learning strategy (CTLS). A considerable number of researches refer to CTLS as face-to-face (FTF) student learning

strategy where students or learners with mobile computers or laptops receive lectures from instructors who are physically present. Then instructors help them in the learning process. In a study conducted by Zehui Zhan and Hu Mei (2013) where online students and face-to-face students were involved in the learning process, the hypothesis that students' academic self-concept would be higher in FTF learning than in online learning was not supported. In this research, 121 undergraduate students enrolled for digital design FTF course and 136 students enrolled for online classes for the same course in a Chinese University. Students were randomly assigned to the two groups. The two groups were both in computer-supported environment.

In online learning, the learner uses the computer alone. It is an individual-child learning strategy (ICLS). Contrary to expectations, no significant difference was found on academic self-concept scale between FTF and online students. The reason might be that academic self-concept might depend not only on the learning processes but also students' characteristics and personality which are formed inherently. Therefore, the effect of the learning environment might not be strong enough to lead to significant difference of academic self-concept between FTF and online students. Online survey was used to collect data while t-test of independent samples and multi-group analysis were used for data analysis. Empirical studies have also found FTF interaction to have the highest social presence or media richness among voice mail, text, and electronic mail (Zehui Khan & Hu Mei, 2013). This study is relevant to the present study due to the use of ICT in the learning process and ASC considered as research variable in the study. Two comparative groups using ICT just as the present study makes it very relevant. T-test of independent variables used for data analysis was relevant for the present study. The research was done at university level, the same variables can be tested at secondary and primary school levels of education.

However, opponents have argued that online media can provide a more convenient and less nervous environment for learning communication (Zhan et al., 2011).

Some authors believed that FTF activities cannot be replaced by online activities because normal communicative processes are disrupted online by the lack of physical presence, making cognitive, meta-cognitive and social learning more difficult (Zhan et al., 2011).

Zehui and Hu (2013) hypothesis that students' social presence would be higher in face-to-face (FTF) learning environment than in online learning was supported. The FTF learning is where learners can physically interact with each other while learning using computers. This is a child-to-child learning strategy. In this research, 1007 online messages from groups were analysed after seven weeks of online discussions in an online survey research. FTF students perceived significantly higher social presence than online students, with a medium effect size. Both groups were in a computer-supported learning environment. This may be explained by the fact that students can communicate more directly and freely in a FTF environment. For example, FTF students could use not only words, but also body language and countenances to express themselves, which help them to achieve higher social presence. High social presence means that the CTC interaction was meaningful in the learning process.

To show the reciprocal relationship, Huang (2011) studied the relationship between

self-concept and academic achievement by analyzing 39 independent and longitudinal samples utilizing meta-analysis and path analysis procedures. The researcher found that there is a strong relationship between ASC and academic performance i.e high ASC is directly related to high academic performance. Therefore learning strategies will have similar influence on both academic performance and ASC.

The use of treatment and control groups with use of computer in treatment group makes this study a suitable review for the present study. T-test was used for data analysis which was suitable for the present study since it analyses or compares performance differences on a variable by two groups sampled independently. The present study employed causal comparative study or design which involves control group who were not using ICT for learning and treatment group who had used laptops in class for learning. The study was done in a University. Like the present study, other studies can be done in elementary schools i.e primary and secondary levels of education. The present study was done in primary level of education with a larger sample size and a lower age bracket.

Miri et al., (2006) examined the use of wireless laptops for promoting active learning in large lecture halls. CTC learning strategies, CTLS and ICLS were used. The study examined students' perceptions of their new learning environment and their classroom behavior. The researchers looked at mainly student-to-student and student-instructor interactions in class in a population of university students in a period of three semesters. A sample of 318 students' responses were incorporated to take part in a survey study. The study took both quantitative and qualitative approaches in the analysis which was also used in the present study. A mixed method research was employed including online-survey with open- and close-ended questions contained on a questionnaire; interviews and non-participant overt observation were used by researchers and their assistants to collect qualitative and quantitative data. Results showed the use of hands-on exploratory learning which is majorly an ICLS, student-centred learning which is CTC and multi-interaction learning which is a CTLS.

The study by Miri et al (2006) showed the use of CTC being preferred in classroom use of laptops. During this time students also developed more academic confidence even when they did not succeed in problem solving and showed no frustration. This depicts capability and academic confidence which are dimensions ASC. Observation guides were used to establish the use of CTC learning strategies by learners, which is described in the context of using CTC. This was appropriate for the present study and could be used for data collection but teacher-respondents were used instead.

Class teachers were asked through interviews to give or state what learners do and how they do it. Questionnaires and interviews were used to obtain the qualitative and quantitative data in this study were also preferred for the present study. However the online survey was not adopted since the researcher interacted with learners physically during data collection. Participants in the study came from across the years of study in the university, with different academic background and pursuing different courses. Learners at such different levels have different perceptions, experiences and technological needs like the use of laptops. That means ASC will be influenced differently. Based on this, the researcher sought to consider learners

of only one class at primary school level.

The researcher in the present study considered participants at primary school level in Standard Seven in order to minimize the effect of academic background and age that would affected the results. Variables in this study were perceptions of use of wireless laptops, studio classes and active learning. These variables were too general. The present study linked the use of learning strategies in the use of laptops and academic self-concept which is more specific.Teachers who were interviewed in the present study observed similar behaviour among learners whenever they used CTC. The social presence due to peers and fellow tutors increased their perception of achievement, capability and academic confidence. There were statistically significant differences in perception of learning among learners who used laptops in CTC and those who used desktops in ICLS in favour of CTC when ANOVA was used for gender and different ages.

Research by Tsuei (2012) aimed at exploring the effects of the synchronous peer tutoring system on children's mathematics learning. In the study, children peer tutored each other in mathematics in a face-to-face online environment. It was found that there were positive effects of peer support via an online synchronous study of elementary students' self-concept and attitudes toward mathematics learning were documented.

From this observation, observation guides were used in overt observation to collect qualitative data on the use of child-teacher learning strategies. The learner and the instructor interacted and one could observe the academic confidence, perception of achievement and capability among learners as dimensions of ASC. The current study involved teachers who regularly handled pupils to give their own observations made during teaching/learning process.

In another study, Light et al (2002) showed the existence and increase of child-teacher learning strategies among learners and tutors after the 1:1 laptop program in the learning institutions. Teacher interviews and classroom observations were used to collect data. The data collection techniques were appropriate though quantitative data could have been collected through student questionnaires. The individual child learning strategy (ICLS) is referred to as online learning or 1:1 laptop programme by the researchers considered in this review.

Carraher (2014) studied students' perceptions of academic self-efficacy and self-regulation while learning in a 1:1 laptop environment. He used a case study and focus group discussions in Nebraska schools in the USA and found that students improved in their academic self-efficacy which involves students' perceptions of themselves. The researcher used online survey and involved 85 pupils in grades 8 and 10.A thin line exists between academic self-efficacy and academic self-concept. Either of them can be used for comparison. Although the sample is small but it is a good study for individual-child learning strategy in the use of ICT.

