

**EFFECT OF COMPUTER BASED INSTRUCTION ON LEARNERS'
PERFORMANCE IN ART AND DESIGN IN PUBLIC SECONDARY SCHOOLS
IN KENYA**

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DECLARATION

This thesis is my original work and has not been submitted for an academic award at any other University.

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DEDICATION

This study is dedicated to my late father Cornelius Muchue, my mum Ruth Wambura and to Kennedy Kinyua's family.

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ABBREVIATIONS AND ACRONYMS

ADPT	Art and Design Performance Test
ANCOVA	Analysis of Covariance
ANOVA	Analysis of Variance
BTAT	Basic Technology Assessment Test
CAD	Computer Aided design
CAI	Computer Assisted Instruction
CAL	Computer Assisted Learning
CBI	Computer Based Instruction
CIT	Conventional Instructional Techniques
CLT	Cognitive Load Theory
CMI	Combined Methods of Instruction
CM	Conventional Instructional Methods
Dip.Ed	Diploma in Education
DQAS	Directorate of Quality Assurance and Standards
ELT	Experiential Learning Theory
GPA	Grade Point Average
ICT	Information Communication and Technology
IT	Instructional Technology
KICD	Kenya Institute of Curriculum Development
KIE	Kenya Institute of Education

KCPE	Kenya Certificate of Primary Education
KCSE	Kenya Certificate of Secondary Education
KNEC	Kenya National Examinations Council
MAS	Mathematics Attitudinal Scale
MED	Master of Education
NACOSTI	National Commission for Science, Technology and Innovation
NEPAD	New Partnership for Africa's Development
NGOs	Non-Governmental Organizations
PAT	Physics Achievement Test
Ph.D	Doctor of Philosophy
SATM	Student Achievement Test in Mathematics
SMEs	Small and Medium-sized Enterprises
SPSS	Statistical Package for Social sciences
SPTFA	Student Performance Test in Fine Arts
SSAT	Standard Students Assessment Tests

ABSTRACT

There is need for research to find out the instructional effectiveness of computer based instruction in the teaching of Art and Design in public secondary schools in Kenya. The purpose of the study was to find out the extent to which computer based instruction could improve learner's performance in Art and Design in Kenya's secondary schools. The main objective of the study was to find out if there is any significant difference on learner's performance in Art and Design after they were exposed to computer based instruction and those who were not exposed. Gender and school categories were also examined to find out if they had any significant effect on learner's performance after CBI was used to teach Art and Design. This is because, in the last six years, learners' performance in the subject has been on the decline KNEC 2008; 2009; 2010; 2011; 2012; 2013; 2014. The study investigated three instructional methods; computer based instruction (CBI), conventional methods of instruction (CM) and combined methods of instruction (CMI) in the teaching of graphics in Art and Design. The study further explored possible gender influence on students' performance after learning graphics in Art and Design using the three modes of instruction. School category was examined to find out if it affected learners' performance. The study design was quasi-experiment of the nonequivalent control design. The target population for the study were Form two students doing Art and Design and their subject teachers. Nine boys' and nine girls' schools were used in the study, a total of eighteen public secondary schools in ten Counties in Kenya. Four hundred and fifty students and eighteen teachers were respondents in the study. The treatment groups had three hundred students while control groups had one hundred and fifty students. Each treatment group had three schools which were either in CBI or CMI. There were also two control groups, consisting three boys' CM and three girls' schools CM. The research instruments used to collect data for this study were two: Art and Design performance tests (ADPT)1 and (ADPT)2 (pre-test, post-test), teachers' and students' questionnaires. Data analysis was done with the help of a computer programme SPSS for statistical analysis. The study found that there is a significant difference in the three modes of instruction. Learners who were taught graphics in Art and Design using CBI showed the most improved performance followed by those who were taught using CMI, but the learners taught using CM showed the least improved performance. This study also found that gender had a significant effect on performance of the learners using the three modes of study. The study also found that the topic on graphics design at the secondary school level in Kenya was poorly done because students lack accuracy and creativity due to inadequate time for practice and exploration. Further the study found out that use of computer-based instruction in schools is constrained by lack of enough personal computers that would encourage individual instruction, lack of computer programmes that are employable in Art and Design and unavailability of internet. Low level of computer literacy among Art and Design teachers confined them to give instruction using traditional methods. The study recommended that, a strong support at the national level be initiated towards a systematic planning for the use of technology in the schools through improving facilities, equipments and training of the Art and Design teachers to gain computer skills.

CHAPTER ONE

INTRODUCTION

1.1 Background to the Problem

There is an increasingly global realisation of the benefits of technological development in all areas of life including Education. This is the reason why information and communication technology (ICT) is globally regarded as a basic requirement and building block of modern society. However, Daniels (2002) points out that there is imbalance in ICT use in education and especially in instructional situations.

Despite the essential facilities provided by ICT, Cullen (2003) observes that computer use in education in developed countries has been embraced more than in developing countries due to the minimum funds extended to schools and other educational institutions in developing countries by their governments. In Britain, Crook (1994) noted that computer based instruction (CBI) has been used to improve instruction especially in Art and Design, mostly in the area of graphics, that every secondary school had personal computers for use by students while every college and university provide basic skills in computer technology to teach technical and other subjects. In South Africa, Lundell and Howell (2000) observed that schools face a number of challenges hindering the use of computers in teaching and learning. Another challenge is that most teachers avoid using computers because they have not perfected their computer skills and that computers as well as funds are insufficient. This implies that most teachers in South Africa are unable to engage the technological benefits in their instructional methods. Similarly, the full potentials of computer in assisting or managing instruction are yet to be exploited in Nigeria. According to

Achuonye (2011), various factors have been identified as hindrances to the use of computers in schools in Nigeria. Some of the related factors are; cost of purchase, unreliable electricity supply, computer illiterate teachers and gender attitudes. In Kenya, teachers may be experiencing similar conditions hindering the use computers in instructional situations (Migwi, 2009).

The government of Kenya has identified education as a vehicle to facilitate economic development and cater for the growing population whereby 70% consists of the youth (Vision 2030; Sesional Paper in Education 2005). This is due to the realisation that education is one of the most effective instrument for promoting sustainable social and economic development (Republic of Kenya, 1999). The government is therefore, committed to provide quality education and training to her citizens at all levels. The commitment has resulted in the current ongoing 8-4-4 curriculum reform which aims at equipping citizens with relevant and quality knowledge with national values and social competencies (Kenya Constitution 2010).