At the Denver School of Science and Technology, researchers Zucker and Hug (2007) were commissioned to examine the public charter high school's 1:1 laptop initiative. Findings

released in their report revealed that 65% of the students felt the integration of the laptops had a "very" positive impact on how much they learned in school, while another 29% claimed there was "somewhat" of a positive impact on their learning. The students also reported the laptop initiative had a positive effect on how well they can collaborate with other students, their interest in school, and the positive effect on their grades (Zucker & Hug, 2007). When learners' interest in school increases, it means academic confidence, which is a sub-set of ASC has also increased. This shows that the use of laptops (an ICT tool) had an influence on learning outcomes and learning process, which includes learning strategies and ASC. The current study considered a specific learning outcome, ASC as research variable or dependent variable.

Bick (2005) studied the impact of Personal Computers (PCs) called Personal Digital Assistants (PDAs) on a general high school academic achievement in a three-month long semester. PDAs are computers like laptops used at personal level. The study sought to establish the link between the usage of PDAs and standard measures of academic achievement in terms of Grade Point Average (GPA) or test scores. Use of PDAs is an individual-child learning strategy (ICLS). Though the study did not directly examine the impact of PDAs on ASC, many researchers have found a reciprocal or relationship between academic achievement and ASC (Guay et al., 2003). The two constructs influence each other positively (Marsh et al., 2002).

The study by Bick (2005) involved two groups of learners; the control group who were not issued with PDAs and treatment group who were issued with PDA devices. A representative sample of 50 freshmen was selected using simple random sampling from a population of about 1500. The devices were used for general academic purposes. At the end of semester students returned the PDA devices. Anonymous information on academic performance for both control and participant groups was availed to the experimenter. Pre-trial and trial assessments were done on the two groups. Pocket-Survey multi-tiered application was used to collect data. Each learner uploaded data online using the PDA. T-test and histogram were used in data analysis. Results in this project showed that PDA-enabled students improved in their GPA compared to the rest of the learners. The researcher used experimental research design which was appropriate since there was administration of treatment to the participants. The use of control group in the experiment provided a comparison group though the sample used was smaller compared to the population of the students in school. The investigation was done in High School but it can still be done to establish the relationship of the variables among primary or elementary school population with an extension of investigating the ICLS relationship with ASC.

Participants were also not assigned randomly to the control and treatment groups. This makes the design used quasi-experimental. It is observed that both control and treatment groups were mixed during the learning process creating a likelihood of those in control group using the devices and influencing the results. This can be corrected by using control group from different institutions. Specific cohorts were used in the experiment to control for variables like age and class level that could also influence the results.

Annan-Coultas (2012) studied students' perceptions in the use of laptops as instructional tools among college students. The aim of the study was to investigate how laptops were used, what students perceive as benefits and detriments of the use of laptops and possible recommendations for improvement. Descriptive case study research design was employed. Data collection techniques used were focus group discussions, survey and classroom observations. Quantitative and qualitative data was collected using a sample of 261 First-year students at the University.

The researcher reported that:

From the observations of Annan-Coultas (2012) students used ICLS to write notes, summing assignments online, reviewing class recordings and completing tests online.

From the use of laptops, 66.7 % of the students reported that having a laptop for academic purposes had benefited their learning. The use of ICLS frequently coupled with the use of CTC in learning sessions, reduced anxiety and increased their academic confidence (Kay, 2006). Academic confidence is a dimension of ASC. This study was done at university level, the same variables can be studied at lower levels like primary and secondary elementary levels. Use of classroom observations was applied in the present study though the researcher depended so much on what subject teachers observed daily. The researcher used very few items on the questionnaire to measure students' attitude and obtain quantitative data, this should be increased to increase reliability of the instrument. In present study, the researcher incorporated collection of both qualitative and quantitative data.

3. Methodology

3.1 Research Design

The main objective of this research study was to establish the influence of learning strategies in the use of ICT on academic self-concept among primary school pupils. This was done by comparing the strength of relationship between the learning strategies and ASC among treatment and comparison groups. The most suitable research design was causal-comparative.

A causal comparative research design is a family of research designs used to examine potential causes of observed differences on a variable among existing groups. It is a form of *ex post facto* design apart from correlation type. The research design seeks to establish relationships between independent variable (IV) and dependent variable (DV) after an event or action or treatment has already occurred. It involves the selection of two or more intact groups that differ on levels of independent variable and comparing the groups on a dependent variable (Salkind, 2010). The researcher's goal is to determine whether the independent variable affected the outcome or dependent variable by comparing two or more groups of individuals with differing levels of DV (Shadish & Cambell, 2002).

In the present study, Standard Seven pupils from primary schools that were using learning strategies in the use of ICT in Bungoma West Sub-county constituted the treatment group and the comparison group were pupils from primary schools in the same locality who didn't have the laptop program i.e. were using traditional learning strategies. The design was suitable

because the control and treatment groups already existed. There were also differing levels of laptop (ICT) use (IV) in the selected schools that made it possible for comparison on their influence on the DV.

In the current investigation, learning strategies in the use of ICT and traditional learning strategies (IV) exerted their influence on pupils' academic self-concept (DV).

3.2 Research Variables

Learning strategy was the independent variable (IV) while learner's academic self-concept was considered as the dependent variable (DV). Both variables were measured at interval level of measurement. The IV had four levels; child-to-child learning strategy in the use of laptops, child-teacher learning strategy in the use of ICT, individual child learning strategy in the use of ICT and traditional learning strategy i.e. a learning path followed by learners in the absence of ICT tool like a laptop. Both IV and DV levels were measured at interval scale (a score on five-point Likert scale).

3.3 Locale of the Study

The study was carried out in Bungoma West Sub-County in Bungoma County, Kenya. The County has nine Sub-counties of which only Bungoma West Sub-county had ICT programme for upper classes in a few primary schools. Generally, public primary schools in the rural areas in Bungoma County and in Kenya as whole have similar conditions. Learners go through the same curriculum; teachers who are curriculum implementers have undergone the same training. Pupils hardly access ICT for learning in most sub-counties. The location was selected purposively because of the use of laptops as ICT tools to support learning in classrooms since the year 2011 to date, including the time of collection of data in 2015. The area witnessed the implementation of the One laptop Per Child (OLPC) programme successfully in five schools. This is a departure from total use of traditional learning strategies in most schools in the area.

3.4 Target Population

The target population in the study was Standard Seven pupils in public primary schools in Bungoma County. The pupils had taken a longer time using laptops (from the year 2011 to 2015) apart from Standard Eight who were left out in ICT use because they were candidates for KCPE and were more occupied with preparations for examinations.

Since the location of the study was in the rural area, was presumed that the pupils had similar experiences and characteristics which can enable the researcher to make generalizations of research findings with confidence. In the current study in Kenya, subjects were of the same grade and underwent similar modes of content delivery and have relatively similar backgrounds and social economic status. The Bungoma West Sub-county has 80 primary schools with each having approximately 70 Standard Seven pupils. Therefore the population was approximately 5600 pupils.

3.5 Sampling Techniques and Sample Size

3.5.1 Sampling Techniques

Purposive sampling and Simple random sampling techniques were used. Simple random sampling is where subjects are selected in such a way that each has an equal chance of being selected. Creswell (2018) argues that random sampling guarantees the researcher that characteristics in populations are accurately reproduced in the sample or has population validity. It also ensures normal distribution of sample data or variables under study. Purposive sampling is where the researcher selects subjects who according to his/her judgment will provide the data required (Slavin, 2007).