While commenting on the ongoing national curriculum reform, Bukenya in the Daily nation, Saturday 16th March 2016), suggested that both humanities and sciences should be valued, avoiding the temptation of labelling humanity subjects as “useless”. Bukenya disagrees with the notion that some subjects do not contribute to job creation. Subjects like literature, the visual and performing arts, where Art and Design belongs, religious studies and language, have been reputed as minimal contributors to job creation. Bukenya (2016) affirms that both humanity and science subjects contribute to valuable education which equips a learner with competent technical skills and strong ethics and that a well educated person should possess productive skills that can contribute to the survival and development of society. Such skills can

be developed through teaching Art and Design using innovative, creative and exploratory means which can be offered by contemporary technology resulting in creating self-reliant citizens (KIE, 2002).

The youth form the social, economic, political base and future of any country and thus, equipping the youth with computer skills plays a key role in promoting the economic development of a country. The awareness of the need to equip the youth with technology is highlighted in the government's preparation to equip primary school children with laptops. According to Wafula & Wanjohi (2007), the use of educational technology has been cited as having a great potential to provide quality education to Kenya's citizens. Utilising what technology is offering would help Kenyans to achieve national goals of education and to advance their knowledge as they prepare to venture into various careers and be able to compete for jobs in the world market (MOE 1998).

The inception of ICT Policy (2006) has enabled significant growth and improved use of ICT in an effort to make Kenya an industrialised nation by the year 2030. To achieve "Vision 2030", education and training are singled out as the vehicles that will drive the country to become a middle-income economy. The opportunity to industrialise Kenya should be given to all citizens, and especially the youth who may have a variety of talents (GoK, 2008).

Art and Design is one subject that can enable learners to develop varied talents through the application of contemporary technology. In support of individual development and in line with Vision 2030, Talabi (1979) postulated that Art and Design activities offer great scope for developing other disciplines like engineering, architecture and other areas that can facilitate technological and industrial

development. To achieve the Kenya vision 2030 where the country should be industrialized by the year 2030, there is need to focus on the development of learners' talents, creative and problem solving abilities through works of Art and Design. Multiple research studies have shown that a strong Art and Design foundation can build creativity, concentration, problem solving abilities, self- efficacy and coordination, which are essential in individual development (Eisner & Day, 2004; Farrell & Meban, 2003). To get effective results from all areas of education and industrial development, all learners should be given the opportunity to develop their capabilities (Deasy, 2002; Fiske, 1999).

The general objectives of Art and Design are: produce artworks for aesthetic and utilitarian function through creative exploration of the principles and elements of art and design, to express their emotions, feelings, ideas and experiences to communicate through works of art and design, to explore the physical environment as a source of inspiration, ideas and materials to produce works of art, to acquire good craftsmanship as they develop a systematic approach in solving art and design problems and tasks, to integrate acquired skills, concepts and attitudes to enrich their understanding of and performance in other fields of study and activities, to exchange ideas and skills through group activities within the school, local communities and other institutions at National and International levels, to apply contemporary technology in solving art and design problems, to apply the acquired knowledge and attitudes for self-reliance in the world of work and to appreciate their own and other peoples artistic and cultural heritage (KNEC, 2012).

In order to realise industrial development, there is need to focus on the application of contemporary technology in solving Art and Design problems as indicated by one of Art and Design objectives (KNEC 2014). It is therefore, imperative that teachers use various instructional methods and approaches to enhance learning and make the subject matter clearer and better understood by the learners. This calls for the utilization of technology to enhance pedagogical approaches that support creativity, innovation and critical thinking. One such instructional method which has been proved to have positive results by researchers is computer based instruction (Sharma, 2003). The use of this method can result in enabling the application of the acquired knowledge and attitudes for self-reliance in the world of work (KNEC 2013). This is because technological growth has come with very useful facilities which could improve classroom instruction in Art and Design, consequently improving learners' performance. Examples of such products are software like Adobe Illustrator, Microsoft Publisher, Super Paint, Corel Draw, Photo Shop, Auto CAD, Page Maker and Designer studio (Bhattacharya and Sharma 2007; Sanyal, 2001; and Sharma, 2003).

Although technology has made available a variety of products that can be used for different purposes and are relevant to education including classroom pedagogy, Migwi (2009) observes that teachers in public secondary schools in Kenya do not use computers for instruction in most subject areas including Art and Design. This is because many of these teachers do not necessarily believe in their own ability to use technology in a classroom with students. A similar finding was reported by Odera (2011) in a study on comparison of the use of computers in public secondary schools in Nyanza province. The study revealed that teachers used computers in

English language, science, mathematics, communication skills and computer literacy. There was no mention of computer use in Art and Design yet, Heinich, Molenda & Russel (2002) highlight that the computer is a useful tool for teaching and learning Art and Design especially in graphics. The understanding of this topic is important to every Art and Design student as the knowledge of graphics skills are in demand in the job market of advertising, creating logos, posters and book covers, which can create employment for students with the necessary skills.

A great deal of research has proved that there are a lot of benefits ICT has contributed towards improving education (Al-Ansari, 2006). ICT has the potential to enrich, deepen skills, motivate and engage students actively in learning while helping them to relate school experiences to work practices (Yusuf, 2005). Teachers should make use of the potential in ICT in subjects like Art and Design especially in graphics which has been performed poorly in the last decade (KNEC, 2014). This dismal performance should challenge Art and Design teachers to put aside traditional methods of instruction (CM) for innovative methods like CBI, or integrate CM with CBI and come up with combined methods of instruction (CMI) which are not teacher-centred but allows learner's to explore and extend their creative abilities. The teaching of difficult concepts and skills like layout, illustration and typography or lettering in graphics design should be encouraged through use of modern technology, in order to give learners opportunities to explore and come up with new discoveries. In relation to employing technology, Harold (1996) highlighted that digital tools and images will continue to be used and therefore, Art and Design teachers should keep up with technology to prepare their learners for the job market and for self-reliance.

Odera (2011) supports use of CBI and purports that the use of computers can assist students to achieve national goals of education. One of the national goals of education in Kenya as reflected in secondary education syllabus is to promote the social, economic, technological and industrial needs for national development (KIE, 2002). Education in Kenya should prepare the youth of the country to play an effective and productive role in the life of the nation. To satisfy the social needs, education must prepare learners for the changes in attitudes and relationships which are necessary for the smooth process of a rapidly developing modern economy. In order to take care of economic needs, education in Kenya should produce citizens with skills, knowledge, expertise and personal qualities that are required to support a growing economy. Similarly, to satisfy technological and industrial needs, education in Kenya should provide the learners with the necessary skills and attitudes for industrial development.

Kenya recognizes the rapid industrial development and technological changes taking place especially in the developed world. In order to fit in and be part of this development Kenya's education system is focused on the promotion of knowledge, skills, and attitudes that will prepare the youth for the changing global trends (KIE, 2002). Students can therefore advance their knowledge as they prepare to venture into various careers in areas of ICT and qualify to compete for jobs in the world market. This is because, the trend towards greater use of technology as a creative tool will continue in future.

Other studies have revealed that, inspite of availability of technological tools, performance in Art and Design in public secondary schools in Kenya has been going down, resulting in some schools dropping the subject (Indoshi, Wagah, & Agak,

2010). The poor performance and dropping of Art and Design by some schools have resulted in reduction of the number of candidates sitting for the subject at KCSE examination (KNEC, 2014). This is a likely indication of a dangerous trend that may result in gradual edging out of Art and Design from the secondary school curriculum in Kenya. The poor performance in Art and Design could be attributed to the teacher's strategy in classroom instruction among many factors. This is an indication that there is an urgent need for innovative and creative methods of instruction like CBI which can help to improve learners' performance in Art and Design. One way of being inventive is to employ the computer and allow the learner to extend the mind as the computer is a mind extension cognitive tool (Harris, 2002). There is therefore need to use innovative and relevant instructional techniques that could be offered through computer based instruction (CBI). Odera (2011) affirms that the use of the creative methods such as computer can enhance the teacher's work making the teacher a facilitator. In addition, use of computer in classroom instruction can make the subject interesting by offering multimedia presentations that would be beneficial to both the teacher and the learner. In addition, the study observes that there has been an increasing demand for a new method of teaching and learning to meet the needs of teachers, students and stakeholders. Computer based instruction is a teaching method that has been proved effective through research and therefore can fill the gap.

Mwanda (2002) expressed a similar opinion in a study on teaching methods of statistics in geography at secondary school level and suggests that teachers must use and improve instructional methods that guide learners to reach their maximum potentials in specific subjects. Art and Design teachers should heed this call and use effective instructional techniques and resources to facilitate the acquisition and mastery of Art and Design concepts and skills. Computer based instruction (CBI) can

offer learners opportunities to develop individual talents, knowledge, skills and self-fulfilment (KIE,2008). Individual development can be realised in all areas of Art and Design through use of CBI programmes like MicrosoftPublisher, AdopeIllustrator, PhotoShop, CorelDraw and many more. These programmes and other CBI facilities can be used to teach formatting, typography, illustration and layout skills in graphics in order to prepare the learner for the job market.

Although Art and Design contribute to economic, social and political development of an individual, there has been a continuous drop in performance in the last six years except in the year 2012. The year 2013 recorded a drastic drop in the mean score, from 127.61 in 2012 to 111.99 in 2013, a drop of 15.62 in one year and 106.14 in 2014, a drop of 13.85. The KCSE Art and Design examination is administered in three papers which are marked out of 200 marks. The mean scores show that the students' perform above 50%, but better results are expected for increased opportunities to higher education. The number of candidates who sat the KCSE in the subject also went down from 1,169 in 2012 to 1,156 in 2013. This shows that there is a problem in Art and Design causing students to perform poorly and to drop the subject.

Art and Design is examined in three papers; Paper 1 is theory, paper 2 is drawing, painting and graphics while Paper 3 is a project. Graphic design is offered in paper 2 but it is performed poorly and is not selected by many candidates (KNEC, 2014). The acquisition of graphic design concepts and skills may be affected by a variety of factors one of which could be related to instructional methods used during content delivery.

Many studies have been carried out on factors affecting the implementation of Art and Design curriculum in Kenya (Digolo, 1986; Gombe, 1990; Nyaga, 1997; Oludhe, 2003). However, no study has been done to investigate the effect of computer based instruction (CBI) on learners’ performance in Art and Design. This study therefore, set out to establish the effect of computer based instruction on learners’ performance in Art and Design in public secondary schools in Kenya and therefore addressed this gap.

1.2 Statement of the Problem

The Kenya National Examinations Council (KNEC) annual Kenya Certificate of Secondary Education (KCSE) reports of the years between 2008 and 2014 indicate a visible decline in learners’ performance in Art and Design. Art and Design is examined in three papers; Art Paper 1: Theory marked out of 60, Art Paper 2; Drawing, Painting or Graphic design marked out of 100, Art Paper 3; Project marked out of 40, thus, total marks are out of 200. The year 2014 recorded a drastic drop in the mean score, from 66.18 in 2008 to 53.07 in 2014, a drop of 13.11 in six years. Table 1.1 shows learners’ performance in Art and Design for seven consecutive years.

Table 1.1: KCSE Candidates’ Overall Performance in Art and Design in the years 2008- 2014

Year	2008	2009	2010	2011	2012	2013	2014
Overall mean	66.18	58.42	57.00	54.80	63.80	56.00	53.07

Source; KNEC annual KCSE reports for the years 2008, 2009, 2010, 2011, 2012, 2013 and 2014.

The number of candidates who sit for Art and Design at the KCSE has gone down and some schools are dropping it as an examinable subject (Wagah, Indoshi & Agak, 2009). The same trend has been noted by Wagah and Okwara (2014), as they pointed out that there is a notable drop of Art and Design by a number of secondary schools in western Kenya. This is an indication that there is a problem in Art and Design causing students to achieve poor results and subsequently, the schools' administration opting to drop the subject in fear that the low grades may affect the school's overall mean grade.

The topic Graphics design in Art and Design in Form two syllabus is apportioned twenty four lessons which translate to more time than any other topic in Art and Design in Form two syllabus. Despite getting more time, graphic design has been performed poorly at KCSE in the recent past (KNEC, 2013, 2014). This implies that graphic design concepts may require different instructional approaches to facilitate the acquisition of the necessary knowledge and skills by learners. It is therefore imperative that teachers seek innovative instructional approaches to improve learners' performance in graphics and in Art and Design as a whole. Wagah, Okwara and Awino (2013) concur that teachers should be inventive in their classroom instruction. Hence, this study examined the extent to which the use of computer based instruction (CBI) affect learners' performance in Art and Design in public secondary schools in Kenya.

1.3 Purpose of the Study

The purpose of the study was to determine the effect of computer based instruction (CBI) on learners' performance in Art and Design in public secondary schools in Kenya.