In the present study, purposive sampling was used to select the Sub-county and the five schools in the OLPC project. All the five schools taking part in the laptop project in Bungoma West Sub-County were involved as treatment group. Simple random sampling was used to select five other schools that are not in OLPC project as a control group. Five folded papers written in 'S' for selected were mixed with others written 'NS' for 'not selected' and were picked by representatives of the schools in the exercise randomly. The same procedure was used for selection of subjects or respondents who took part in the study for both groups.

3.5.2 Sample Size

A sample size of 375 pupils were selected through the process of simple random sampling.189 pupils came from four schools taking part in the OLPC project and 186 pupils from four schools not covered by the project from the same Sub-county, one school was involved in the pilot study. The following formula was applied to get the sample size:

Sample size $=$ $X^2NP(1-P)$ where N = population size - $d^2(N-1) + X^2 P(1-P)$

X^2 = table value of Chi- Square @ d.f =1 for desired confidence level. P = population proportion (assumed to be .50), d = degree of accuracy (Morgan & Krejcie, 1970).

Table 3.1 shows target population and sample size according to gender

Table 3.1 *Sample Size*

Population type	Target pop.	Sample	Boys	Girls
Treatment Group (4 schools)	2812	189	93	96
Comparison Group (4 schools)	2750	186	93	93
Total (8 schools)	5562	375	186	189

Source: Bungoma West Sub-County Education Office

Purposive sampling was used to select teachers who took part in the study. 18 teachers who were handling Standard Seven pupils in the four schools in the treatment group were selected. Four teachers had taken part in the pilot study and were not allowed to take part in the main study.

3.6 Research Instruments

The main research instrument used in the study was a questionnaire with Academic Self-Concept Scale (ASCS) which was adapted to suit the study. The ASCS was created by Reynolds (1998) in Zehui and Hu Mei (2013), and includes 40 Likert scale items like "I often expect to do poorly on exams" and "I consider myself a very good student." The reliability coefficient of this ASCS was 0.88. In the current study, most related items from this survey were chosen and reliability of the adapted questionnaire estimated through the test-retest method with one day interval between the tests.

The ASCS was part of the questionnaire together with seven other sub-sections that address research questions and hypothesis. The learning strategies were measured by Learning Strategy Rating Scale (LSRS).The scores were at interval scale of measurement. Structured interview and observation guides were used to collect qualitative data from teachers and students in the treatment group.

3.6.1 Pilot Study or Pretesting

Before the main study, the researcher did a pilot study. Two schools were involved; one from the control and another from treatment group. 30 pupils from each school were selected randomly to take part in the pilot study. The selected schools did not take part in the main study. Four teachers from   the treatment group took part in pilot study

3.6.2 Validity of Research Instruments

Content and construct validities of the instrument were established through discussion of the contents and by seeking expert judgement from the two Supervisors. Furthermore, experts from Department of Educational Psychology in Kenyatta University reviewed items of the instruments to establish their accuracy in capturing the concepts of the study. This was done through holding discussions, obtaining relevant comments and suggestions that were synchronized. Comments and corrections from departmental seminars and defenses were also incorporated. Through peer review, content validity was also ensured from which only relevant items on the instrument were included. The researcher then revised the items and restated them in accordance with the corrections to provide the right responses for the study.

3.6.3 Reliability of Research Instruments

Reliability of the instrument was established through the test-retest method during the pilot study and the correlation coefficient established. In the test re-test method, the researcher administered questionnaires to 30 respondents twice with a time interval of one day between the two administrations according recommendations by Coopers and Schindler 2001:216 in Cohen, Lawrence and Morrison (2011). Reliability coefficient of the two tests was then calculated using Pearson product moment correlation coefficient statistical method. Results

from the pilot study were used to make corrections on the instrument and procedures to increase its reliability for consistency or reproducibility. Results of the pilot study were analysed and tabulated as shown in Table 3.2 below.

Table 3.2. Results of the reliability coefficient pilot study in treatment and comparison groups

Variable	No. of respondents		Pearson
	Control group	Treatment group	
Learning strategy (IV)			
LSRS for pupils with laptops	-	40	.78
LSRS for pupils without laptops	40	-	.80
ASC Questionnaire (DV)			
Perception of achievement	40	40	.72
Capability	40	40	.75
Academic confidence	40	40	.84

3.7 Actual Data Collection

The researcher with the help of three research assistants administered questionnaires to the respondents with help of teachers in the schools. The teachers were requested to assemble and arrange pupils to take part in the research. Respondents were asked to take time and complete the questionnaires themselves. 18 teachers who were in charge of the laptop programme from the four treatment schools were interviewed by the researcher at different times each at a time. All interviews were conducted by the researcher using an interview guide (Appendix E). The interviews were partially structured and elicited information on learning strategies, impact of use of laptops on learners' academic confidence, capability, perception of achievement and any challenges faced by learners in the learning process. Each interview lasted for about 40 minutes. All interviews were audio-taped and transcribed. Each teacher was also asked to fill a questionnaire regarding their experience with learners.

Each laptop classroom was observed on four different occasions. The control group classes were observed twice. All observations were conducted by the researcher. Observations ranged from 90 minutes to 2 hours since learners had extended classes. The observations focused on the role the teacher, frequency of child-teacher interactions, frequency of child-to-child

interactions and frequency of individual-child learning strategies. The researcher also sought to find out how the laptops were used, assignments done on the laptops, academic problems solved, the confidence in the learners, capability while working on the laptop, self-expressions of the learners and teacher support during lessons. Field notes for every observation were kept for analysis.

3.8 Data Analysis

Data analysis followed a series of steps for easy reading and complete discussion as recommended by Creswell (2018) in research tips. Items from the questionnaire were arranged and grouped according to particular research questions and objectives. The data was coded, entered into computer and gleaned for analysis through Statistical Package for Social Sciences (SPSS), a computer program for testing major inferential research hypotheses of the study. Missing data was classified, reasons of its occurrence, impact and remedies established. The researcher also identified outliers and got remedy for them. Before application of each statistical model, the researcher tested for assumptions of normality, homoscedasticity, multicollinearlity and linearity.The researcher established distinct relationships among variables using Compare Means, Pearson product moment correlation coefficient and t-tests. These analytical methods had been chosen because data was measured at interval scale and the assumption of normality of data tested.

Data from classroom observations and teacher interviews were first transcribed. Subsequently, the researcher and his assistants repeatedly read the transcripts and identified excerpts that discussed the learning strategies in the use of laptops, the role of the teacher, observations made about learners' behaviour change in terms of academic confidence, perception of achievement and capability of the learners.

Excerpts related to practice included statements on the ways in which students utilized computers for instructional tasks. As analysis of each individual teacher was completed, data were compared with other teachers to identify similarities and differences. Disagreements were only minimal and were all resolved.

3.9 Logistical and Ethical Considerations

3.9.1 Logistical Considerations

The researcher started by obtaining a letter of approval from Kenyatta University Graduate School through the Department of Educational Psychology. Permission was then sought from National Commission for Science, Technology and Innovation (NACOSTI) .The researcher and three trained research assistants travelled to Bungoma West Sub-county. The respondents did not meet any cost. Permission was sought from the respective authorities through the Ministry of Education, County Education Offices and Sub-county Education Office. Head teachers of the respective primary schools were requested to allow teachers and pupils to take part in the research. This was accomplished through a self-introduction letter to the sampled schools and having a familiarization meeting.