1.4 Objectives of the Study

The objectives that guided this study were to:

- i. Establish if there is a difference in the performance of learners who were taught Art and Design using CBI and those who were taught using CM.
- ii. Examine if there is a difference in the performance of learners who were taught Art and Design using CBI and those who were taught using CMI.
- iii. Investigate if there is a difference in the performance of learners who were taught Art and Design using CM and those who were taught using CMI.
- iv. Find out if there is a difference in the performance of male and female learners who were taught Art and Design using CBI, CM and CMI.
- v. Determine if school category has any effect on learners' performance after they were taught Art and Design using CBI, CMI and CM.

1.5 Research Hypotheses

The following null hypotheses were tested:

- Ho₁: There is no significant difference in the mean scores of learners who were taught Art and Design using CBI and those who were taught using CM.
- Ho₂: There is no significant difference in the mean scores of learners who were taught Art and Design using CBI and those who were taught using CMI.
- Ho₃: There is no significant difference in the mean scores of learners who were taught Art and Design using CM and those who were taught using CMI.
- Ho₄: Gender has no significant effect on the mean scores of learners who were taught Art and Design using CBI, CM and CMI.
- Ho₅: School category has no significant effect on the mean scores of learners who were taught Art and Design using CBI, CM and CMI.

1.6 Significance of the Study

The findings of this study may help to enrich the Ministry of Education policies to enhance the teaching of Art and Design by encouraging the use of computer based instruction (CBI) which is the new technology which may improve acquisition of knowledge and skills. The use of the computer can persuade the Art and Design teacher and learners to explore other mediated ways of teaching. Computer based instruction can motivate learners to be creative in Art and Design hence improve their performance and enrolment in the subject. The findings from this study may provide the stakeholders with valuable information about the benefits of computers in teaching Art and Design. The information can persuade stakeholders to support in funding schools to purchase computers and software for teaching and learning purposes. The findings of this study may aid policy makers and Quality Assurance Directorate in the Ministry of Education to enhance strategies of equipping secondary schools with computers and train teachers to be computer literate for integration of computers for instruction.

The findings may enrich the policies at the Kenya Institute of Curriculum Development (KICD) to realise the need to create room for computer developed Art work in the curriculum and the potentials of computer as an instructional mode. The institute may then provide useful programmes, syllabus, teachers' guides and text books to assist in the integration of computers in the Art and Design classrooms. KICD may also realise the need to in-service Art and Design teachers to be knowledgeable in the use of computer instruction. The Kenya National Examinations Council may realise the need to set alternative Art and Design examinations which can embrace computer produced Art work and consider it equally acceptable for examination just like manually produced Art work. This study may contribute to other studies and help to improve the theory of instruction.

1.7 Limitations of the Study

This study was limited by certain conditions that were beyond the researcher's control. The groups that were used in this study were in public secondary schools. Private secondary schools were not included in this study and therefore the results were limited to public secondary schools. The other limitation in this study was that the findings were on one topic, graphic design, other topics in Art and Design were not covered. There was no uniformity in available instructional resources including computers that were used by learners in the sampled schools which encouraged sharing of the resources. The researcher had no control of initial differences between the groups, for instance, prior computer experience and exposure of learners to computers. The researcher had no control over learner's and teacher's ability, motivation, attitude and will to explore when using the computer.

1.8 Delimitations of the Study

The study used information collected from eighteen public secondary schools in Kenya that offer Art and Design as an examinable subject at the KCSE and have running computers. The respondents were four hundred and fifty Form two students and eighteen Art and Design teachers from the respective secondary schools selected for the study. Form two students were selected as respondents because this is the time the students choose Art and Design as an examinable subject at KCSE and therefore may be aware of its benefits. Form one students were not considered for the study because it is assumed that they needed time to cover the basic skills in graphics and Art and Design as a whole. Form three and four students were left out to concentrate on covering the syllabus and revise for KCSE. National, Extra-County and County public secondary schools were used in this study. It was found that Sub- County public secondary schools were not offering Art and Design. Private secondary schools were not part of this study.

1.9 Basic Assumptions of the Study

The following assumptions were considered in undertaking the study. To begin with, the researcher assumed that Art and Design teachers are qualified and have basic computer skills which can be applied in Art and Design. It was also assumed that the teachers would take CBI programmes positively. Further, it was assumed that Form two students who were involved in the study had common learning abilities and that the respondents would provide honest responses for the questionnaires. Lastly, though the study was done in ten Counties in boys,' and girls' public secondary schools, its findings would closely mirror other schools in Kenya.

1.10 Definition of Key Terms

Art and Design: A subject in Kenyan curriculum which promotes individual expression, creativity, imagination, sensitivity, conceptual thinking, observation skills, analytical abilities and practical attitudes.

Computer-Based Instruction (CBI): The use of the computer programmes in giving instruction and reinforcing concepts and skills to create complete works in Art and Design.

Performance: A measure of achievement as measured by Art and Design Performance Test (ADPT) at the end of the period of instruction.

Traditional Methods of Instruction (CM): The use of conventional methods of teaching, for instance lecture, demonstration, question and answer, commonly used by Art and Design teachers to instil knowledge, and other skills to learners in public secondary schools in Kenya.

Combined Methods of Instruction (CMI): The use of the computer as a resource as well as the use of conventional methods to instil skills to learners in Art and Design.

Computer Assisted Instruction (CAI): It is an interactive instructional technique whereby a computer is used to present the instructional material and monitor the learning that takes place or it is the use of computer as a tool to facilitate and improve instruction.

Hardware: The computer equipment used to do the work (i.e., operate Software programs). It consists of the items you can touch, such as the computer case and the peripherals (e.g., monitor, keyboard, mouse) that are attached to the computer.

Information and Communication Technology (ICT): Technologies such as computers and the Internet which are enabling tools for educational change and reform. ICTs help expand access to education, strengthen the relevance of education to the increasingly digital workplace, and raise educational quality by, among others, helping make teaching easier.

Software: The computer programs that allow students to learn new content and skills, practice using content already learned. The programmes were used by students to create complete graphics work in Art and Design. It is a stored digital information on magnetic disks or tapes or as electronic information in the computer's memory that determines what the computer does. Software can be divided into two groups, operating system software and application software.

Instructional Technology (IT): The systemic and systematic application of strategies and techniques derived from behaviour to come up with solutions of instructional problems.

Learner-Centred : Students have a natural inclination to learn; learn better when they work on authentic tasks; benefit from interacting with diverse groups of people; and learn best when teachers understand and value difference in how each student learns.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter presents a review of related literature to the study. The literature explored benefits of Art and Design in society. It proceeds on to look at what others have said about the effect of computer based instruction (CBI) on learners' performance in Art and Design, effect of traditional methods of instruction (CM) on learners' performance and effect of combined methods of instruction (CMI) on learners' performance. Also discussed herein are gender effect on learners' performance after using the three instructional methods (CBI,CM & CMI) and the effect of school category on learners' performance after using CBI, CM &CMI. Theories on which the study was anchored and the conceptual framework that show the relationship between the variables are discussed. Equally, it provides a summary on the related literature.

2.2 Benefits of Art and Design in Society

Deasy (2002) points out that Art and Design education can develop creativity and critical thinking skills, thus giving a holistic education to a learner. According to Glenn (2011) art education enhances the development of an individual's personality and strengthens social cohesion. In addition, the arts have played a significant part in world societies throughout history and cultures around the world are rich in artistic practices. The practices include the use of drama, music, dance and the visual arts where Art and Design belongs.

However in most developing countries, art education has been largely ignored. In Kenya, Wagah, Indoshi and Agak (2009) found that the number of schools offering Art and Design has gone down since the inception of the 8-4-4 system of education in 1985. They concur that the survival of Art and Design in the curriculum is at risk. In their study, they found out that students taking Art and Design had positive attitudes towards the subject but teachers had negative attitudes towards the subject. The schools' administration was not supportive either, as the facilities where Art and Design was taught were wanting and deplorable as compared to science laboratories. In most schools, art rooms were found to be made of semi-permanent buildings while science laboratories were made of permanent and up to date buildings.

The contributions made by Art and Design in human development may not be clear to many in the world and in Kenya today. The researcher therefore found it necessary to mention a few of the various benefits made by the subject in society. Highlighting the importance of Art and Design, Daisy (2007) observes that Art and Design is recognised globally as an important discipline in development of modern technology. While recognising the power of Art and Design towards technological development, Talabi (1979) postulates that the Artist indicates the possibilities of making or constructing something through imagination and creativity, while the scientist brings it to reality by making the article. He gave an example of Leonardo Da Vinci, an artist, who illustrated graphically the idea of the flying machine, four hundred years before it was brought to reality by scientists. This flying machine is present day's aircraft and most likely the rocket too. This is an indication that art and science could bring about technological development if ideas are brought to reality through teamwork.

The importance of Art and Design is evident as it contributes immensely in all areas of life. For this reason, the instructional methods used in Art and Design should be upgraded to match contemporary technological development in order to avoid discouraging the learner who is talented in artistic skills. The use of the computer in teaching can equip the learner with skills which are in demand in the job market making them worthy competitors for jobs and training for self-employment. A real example can be found in the Daily Nation of Friday September 2, 2016 where a young man, Jinnah Njue is featured. Ian Dennis (2016) comments as follows about Njue:

“He has made the computer screen his canvas, while digital software techniques are his tools of trade. He is painting his way into the world of digital art, and his work has not gone unrecognised; international magazines such as Photoshop Creative and Advanced Photoshop have featured his work. He regularly works with Photoshop Creative, Raphtor Graphic and Twine, all from the United Kingdom. In Kenya, he has worked with several clients, mostly SMEs, NGOs and Corporates.”

Njue says the following about himself ;

“I have been contracted by companies abroad on numerous occasions to carry out design and branding work for them. The recognition has also brought with it respect from my peers in the creative industry.”

As if to support the above comments, Lauglo and Maclean (2005) noted that Art and Design caters for the personal development goal of educating the whole person, the social-political goal of providing equal opportunities and catering for a wide range of talents of Kenya’s citizens. According to KIE (2008), Art and Design is intended to prepare learners for vocation, awaken creativity in the individual learner

and help the him/her to apply the acquired knowledge and attitudes for self-reliance in the world of work. Otati (2013) in a study on factors affecting students' KCSE performance in Art and Design in secondary schools, noted that Art and Design is therapeutic as it is used to improve and maintain psychological, mental and emotional needs of individuals. It is a means for individual expression, which provides the learner with opportunities to engage in and appreciate expressive experiences depicted through visual forms. Such forms are a means for communication far and beyond the boundaries of verbal and written language (Seidel and Palmer, 2005).

The social role played by Art and Design is highlighted by Digolo (1986) as he asserts that the subject serves specific functional roles during festivals, rituals and ceremonies. Talabi (1979) agrees that the subject reveals cultural traits and a nation's artistic heritage. He asserts that it teaches morals, eliminating greed, envy and disregard for fellow man. These qualities are in support of Kenya's vision 2030 social pillar of building a just and cohesive society (Government of Kenya, 2008).

Art and Design is a visual means of communication used in all subjects of school curriculum and is instrumental in achieving good results in all academic fields. According to KIE (2008), Art and Design develops the whole person elevating their imagination, skills, thought process, values and awareness of the world around them. It therefore forms a good base for every subject in the curriculum as it helps the learner to integrate acquired skills, concepts and attitudes to enrich their understanding and performance in other fields of study (KIE 2002, KNEC 2012).

Despite the importance of Art and Design, KNEC (2014) reports that candidates KCSE results in the subject have shown a declining performance. It is because of these reasons that the researcher found it appropriate to explore the effect of computer based instruction on learners' performance in Art and design.

2.3 CBI and Learners' Performance in Art and Design

Fakomogbon, Omiola, Morakinyo and Ibrahim (2012) did a study in Nigeria on effects of Web-based instruction on upper basic secondary school students' performance in basic technology. Their study critically examined the effects of a web-based instruction on upper basic students' performance in basic technology. The quasi-experimental design, which involved the pre-test, post-test, nonrandomised, and non-equivalent control group design was employed for the study. Two intact classes from sampled schools were randomly selected for the study. Students from the sampled classes were further stratified along gender and the schools were categorised as urban and rural. Two researchers designed instruments: a web-based instructional package on metal and wood materials and Basic Technology Assessment Test (BTAT) were used as treatment and test instrument respectively. Three research hypotheses were generated and tested using the t-test statistical method. Findings indicated that students taught with a web-based instructional package performed significantly better than those taught without the use of the package. It also revealed that gender factor affects the performance of students when they were exposed to a web-based instruction. This was because there was significant difference between male and female students. Furthermore, school location affects the performance of students in experimental and control groups because urban school students performed better than their rural school students counterpart.

Based on these findings, recommendations were made on the need to develop relevant WBI for teaching various topics in Basic Technology in Nigerian Upper Basic Schools.