3.9.2 Ethical Considerations

The researcher provided written information to participants indicating the nature and purpose of the research and that their participation was voluntary and contact details were provided for further information about the study. No respondent was coerced to give answers. A written consent from the participants was obtained before commencement of data collection .Respondents were reached out in their respective schools and requested to fill questionnaires. All respondents were respected and their values and codes of regulations not interfered with. Confidentiality of the information given by subjects was assured and observed. Respondents' identities remained anonymous. Finally, when the research was completed, results were made available to the participants and other stakeholders as a way of giving feedback.

4. Results, Interpretation and Discussion

4.1 General and Demographic Information

This section gives a general overview of the return rate of questionnaires used for the study. It also shows the extent of contact with teacher respondents for interviews. The final sample size is then covered.

4.2 General Information

The researcher visited all schools sampled for the study and administered questionnaires to pupils and teachers in person with the help of trained research assistants. The researcher interviewed teachers and did classroom observations personally. A high return rate of questionnaires of 98.4% was reported because the researcher collected the questionnaires immediately after administration. A sample of 375 student questionnaires was expected but 369 were actually used in the analysis because six questionnaires did not have a consistent trend of data.

The purpose of the qualitative study through interviews and classroom observations was to augment the body of literature in the area of academic self-concept by focusing on the impact of the laptops program on learners' academic self-concept, performance and general pupils attitude and behaviour manifested in learning strategies; CTC, CTLS and ICLS. Secondly, it sought to supplement quantitative findings. Descriptive qualitative data was collected using structured interviews, structured questionnaires and classroom observations among 18 teachers in 4 schools where the laptop program is being implemented in Bungoma West Sub-County. Data was collected according to treatment groups; the comparison and experimental groups as shown in Table 4.1 below. A total sample of 387 respondents was therefore used for this study.

Table 4.1. Return Rate according to experimental groups

Frequency Percent		
Treatment group (TG)	186	50.4
Control group (CG)	183	49.6
Total	369	100.0

From Table 4.1, there were slightly more than half (50.4%) of the respondents in treatment group, sampled from schools with laptop program. Respondents in the comparison group were slightly less than half of the sample (49.6%), sampled from schools without laptop program (who used traditional learning strategies) in the same sub-county.

Table 4.2. Return rate according to gender and experimental group

	Gender		Total
	Female	Male	
TG	96	90	186
	50.8%	50.0%	50.4%
CG	93	90	183
	49.2%	50.0%	49.6%
To Total	189	180	369
	100.0%	100.0%	100.0%

Note. TG-Treatment group (those with laptops), CG-Control (Group without laptops)

Table 4.2 shows that there were slightly more female than male respondents in treatment sample but comparison group had equal number of male and female respondents.

Table 4.3. Return rate according to age of subjects

Age range	Frequency	Percent (%)
below 11 years	17	4.6
11-12 years	95	25.7
13-14 years	168	45.5
above 14 years	89	24.1
Total	369	100.0

According to data in Table 4.3, respondents were categorized in age ranges. Majority of the respondents were aged 11 years. The modal age was 13-14 years. Return rate according to gender was also made as shown in table 4.4.

Table 4.4. *Return rate according to gender*

	Frequency	Percent
Female	189	51.2
Male	180	48.8
Total	369	100.0

In general, Table 4.4 shows that more than half of the respondents were female (51.2%) and their male counterparts constituted slightly less than half (48.8%).

4.3 Demographic Data

Results from Table 4.1 indicate that the sample schools were sub-divided into two major groups but from the same locality depending on the experimental condition; the treatment or experimental group and comparison group. The treatment group whose respondents had laptops constituted slightly more than half of the total sample. The comparison group constituted respondents from schools where there were no laptops and were slightly less than

half of the total sample. The treatment group was slightly larger. Table 4.2 shows the gender composition of both control and treatment groups. The table shows that the treatment group had slightly more female subjects than male subjects while the control group had slightly less female subjects than male subjects. Overall, the sample involved four schools from treatment group and four schools from comparison group with treatment group having slightly more than half of the subjects as shown in Table 4.4.This is a difference of only 1.4 %.

Table 4.5 below indicates the 8 schools labeled A to H. Schools A, B, C and D were in the treatment group while schools E, F, G and H were in the comparison group.

Table 4.5. School in treatment verses gender

School In treatment	gender		Total
	Female	Male	
school A	12	32	44
school B	34	15	49
school C	25	20	45
school D	25	23	48
School in treatment school E	12	32	44
school F	33	16	49
school G	27	17	44
school H	21	25	46
Total	189	180	369

Table 4.3 indicates variation in age of the respondents. The modal age interval is 13-14 years but generally, majority of the standard seven pupils are above 11 years. Teachers from schools in treatment group were sampled to provide qualitative data on their experience with pupils using laptops, the changes observed among pupils due to the program in terms of learning strategies used by learners during lessons and dimensions of academic self-concept i.e capability, academic confidence and perception of achievement over time as shown in Table 4.6 below. The table shows the age and teaching experience of teachers.

Table 4.6. Age of teacher participants versus teaching experience

Age in years	Teaching	experience years			Total
	below 5	6-10	11-15	Above15	
25-30	2	0	0	0	2
31-35	0	2	1	2	5
36-40	0	1	4	0	5
41-45	0	0	2	3	5
Above 45	0	0	0	1	1
Total	2	3	8	6	18

Table 4.6 shows that most teachers who took part in the study had teaching experience of above 6 years.

4.4 Results of the Study

The results of study were presented in line with objectives study. This section gives relevant descriptive statistics of each objective followed by relevant specific inferential statistics used to test the null hypothesis in order to achieve the study objectives. A comparison of strength of relationship between learning strategies and academic self-concept for both treatment and comparison groups was done to ascertain the influence of use of ICT on ASC. Finally a discussion of the results was made.

4.4.1 Relationship between Learning Strategies in ICT and Academic Self-Concept

a) Description of learning strategies in the use of ICT (laptops), Child-to-child (CTC), Learning Strategies

The child-to-child learning strategy was measured on Learning Strategy Rating Scale (LSRS).The respondents were asked to rate how they enjoyed working with, extent of learning, solving academic problems and doing assignments using the strategy. The pupils were required to score on 5-point Likert attitude scale either 'strongly agree' (SA) for a maximum score of 5, 'agree' (A) for a score of 4, 'not sure' (NS) for a score of 3, 'disagree' (D) for score of 2 and strongly 'disagree' (SD) for a minimum score of 1.

The researcher then analysed data to find the range, maximum and minimum scores, means, standard deviations, skewness and kurtosis of specific CTC learning strategies in treatment group. Results are as shown in Tables 4.7

Table 4.7. Child-to-Child learning strategies

CTC	N	Range	Min	Max	Mean	SD	Sk	Kurtosis
LG	186	4.00	1.00	5.00	3.9301	1.15335	-1.273	.876
GPS	186	4.00	1.00	5.00	3.9409	1.23540	-1.086	.135
TDA	186	4.00	1.00	5.00	3.9409	1.08640	-1.211	1.100
GSC	186	4.00	1.00	5.00	3.9624	1.15954	-1.293	.989

Note. Min = minimum, Max = maximum, SD= standard deviation, N= no. of respondents

LTL = Learning with group, GPS = Group problem solving with laptop, TDAL = Teamwork in Doing Assignments, GSC = Group Support in Classroom.