According to Nyah (2014), teachers and educators have always been interested in finding methods which will enhance learning and therefore, various instructional methods and approaches are used by teachers to make the subject matter clearer and better understood by the learners. Like other teachers in other disciplines, the Art and Design teacher is challenged to explore and discover where and how technology can be applied to improve learners performance in the subject. Nonetheless, Art educators will continually be confronted with the challenge of integrating new technology into Art and Design curriculum. The question is; how are the Art and Design teachers meeting these challenges and how are they using new technology to improve learners' performance?

As if to respond to the above question Knaak (2010) opined that teachers should use technology software to facilitate instruction not only for their progress in teaching but also to help maximize their students' learning potential. Odera (2011) investigated how secondary school teachers used computers in public secondary schools in Nyanza Province. The study purports that computers have been found useful in various subjects namely mathematics, sciences, English language, social studies and graphics. Further suggestions from the study highlight various ways of employing graphics in lesson presentation in other subjects like using it as primary information as well as analogy and putting a picture as the main concept. Heinich, Molenda and Russel (2002) agree that the computer is a very useful tool in teaching and learning graphics.

A study carried out by Nyah (2014) in Nigeria set out to determine the effect of colour in computer graphics designed instructional materials on students' academic performance in fine arts in private secondary schools in Akwa Ibom State. A simple random sample of 60 senior school II fine arts students from two private secondary schools was used for the study. The two schools were purposively selected from five private secondary schools that offer fine arts at senior school II class. The study used non randomized control group pre-test-post-test experimental design to carry out the study. A research instrument named, Student Performance Test in Fine Arts (SPTFA) was used in gathering data. Data was analysed through use of descriptive statistics of mean, standard deviation and analysis of covariance (ANCOVA). The result obtained from the analysis showed that students taught using Computer-Aided designed (CAD) instructional materials performed significantly better than those taught without using any (CAD) instructional materials. Consequently, colour showed high significance. It was therefore recommended that computer graphics should be used in the preparation of instructional materials as it had a significant effect on the students' performances in fine arts. It was suggested that the proprietors of the private secondary schools in Akwa Ibom State should establish Desktop publishing unit for the development of quality print instructional materials.

Art and Design is a practically oriented subject where a variety of skills are developed to enable students to produce unique products. As such, Art and Design teachers should employ computer based instruction (CBI) in the teaching of various skills to reap these benefits. Hertz (2013) posit that computer based instruction (CBI) can be used to solve many problems in Art and Design as computers are problem

solving tools. If computers are problem solving tools, Art and Design teachers should employ them to give instruction and extend learners' visual understanding of layout, illustration and lettering skills in graphics design and other areas in Art and Design. This study used three CBI programmes which are explained below.

2.3.1 Use of Microsoft Publisher in Teaching Art and Design

Microsoft Publisher is an entry level desktop publishing application from Microsoft. It differs from Microsoft word in that its emphasis is placed on page layout and design rather than text composition and proofing/formatting. It is an easy-to-use and less expensive programme with a focus on the small business market where firms do not have dedicated design professionals available to make marketing materials and other documents. Microsoft Publisher is a desktop publishing programme that can be used to create a variety of publications such as business cards, greeting cards, calendars, newsletters and so much more. With publisher one can create, design and publish professional marketing and communication materials for print and for e-mail merges. It is therefore necessary to equip learners with knowledge and skills to enable them to use Microsoft Publisher as it can contribute in marketing in their business enterprises.

Microsoft Publisher is an application that turns your computer into a desktop publishing centre thus allowing students to create a number of professional looking documents. The programme can be used by students during graphics design lessons to create a class newsletter, a flyer for an upcoming fundraiser, invitations for class functions or information brochures on any number of topics and business logos. It allows ones creativity to flow freely from the mind to the screen to print. It offers up a

powerhouse of tools to users in all fields. It is therefore very useful for the Art and Design student to be compliant with the knowledge of using this programme especially when learning skills in graphics design.

2.3.2 Use of Adobe Illustrator in Teaching Art and Design

Adobe Illustrator is a vector graphics editor developed and marketed by Adobe Systems. A vector graphics editor is a computer programme that allows users to compose and edit vector graphic images interactively on a computer and save them in one of many popular vector graphics formats. Vector graphics is the use of polygons to represent images in computer graphics. Vector graphics are based on vectors which lead through locations called control points or nodes. Each of these points has a definite position on the x and y axes of the work plane and determines the direction of the path; further, each path may be assigned a stroke colour, shape, curve, thickness and fill. Vector editors are often contrasted with bitmap editors and their capabilities complement each other. Vector editors are often better for page layout, typography, logos, sharp-edged artistic illustrations (e.g. cartoons, clip art, complex geometric patterns), technical illustrations, diagramming and flowcharting. Creating vector images allows one to create clean, beautiful works of art that can be scaled up and down infinitely without ever losing quality.

Vector images are actually smaller than their counterparts. Bitmap editors are more suitable for retouching, photo processing, photorealistic illustrations, collage and illustrations drawn by hand with a pen tablet. Recent versions of bitmap editors such as GIMP and Adobe Photoshop support vector tools (e.g. editable paths) and vector editors such as Adobe Fireworks, Adobe Freehand, Adobe Illustrator, Affinity Designer, Animation, Artboard, Autodesk Graphic (formerly iDraw),

CorelDraw, Inkscape, sK1 or Xara Photo & Graphic designer have adopted raster effects that were once limited to bitmap editors (e.g. blurring). Adobe Illustrator is part of Creative Cloud.

Adobe illustrator is a programme used by both artists and graphic designers to create vector images. These images are used for company logos, promotional uses or even personal work both in print and digital form. So Adobe illustrator is used to create illustrations, charts, graphs, logos, diagrams and cartoons of real photographs. While the programme may be difficult to understand initially, the final product will be well worth the learning curve. Creating an image in Adobe Photoshop doesn't allow resizing of images due to how it pixelated and often looks horrible and one needs to start all over again. The same doesn't apply for Adobe illustrator. This makes Adobe illustrator a more ideal programme for companies as opposed to Adobe Photoshop since they can create images and logos that can be small enough to be a tiny icon or large enough to appear on a billboard.

Adobe illustrator doesn't require any prior knowledge of drawing or painting, but one can also import a photograph and use that photograph as a guide to trace and re-colour a particular subject thus turning it into a work of art that looks as though you drew it freehand. As a graphics designer one can use illustrator to easily create sleek, aesthetically pleasing company logos. People also looking to create a website can create a mock-up through illustrator. Since it's an Adobe product it works seamlessly with Photoshop. Illustrator also easily converts an image from a vector image into a bitmap or jpeg one that are created as raster images but cannot convert a raster image into a vector image. For example if one draws a heart using Photoshop and one decides that the bottom is too wide, one has to start all over again but with

illustrator one easily adjusts without worrying about the quality. This allows one to easily make changes through creative process and doesn't restrict one to the images one has already created. Adobe illustrator is an expensive programme and is created to target professionals more who will fully utilise its fullest capacity. Illustrator uses mathematical equations to draw out the shapes and thus makes vector graphics scalable without the loss of resolution. (<https://en.m.wikipedia.org>, <https://blog.udemy.com>, www.vectordiary.com). It is very useful to Art and Design students and teachers to have the skills so as to produce aesthetically appreciated art work.

2.3.3 Use of Photoshop in Teaching Art and Design

Adobe Photoshop is a raster graphics editor developed and published by Adobe Systems for windows. A raster graphics editor is a computer programme that allows users to create and edit images interactively on the computer screen and save them in one of many popular formats. A raster graphics editor supports a certain repertoire of image editing operations. Depending on the programme the capabilities may be extended by use of plug-in software. Adobe Photoshop specialises in the editing of (digital) photographs. It was created in 1988 by Thomas and John Knoll. Since then it has become a part of standard in raster graphics editing, such that the word "Photoshop" has become a verb as in to "Photoshop an image", though Adobe discourages such use. It can edit and compose raster images in multiple layers and support mask, alpha compositing and several colour models.

Photoshop has a vast support for graphic file formats. In addition to raster graphics, it has abilities to edit and render text, vector graphics and video. Adobe Photoshop is a graphics editing programme used by professionals in the fields of

graphic design, illustration, photography and photo journalism. It is useful in an art class that focuses on graphics, and for students and teachers who work on web pages and multimedia projects. It is a very motivating tool for students, especially those interested in art and media and provides very polished results for various student projects. Adobe Photoshop offers tools that can help the learner to excel. The teacher should use Photoshop elements and integrate them successfully into the curriculum to make sure that the programme is used as a tool for enabling students to create valuable artwork.

2.3.4 CBI and Learners' Performance in other Disciplines

A lot of research has been carried out in secondary schools, colleges and universities globally on the use of computers in teaching and learning, in search of instructional methods that can enhance learning. Researchers from developed countries have reported positive gains in the use of computers as a tool that can be used to teach across all curriculum subjects, for example, computer literacy, calculations, data manipulation, word processing and presentation, (Clark 2000; Heinich, Molenda, and Russell, 2002; Zhang 2000). According to Santrock (2004), instructional methods that captivate the learner enhances acquisition of skills, knowledge, and attitudes. Use of CBI is captivating and interesting and thus, it is hoped that the learners are challenged to explore and use innovative ideas that make them gain the intended knowledge, skills, attitudes and experiences for both self-education and social economic purposes. This is a step towards enabling the country to achieve the “vision 2030” goal of getting industrialized by the year 2030.

In Nigeria, a study carried out by Warschauer (2006) revealed that students taught with new technologies did not regress on outcome assessments. He further asserted that when new technologies are integrated into teaching and learning,

students are more engaged in learning, resulting in improvement in academic performance. In agreement, Nyah (2014) pointed out that various instructional methods and approaches have been used by teachers in all disciplines in an effort to clarify subject content and improve learner's grasp and comprehension of subject content.

Another study in Nigeria carried out by Akanmu (2015) examined the effect of GeoGebra software on the performance of learners in Mathematics. It also assessed the effect of gender on the performance of learners taught Mathematics with the use of GeoGebra package, and further investigated the effect of the Information and Communication Technology (ICT) package on students' attitude towards Mathematics in the area. These were with a view to provide empirical information on the effectiveness of the package in improving students' learning outcomes in Mathematics as well as to provide a template for integrating ICT into Mathematics class instruction in particular and teachers' education/training programme in general. The study adopted the non-equivalent pre-test post-test control group design. The study population involved secondary school Mathematics students in Ogbomosho North Local Government Area of Oyo State. The senior secondary school two (SS II) Mathematics students from two intact classes from each of the two purposively selected schools in the area constituted the sample (54 students for experimental group and 51 students for control group).

Availability of functional computer systems served as basis for selecting the schools. The classes were assigned into two groups (experimental and control) using simple random sampling technique. The experimental group was taught using GeoGebra, while the control group was taught using the conventional method. In

experimental group, the students interacted with different kinds of GeoGebra tools to solve problems in geometry, algebra, introductory calculus, among others. The control group was exposed to the conventional method and taught the same topics. The experiment lasted for the period of six weeks. Two instruments were used for data collection, namely: Student Achievement Test in Mathematics (SATM) and Mathematics Attitudinal Scale (MAS). The two groups were pre- and post-tested using SATM, after which MAS was also administered to them. Data collected were analyzed using t- test statistics.

The findings showed that the students taught with GeoGebra performed better at the posttest level than the pre-test level in Student Achievement Test in Mathematics. The result further showed that the attitude of students towards Mathematics is significantly dependent on their knowledge of GeoGebra. Hence, the knowledge of GeoGebra positively influenced the attitude of students towards Mathematics. It was therefore concluded that the integration of GeoGebra, an ICT package, would have positive effect on the students' learning outcomes in Mathematics, especially on students' performance in both internal and external examinations, and at the same time, their attitude towards Mathematics would be greatly enhanced.

In Kokaeli Turkey, Karakas and Tekindal (2008) carried out a study on effects of Computer Assisted Learning in teaching permanent magnet synchronous motors. In their study, they compared the use of Computer Assisted Learning (CAL) with traditional learning methods in teaching the topic. They used experimental method on 16 students and control group of 15 students. The study found CAL method more effective in increasing students' success than traditional method. The experimental

group was found to have a positive attitude towards CAL. Unlike Karakas and Tekindal, this study has compared three teaching methods; that is computer based (CBI), combined methods of instruction (CMI) and traditional methods of instruction (CM). Quasi-experimental rather than experimental method of collecting data was used on 300 students in the treatment groups and 150 in the control groups. This study is also different in the use of instruments as teachers' and students' questionnaires were used to enrich the data collected using two Art and Design Performance tests (ADPT 1 and 2).