Results in Table 4.7 show that all the CTC strategies had a high mean score of above 3.9 out of a the maximum 5.The standard deviation for each strategy is high in comparison with the highest possible score of 5, with solving problems as a group having the highest variation. All CTC learning strategies had a negatively skewed distribution. This indicates that the strategies had high mean scores with a negative departure from the normal distribution. They all have a kurtosis of less than 3 meaning they are almost platykurtic which shows variation in preference and use of CTC strategies among respondents.

Child-teacher strategies (CTLS)

The child-teacher learning strategies were measured on Learning Strategy Rating Scale (LSRS).The respondents were asked to rate how they enjoyed working with, extent of learning, solving academic problems and doing assignments using the strategies. The pupils were required to score on 5-point Likert attitude scale on either 'strongly agree' (SA) for a maximum score of 5, 'agree' (A) for a score of 4, 'not sure' (NS) for a score of 3, 'disagree' (D) for score of 2 and strongly 'disagree' (SD) for a minimum score of 1. Descriptive statistics showing the range, minimum and maximum scores, mean, standard deviation, skewness and kurtosis on LSRS is as shown in Table 4.8

Table 4.8. *Child-teacher learning strategies in the use of laptops (treatment group)*

CTLS	N	Range	Min	Max	Mean	SD	Sk	Kurt
DE	186	4.00	1.00	5.00	3.7688	1.23695	-.919	.355
LL	186	4.00	1.00	5.00	3.9624	1.13122	-1.126	.355
SAP	186	4.00	1.00	5.00	4.0108	1.09539	-1.368	.355
TSC	186	4.00	1.00	5.00	3.9785	1.13403	-1.261	.355

Note. DE-Degree of Ease of use, LL-Level of Learning , SAP-Solving Academic Problems, TSC-Teacher   Support in Class, Max-Maximum score, Min-minimum score, SD-Standard Deviation, Sk-Skewness, Kurt- kurtosis.

Individual-child learning strategies (ICLS)

The individual-child learning strategies (ICLS) were measured on a Learning Strategy Rating Scale (LSRS).The respondents were asked to rate how they enjoyed working with, extent of learning and doing assignments as part of the strategies. The pupils were required to score on 5-point Likert attitude scale on either 'strongly agree' (SA) for a maximum score of 5, 'agree' (A) for a score of 4, 'not sure' (NS) for a score of 3, 'disagree' (D) for score of 2 and strongly 'disagree' (SD) for a minimum score of 1 at interval level of measurement. Descriptive statistics showing the range, minimum and maximum scores, mean, standard deviation, skewness and kurtosis on LSRS for   pupils using CTLS in ICT is as shown in 4.9.

Table 4.9. Individual-child learning strategies in treatment group

ICLS	N	Range	Min	Max	Mean	SD	Sk	Kurt
DE	186	4.00	1.00	5.00	3.5161	1.29124	-.653	-.762
LL	186	4.00	1.00	5.00	3.3548	1.38052	-.386	-1.189
DA	186	4.00	1.00	5.00	3.6452	1.25328	-.850	-.268

Note. DE= Degree of Ease of use, N= Number of respondents, Max= Maximum, Min=minimum, LL= Level of Learning, Doing Assignments, SD= Standard Deviation.

The researcher was interested in the levels of use and preference of learning strategies in ICT

use. The participants' score on the Learning Strategy Rating Scale (LSRS) from the questionnaire was used to categorize the participants in *low, average* and *high* levels of preference and use of the learning strategies- CTC, CTLS and ICLS. The cut-off score for low level was between 1.0 and 2.9, the range for the average level was 3.0 to 4.0 and that for high level was 4.1 to 5.0. Results of the analysis are shown in Tables 4.10, 4.11 and 4.12.

Table 4.10. Levels of preference and use of Child-to-child learning strategies

	Frequency	Percentage
Low	12	6.5
Average	72	38.7
High	102	54.8
Total	186	100.0

Results from Table 4.11 show that more than half (54.8%) of the respondents rated the CTC learning strategy highly and slightly more than a third rated it averagely (38.7%). This showed that majority enjoyed and preferred the use of CTC learning strategy during ICT classes. It implies that social presence or working with others while using computers in the learning process was critical in engaging learning tasks.

Table 4.11. Levels of preference of Child-teacher learning strategy

	Frequency	Percentage
Low	18	9.7
Average	63	33.9
High	105	56.5
Total	186	100.0

It is observed from Table 4.11 that, majority of the respondents (56.5%) rated CTLS highly while a third (33.9%) rated it averagely. It implies that most of the pupils preferred and

enjoyed using CTLS when using computers in class. This shows that learners also preferred the presence of a teacher or tutor when using ICT.

Table 4.12. Levels of preference and use of individual-child learning strategies

	Frequency	Percentage
Low	45	24.2
Average	68	36.6
High	73	39.2
Total	186	100.0

Results in Table 4.12 show that less than half (39.2%) of the respondents rated the preference and use of ICLS in class highly. More than a third rated it averagely and below. The results show that majority of the pupils don't enjoy or prefer the use of ICT tools alone. Overall, majority of the respondents in treatment group or those who were using learning strategies in the use of ICT (laptops) were categorized in high level preference and use.

(b) Hypothesis testing

The first objective was to find out the influence of learning strategies in ICT use on academic self-concept. To achieve this objective the following first null hypothesis was advanced;

H_0 : There is no significant relationship between learning strategies in the use of ICT and academic self-concept.

To determine the significance of the relationship between learning strategies in ICT use and academic self-concept, data was subjected to analysis using Pearson product moment correlation coefficient across the three dimensions of academic self-concept i.e capability, perception of achievement and academic confidence. Results of the analysis were recorded in Table 4.13 below.

Table 4.13. Correlation of learning strategies in ICT use with academic self-concept

		C	PA	AC
ICLS	Pearson Correlation	.092	-.027	-.025
	Sig. (2-tailed)	.212	.711	.732
	N	186	186	186
CTC	Pearson Correlation	.300**	.275**	.311**
	Sig. (2-tailed)	.000	.000	.000
	N	186	186	186
CTLS	Pearson Correlation	.178*	.121	.183*
	Sig. (2-tailed)	.015	.100	.013
	N	186	186	186

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Note. C-Capability, PA- Perception of Achievement, AC-Academic confidence, ICLS-Individual-Child Learning Strategy, CTC- Child-To-Child learning strategy, Sig.-Significance, N-Total number of respondents.

From Table 4.13, it is observed that there is a statistically significant positive relationship between CTLS and CTC in the use of ICT and academic self-concept dimensions of capability, perception of achievement and academic confidence [r(186)= 0.300, 0.275 and 0.311, p< 0.05] for CTC and [r(186)=0.178, 0.121, 0.183, p< 0.05)] for CTLS safe for perception of achievement dimension of ASC. It was also observed that there is no significant correlation between individual learning (ICLS) and academic self-concept across the dimensions [r (186) = 0.092, -0.027 and -0.025, p> 0.05]. This implies that the null hypothesis is rejected at 0.05 significant levels for CTC and CTLS, but it is tenable for ICLS at 0.05 significant levels. It shows that there exists a strong relationship between learning strategies in the use of ICT and ASC apart from where learners work alone on the laptop or computer during lessons.

(c) Qualitative analysis

According to Collaborative Learning Theory, pupils attempting to learn together capitalize on one another's skills and resources. Knowledge can be created in a population where learners actively interact by sharing experiences. This interaction has effect on academic self-concept of learners in line with The Self Theory of Personality Development. The interaction boosts the self-image of a learner since they freely share skills and resources that make an individual learner feel valued. Laptops as an ICT tool in class are resources that learners use to interact collaboratively. Teachers who dealt with pupils in school were interviewed results reported and discussed.

Teacher-participant in school A when asked about how the laptop programme has helped in building learner's academic confidence said laptops have made most learners to be competitive with eagerness to outshine one another in operating and using the laptop. They always liked to be 'smart' before others. Always wanting to show how best they operated the laptop and use it for classwork and doing assignments

The study sought to know how the CTC has helped improve students' perception of achievement. The teacher-participants in schools A, B, C and D reported that learners in computer classes either formed working groups themselves or the teacher grouped them according to their different needs. What made learners enjoy working together was general sharing of the laptop, support received from one another especially when they had difficulty in operating the laptop, particularly when the laptops developed technical problems, doing assignments or finding extra information for academic work given by teachers in various subjects. The teachers reported that sometimes the non-academic activities on the laptops attracted learners to collaborate including playing computer games together.

Twelve out of 18 teacher-participants in treatment schools reported that pupils' confidence in attempting challenging academic tasks as a group had grown tremendously. Although low achievers had difficulty in using information from the laptop, but most of them are now able to look for it with the help of their classmates. The researcher also sought to find out if the use of CTC strategies in the laptop or treatment groups helped improve academic confidence and capability of the learners. Based on this, respondents were asked to explain how the laptop programme helped pupils like school and concentrate in class. 14 out of the 18 respondents agreed that indeed the program has helped them like school and concentrate in class.

According to the respondents, this was manifested through eagerness to learn more about the computer and new technological skills, liking for group work and peer teaching, self-determination and expression, improvement in academic achievement due to the programme particularly in Mathematics and English, reduced absenteeism and good time management, independency in operating the laptop, learners finding entertainment in the laptop and learner friendly content on the laptop.

The study also sought to find out if there was any significant relationship between child-teacher learning strategies and academic self-concept. Respondents were to share on

whether the use of child-teacher learning strategy had any influence on dimensions of academic self-concept namely; academic confidence, perception of achievement and capability

Respondents from schools B and C reported that, teachers' role in computer classes was vital for learners. Learners interacted with teachers during lessons like 'co-learners'. In actual sense a teacher remained a facilitator. The teacher respondents reported that majority of learners' confidence in class was higher when the teacher is present during computer classes. A teacher in school A said:

...pupils in my class always run to me with their laptops for technical help. Whenever the technical problems are solved, they go back with confidence and happiness. I also help them solve academic problems and assignments using laptops. Learners who seemed to be introverts are now participating in class, they take initiative to approach me for help and express themselves during classes. I have always helped them solve academic conflicts that arise due to competition of using the laptops in class.

In general other respondents from schools B, F and C reported that absenteeism in their classes has drastically declined since the commencement of computer lessons. According to these teacher-respondents, most learners in class now consult, although some have to be reminded, unless they run into a technical problem with the laptops. Furthermore, teachers guided learners on how to use the ICT tools, engaged the pupils in question-answer learning process and did classroom management.

The study sought to find out if the use of individual-child learning strategies has significantly impacted on the academic self-concept of learners using laptops. Teachers were required to share on their experience with learners who highly preferred the use of ICLS. Respondents identified learners who enjoyed a lot when they worked alone with the laptop or how learners responded when they were required to work alone on the laptop. All participants observed that majority of the learners didn't prefer working alone.

A teacher in Primary School C said that most of the learners didn't show a lot of excitement whenever they are requested to work on their own. Furthermore, due to evaluation on individual basis, learners are required to work individually. During this period, respondents in the four schools in treatment group reported that learners were never as excited as they are when working in groups or when interacting with the teacher. Fundamentally pupils are more excited, relaxed, and eager to learn new concepts when the laptop is used in class than when it was not.

Out of the eighteen participants in the four schools, fifteen reported that the laptop program had stirred up pupils to participate more in class with confidence, take assignments positively especially for challenging subjects like Mathematics. They reported that pupils had become more motivated in attending classes with laptops. At individual level, learners get extra information in academic areas like science, Mathematics, social studies and English on the laptops. This has boosted their academic confidence. From the interviews with teachers, creativity of the learners in the computer classes through practical operation of laptops has

boosted their perception of capability. These are aspects of ASC.

(d) Discussion of the Results

The present study shows that CTC learning strategy in laptop use has higher influence on capability domain of academic self-concept in comparison with traditional learning strategies. The results support findings in a study by Gao, Baylor, Shen (2005) who found that when learners are provided with visualization tools with relevant content, the learning processes and outcomes are improved. This can be attributed to the fact that in CTC strategy in which learners are provided with ICT tools, the learning environment is enriched. Furthermore child–to-child learning strategies are learning processes that involve collaborative knowledge construction which influences learning outcomes that includes academic self-concept. Collaborative knowledge construction in child-to-child learning strategy involves a big measure of social presence.

According to Garison and Anderson (2003) social presence in a learning context is "the ability of learners to project themselves socially and emotionally as 'real' people into a community of learners" (p. 94). It emphasizes more on the feelings of the learners on relationships with others. Richardson & Swan (2003) reported that learners' social presence provides for quick communication cues and immediate responses among themselves. This agrees with the collaborative knowledge construction among learners when using CTC learning strategies as the case in the present study.

Gunawardena and McIsaac (2004) found that social presence was an important factor in improving learning. Results of a study by Hall and Herrington (2010) also showed that social presence motivated learners, enhanced the sense of active community, promoted learners' engagement and interaction such as seeking help from others. Lomicka and Lord (2007) suggested that social presence enhances the interaction between learners, which, in turn, affects learning performance. In the present study the CTC learning strategies in the use of laptops included; solving academic problems as a group, doing assignments together, team support, enjoyment when working together on the laptop, interaction with teammates and sharing ideas confidently with others. This collaboration was highly preferred by respondents in the current study.

It should be noted that learners in the schools where laptops were used (treatment group) held the use of ICT in the learning process with high regard owing to the fact that the locale was a rural area in which learners rarely accessed computers for academic use. Pupils were always determined to attend class, valued themselves because of having an opportunity to use laptops to help them get more information about what they learn in class. Working in smaller groups of three or four members provides a very relaxed and conducive learning environment both in schools in control and treatment groups which enhances academic self-concept.

According to Parker, Martin, and Marsh (2008), students' academic self-concept was found to be substantially associated with their satisfaction, since the higher the student's academic self-concept, the more interested he/she was in learning, and the more satisfied he/she was with school.

In tandem with the Collaborative Learning theories, Self-theories and literature reviewed, children improve their self-image if they are made to feel that they are valued and wanted. Self-image is part of the self-concept of a person. Learners' academic self-concept is improved when a tutor collaborates with them, involves them in the learning process and appreciates them. In line with Cognitive Multimedia Learning Theory, pupils learn more with words and pictures than words alone. In this context, the presence of the teacher and laptops help the pupil learn more. The presence and participation of teachers in the learning process as 'co-learners' with pupils makes them feel valued and wanted. This is the genesis of positive self-image and thus improved self-concept and academic self-concept.

This agrees with observations made by Miri et al (2006). It was also observed that some pupils having mastered how to operate the laptop helped teachers who did not have adequate ICT skills to effectively operate the laptops. Learners engaged teachers whenever they found new information on the laptops. This child-teacher symbiotic relationship boosted learner's academic confidence just as was also observed in Mouza (2008). They were happy and confident for providing instruction to teachers. As has been observed by the participants, aspects of academic self-concept among learners seemingly improved over time. This can be attributed to partly the contribution of social presence by the teacher.

This observation agrees with results of a study by Zehui Zhan and Hu Mei (2013) where supporters of this view maintain that, in a FTF approach to learning, learners who have verbal and non-verbal communication and social interaction produce emotional connections which eventually affect perceptions of the learner. The results also concur with the main elements of Collaboration and Theory of the Self of personality development.

It can be seen that the social presence of a teacher provides an opportunity for the learner to consult, receive assistance in the learning process that makes them have high perception of achievement. They also engage in verbal and non-verbal communication that enhances learning. Cognitive Multimedia Learning Theory also underscores the various channels of learning of receiving learning experiences. Based on this theory, the more the channels a learner uses to receive learning experiences the more the amount of learning that occurs. This increases the academic confidence of the learners and even perception of achievement of the learners. The teacher corrects guides and motivates learners who in turn improve their performance.

Results from this study on ICLS in laptop use agree with an earlier study by Zucker and Hug (2007) who examined the 1:1 laptop use in school. The study found that 65% of the respondents felt that the 1:1 laptop initiative had a positive impact on learning in school. In the current study, almost two thirds of the respondents in ICLS highly preferred the use of this strategy in the presence of laptops while 52% of respondents in the control group preferred the strategy even without laptops.

From the findings of the current study, the mean score of ASC of learners in both TG and CG is high for respondents at all levels of preference and use of ICLS. However these differences in mean scores of ASC are not significant. This shows that the use of laptops does not create a significant difference in academic self-concept in the context of ICLS. The high ASC can

therefore be attributed to other factors like academic achievement.

Similar findings in a   study conducted by McInerney et al., (2012) show that learning strategy, academic self-concept and academic achievement have a reciprocal relationship. The high ASC in ICLS could be attributed to such factors as academic achievement since most of the respondents in the current study came from the upper group of academic performers. Contrary to these results are results from earlier research by Cavanaugh et al (2007) who found that low-achieving learners were more engaged in self-directed learning than high-achieving learners and those using traditional learning strategies. The self-directed learning is ICLS. Although the study did not link the learning strategy directly to ASC, with the reciprocal relationship that exists between ASC self-concept and academic achievement, it can be concluded that the self-directed learners had also high ASC.

In the present study, majority of the respondents (almost two thirds) in both CG and TG came from the upper category of performers in Standard Seven. Due to high academic performance, their ASC will remain high since the two variables have a reciprocal relationship. Learners who perform well in class are self-directed and therefore do well in ICLS with or without ICT equipments.

Another factor that may contribute to learners having high ASC in ICLS is the inadequacy of laptops in the schools. When learners are given opportunity to use laptops in class sessions, they make maximum use of them, discover more activities on the laptop and enjoy animations and other non-academic programmes installed on the laptop in ICLS. Learners have a lot of enthusiasm for computer classes since laptops were rare equipments in school. They always competed for chance to personally handle and use the laptop in class and even outside class. Those who accessed and used the laptops really valued themselves and counted themselves as privileged. Putting value on themselves is rooted in the Self Theory of Personality development by Carl Rogers which emphasizes that, perceptions about self which includes self-esteem which is value one attaches on self and ASC is a dimension of self.

4.4.2 Relationship between Traditional Learning Strategies and ASC

a) Descriptive statistics of traditional learning strategies

Traditional learning strategies were measured on Learning Strategy Rating Scale (LSRS).The respondents   were asked to rate how they enjoyed working with, extent of learning, solving academic problems and doing assignments using the strategies without the use of laptops. The pupils were required to score on 5-point Likert attitude scale either 'strongly agree' (SA) for a maximum score of 5, 'agree' (A) for a score of 4, 'not sure' (NS) for a score of 3, 'disagree' (D) for score of 2 and strongly 'disagree' (SD) for a minimum score of 1. Results are as shown in Table 4.14

Table 4.14. Traditional learning strategies

N	Range	Min	Max	Mean	SD	Skewness	Kurtosis
183	3.74	1.26	5.00	3.529	.64625	-.252	.106

Note. N= Number of respondents, Min= minimum, Max= maximum, SD= Standard Deviation.

From Table 4.14, the range for the scores is 3.74 with minimum score of 1.26 and max score of 5. This shows that there was variation among pupils in the use, learning and preference of traditional learning strategies. The mean of the scores was 3.52 (SD=0.6425) out of a maximum of 5 showing that majority of the learners rated the

use of traditional learning strategies highly with high homogeneity. The learning strategies had skewness of -0.252 depicting that the data is negatively skewed and approximately symmetric since is less than -0.5 or 0.5. The negative skewness indicate that most of the score were above the mean. Kurtosis of the scores is -0.106 which is less than 0 for excess or less than 3 meaning it's less peaked or almost platykurtic since a value of 3 is normal distribution or mesokurtic. Negative kurtosis also implies the distribution was multimodal with fewer extreme and highly dispersed values.

The researcher further analysed the respondents' rating of use of traditional learning strategies and came up with three categories of *low, average* and *high* levels. The cut-off score for low level was between 1.0 to 2.9, the range for the average level was 3.0 to 4.0 and that for high level was 4.1 to 5.0. Results of the analysis are shown in 4.15 below

Table 4.15. Levels of use and preference of traditional learning strategy

Level of use of TLS	Frequency	Percentage
Low	34	18.6
Average	113	61.7
High	36	19.7
Total	183	100.0

Note. TLS- Traditional Learning Strategy

It is observed from Table 4.15 that majority of the respondents (61.7%) rated the use of learning strategies without ICT as average, less than a quarter (18.6) rated the use and preference of traditional learning strategies as low and less than a quarter (19.7) again rated the strategies as high. Therefore, a minority of learners preferred and enjoyed the use of strategies without ICT.

(b) Hypothesis Testing

The second objective was meant to find out the correlation between traditional learning strategies and academic self-concept. Based on this objective, the following hypothesis was advanced.

H_0 : There is no significant relationship between traditional learning strategies and academic self-concept.

To advance this hypothesis, data was subjected to correlation analysis by determining Pearson product-moment correlation coefficient between traditional learning strategies and dimensions of academic self-concept. Results of the analysis are displayed in Table 4.16 below.

Table 4.16. Results of Pearson correlation analysis between traditional learning strategies and dimensions of academic self-concept

	C	AC	PA
Pearson Correlation	.393**	.422**	.446**
Sig. (2-tailed)	.000	.000	.000
N	183	183	183

**. Correlation is significant at the 0.01 level (2-tailed).

Note. Capability, AC- Academic Confidence, Perception of Achievement, N-Number of respondents.

Results in Table 4.16 indicate that there is a significant positive relationship between traditional learning strategies and the three dimensions of academic self-concept [r(183)= 0.393, 0.422 and 0.446, p< 0.01] for capability, perception of achievement and academic confidence respectively. This implies that there is a strong correlation between the use of traditional learning strategies and academic self-concept. Therefore the null hypothesis is rejected at 0.01 significance level and alternative hypothesis adopted.

(c) Discussion of Results

Results of this study agree with previous study by Jong (2005) which found that traditional learning strategies strongly correlated with academic self-concept in specific subjects like Mathematics and English self-concepts. Jong found that both traditional deep and surface learning strategies had a positive correlation with ASC. The present study also supported findings by McInerney et al., (2012) whose findings showed that traditional learning strategies were strongly related to academic self-concept. This implies that even without ICT, there is a strong relationship between ASC and learning strategies used by learners.

It can be seen that the social presence and interaction between the teacher and the learner provides an opportunity for the learner to consult, receive assistance in the learning process and that makes them have high perception of achievement and academic confidence. Positive comments, encouragement from teachers and interaction with other learners enhance academic confidence and perception of achievement. This is also in agreement with the Self Theory of personality development by Carl Rogers which says that if a child feels highly valued and wanted as a child, that person is more likely to grow up with a positive self-image with the possibility of becoming self-actualized (Rogers, 1959). Therefore the self is influenced by the value put on the child. The learning environment which includes learning strategies will impact on how a child values him/herself.

Areepattamanni and Freeman (2008) also posited that academic self-concept has the greatest potential of being directly influenced by the regular class room teacher and should therefore be of main concern. The interaction which also constitutes learning strategies is a factor that influences ASC even without ICT which finally influences academic achievement of learners.

McInerney, Rebecca, Magdalena and Amy (2012) found that academic self-concept, learning strategies, and academic achievement have reciprocal relationships with each other among high school students. Just like in the present study, whatever learners engage in during the learning process influences their ASC based on the accomplishments and interactions made during learning process.

5. Summary, Conclusion and Recommendations

5.1 Summary

The study was designed to finding out the influence of learning strategies on Standard Seven pupils' academic self-concept in the use of information communication technology (ICT) in Bungoma County. The study determined the relationship between the use of traditional learning strategies among pupils in schools without ICT (comparison group or CG) and academic self-concept and relationship between the use of learning strategies in the use laptops or ICT among pupils in schools with ICT (treatment group (TG) and academic self-concept. The learning strategies considered in the study were: Child-to-child (CTC), Individual-child and (ICLS) Child-teacher learning strategies (CTLS). Each learning strategy was correlated with ASC of the pupils.

The study also compared the mean differences in ASC between learners using learning

strategies in ICT use and those using traditional learning strategies. The study further examined gender differences in ASC among pupils in treatment and comparison groups.

The fourth objective was to find out gender differences in ASC among learners using ICT and those without. The results show that there were no significant gender differences in ASC that existed between boys and girls in both treatment and comparison groups.

5.2 Conclusion

Results from this study provided evidence that learning strategies influence academic self-concept in a computer-aided learning environment. The results showed that learners who used ICT had higher academic self-concept than those who did not use ICT contrary to the hypothesis. This is also explained well by Multimedia Learning Theory which provides that increased channels of receiving information through audio-visual perceptions increases learning outcomes. In general, this means that integration of ICT in learning strategies like the use of laptops has a significant positive effect on academic confidence, perception of achievement and capability of learners.

Specifically, significant relationships existed between the different learning strategies in the use of ICT and ASC among learners who used laptops. The learning strategies investigated were; child-to-child (CTC), child-teacher (CTLS) and individual-child (ICLS) learning strategies in ICT use. It was found that there was varied strength in relationship between the different strategies and ASC. From the results of the present study, CTC was most preferred and had the strongest relationship with ASC, followed by CTLS and then ICLS whose relationship was not significant.

It is evident that learners prefer CTC learning strategy which is a collaborative or constructivist approach to learning more than individualized approach to learning. CTLS is also popular among learners where the teacher's presence as a tutor in face-to-face approach plays a vital role.

Therefore when teachers use more of CTC learning approach in lesson planning and execution of lessons, learners' academic self-concept improves, which is a good recipe for academic achievement.

The presence of laptops in learning sessions increases the attention of learners, gives them confidence in sharing ideas with others, enhances teamwork and they become more motivated to solve academic problems and assignments. The laptop is a motivational tool to help even the lower academic performers because it involves development of both cognitive and psychomotor learning skills due manipulation of the laptop to find information. Therefore, availability of digital learning devices to learners complements the highly formalized classroom teaching and learning process. Variation of learning strategies by creating opportunities for learners to use CTC, ICLS and CTLS when ICT components are incorporated in the teaching and learning process complements the learning process.

5.3 Recommendations

5.3.1 Policy Recommendations

From the results, there is a significant difference in academic self-concept between learners who use learning strategies in the use of laptops and those who use traditional learning strategies in favour of those with laptops. Therefore it is important that parents, teachers, school managers especially those from rural areas provide digital learning devices like laptops to help enhance academic self-concept of pupils in primary and even in secondary schools. Academic self-concept has a positive reciprocal relationship with academic achievement of learners. Positive academic self-concept is a good recipe for academic achievement for any learner.

Teachers and other curriculum implementers and developers should consider retraining with a view of equipping themselves with ICT skills that are anchored on classroom learning strategies of learners and change of teaching-learning approaches and pedagogies. Institutions that are entrusted with the task of curriculum design should emphasize the use of child-to-child and child-teacher learning strategies for pupils to help them boost their academic self-concept which eventually can translate to academic achievement.

The National and local Governments should come up with comprehensive policies to guide implementation of digital learning that should include learning strategies in ICT use. The Government through MOEST should consider developing a policy on helping learners in rural areas to improve their academic self-concept as a basis of improving their academic achievement through incorporating ICT across classes in primary schools.

5.3.2 Recommendations for Further Research

Results of this study showed significant differences in academic self-concept between treatment group in schools where laptops are used and comparison group in schools where learners use traditional learning strategies. This involved public schools in a rural area only. Variables of type of school were not considered. Therefore further studies are required to involve private schools and public urban schools.

Further studies should be done to involve other class levels in primary and secondary schools since the present study involved only Standard Seven pupils. Levels like Class five, six, eight and Forms 1-4 at secondary school should be compared.

Other studies can be done involving pre-test and post tests in an experimental research design using one sample to compare academic self-concept before and after treatment or use of ICT. Same variables can be studied using control group with post and pre-test. Studies can also be done comparing child-to-child, Child-teacher, and individual-child learning strategies in the use of ICT with their respective traditional learning strategies in a comparison group.

The present study considered general academic self-concept as the dependent variable. Further studies can be done considering self-concept of specific subject areas like English, Mathematics, science, social sciences and technical subjects. To verify if the results are consistent among learners and cross-checking for overrating of students due to self-rating on

the questionnaire, further studies can be done using focus group discussions and student interviews.

The results of this study may be generalized to the Kenyan primary school pupils' population with caution because it covered a small sample drawn from only one county. In order to control cultural and geographical effects, the study should be replicated in other counties.

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