A study by Scott and Duane (2010) on impact of computer based instruction (CBI) on student comprehension on drafting principles found that CBI serves to establish more effective learning situations like improving content presentation, learner participation and retention of learned concepts than traditional teaching methods. This study agrees with these findings except that it did not consider learner's retention of drafting principles but measured learner's performance in graphics in Art and Design after having been taught using three instructional methods; CBI,CMI and CM.

In Kenya, Mwanda (2002) investigated three types of instructional practices, two using computer and one using conventional methods. He looked at three types of instruction; that is, computer assisted instruction (CAI), individualised computer assisted instruction(ICAI) and conventional methods of instruction (CM). His study found the use of computer in teaching statistics in geography successful but equally as effective as conventional method. He found that learners had positive attitudes towards geography and the use of CAI. Target population in his study were form one students and their teachers while this study used form two students and their teachers.

This study looked at three types of instruction, CBI, CMI and CM. The learners were not limited to use the computer individually as they were allowed to receive assistance from their teachers and fellow learners. This study did not look at learner's or teacher's attitudes but rather looked at the acquisition of graphic skills in Art and Design after learning the skills using computer programmes through CBI. The skills were measured through Art and Design performance tests (ADPT 1 &2), which comprised of theory questions and practical production of a graphic work from every learner who participated in the study. If CBI has been used effectively in geography, Art and Design teachers should feel encouraged to use it to improve skill and knowledge acquisition.

Jesse, Twoli and Maundu (2014) investigated the enhancement of science performance through computer assisted instruction among selected secondary school learners and the influence of instructional methods on efficiency of content delivery to the learner. Their study was related to finding out the factors which contribute to poor performance in science subjects and among them is the inappropriate teaching approaches that are teacher-centered rather than learner-centered. Quasi-experimental design was used, based on the performance in science when the Conventional Instructional Techniques (CIT) are used and when a combination of computer-assisted instruction (CAI) and conventional instructional methods are used. Biology, Chemistry and Physics teachers and Form Two learners from six provincial secondary schools situated in the greater Embu district were involved in the study.

Data was collected using Standard Students Assessment Tests (SSAT) and analyzed in order to uncover whether there was a significant difference in learners' science performance before and after the treatment. The study found out that learners

taught through computer assisted instruction (CAI) performed significantly better than learners taught through conventional instructional techniques (CIT) in science. Based on these findings of the study, it was concluded that use of computer-assisted instruction improves secondary school learners' performance in science. This means that computer technology has provided teachers and learners with contemporary tools which continue to have a profound effect on classroom instruction.

Thiong'o, Ndirangu and Okere (2014) in their study on effects of computer-based simulation module on secondary school students' achievement in understanding of magnetic effect of electric current, found CBI successful as an instructional method. They affirm that the use of the computer in instructional situations in various subject areas in many countries has given positive results. Their study aimed at finding out the effect of computer-based simulation module on students' achievement in magnetic effect of an electric current. The study adopted Solomon-Four Quasi-Experimental Design which involved comparisons between two experimental and two control groups. Purposive sampling technique was used to select four County boys' secondary schools in Nyeri County which had computers, and were accessible to the researcher.

The four schools were randomly assigned to the experimental and control groups. Each school provided one Form Two class for study and a total of 170 students were involved. All the subjects were exposed to the same content of magnetic effect of an electric current. However, the experimental groups were taught using Computer-Based Simulation module while the control groups were taught through regular teaching methods. Experimental group I and control group II were pre-tested prior to the implementation of the Computer-Based Simulation module. After teaching for four weeks, all the four groups were post-tested using the Physics

Achievement Test (PAT). The result of the study showed that Computer-Based Simulation Module resulted into higher achievement mean scores in magnetic effect of an electric current on Physics Achievement Test, among the groups that received the treatment. The mean scores were statistically significantly different in favour of the experimental groups.

Studies done in other subjects in Kenya and other countries in the world have attested to the successful use of CBI in improving instructional methods that lead students to reach their maximum potential. Heinich, Molenda & Russell (2002) posited that the computer is a very useful tool in teaching and learning graphics. Senteni (2004) found out that CBI enabled the students to increase their motivation and achievements and to develop positive attitudes towards computers and the subjects in which computers are used.

Liao (2007) found out that CBI had positive effects on learner performance by comparing fifty two studies in Taiwan in his meta-analysis study. The aforementioned reasons have convinced some Art educators to believe that computer technology can be used as a creative tool (Dunn, 1996; Freedman, 1989; Greh, 1986). In fact, some students who believe themselves incapable of drawing have stated that computers make them artists (Freedman, 1989). This may be due to the fact that these students are able to experiment more easily on the computer than is common in other media (Freedman, 1989; Greh, 1986). Computer programmes like Photoshop, Coreldraw, Paint brush, Adobe illustrator and other tools should be used in graphics design to teach and make functional products. A similar observation was made by Nyah (2014) who put it as follows;

“The development of graphic design application softwares like, Adobe illustrator and PageMaker, Designer studio, CorelDraw, Photoshop and AutoCAD are known to have provided possibilities to improve the use of these visual design tools in our instructional graphics.” A gap exists as no study has been conducted on use of computer in classroom instruction in Art and Design in public secondary schools in Kenya. Hence, this study explored the effect of computer based instruction on learners’ performance in Art and Design in public secondary schools in Kenya.

2.4 CM and Learners’ Performance in Art and Design

In the past, the conventional process of teaching has revolved around teachers planning and leading students through a series of instructional sequences to achieve a desired learning outcome. Typically these forms of teaching have revolved around the planned transmission of a body of knowledge followed by some forms of interaction with the content as a means to consolidate the knowledge acquisition (Sadker and Sadker, 2002).

Different researches in different fields reveal that CBI serves to establish more effective learning situations like improving content presentation, learner participation and retention of learned concepts than conventional teaching methods which involve teacher presentation in form of lecture, demonstration, discussion, and question and answer, (Lin, 2009). A study carried out in Turkey by Kumar et al. (2003) on the use of a variety of electronic media ranked the computer as number one in effectiveness among other media. It was found to be uniquely superior in enhancing knowledge and technical skills in learners as compared to conventional methods. There are a variety of conventional methods of instruction used by Art and Design teachers. Some of the methods are listed below;

2.4.1 Use of Lecture Method in Teaching Art and Design

The lecture method is often considered conventional but it is still one of the most widely used by Art and Design teachers. It is a process of verbally delivering a body of knowledge as pre-planned by the teacher. The lecture method is criticised as outdated/old fashioned, but if planned carefully and skillfully delivered, it can be pleasurable for the learners and effective in achieving the desired teaching aims (Thungu, Wandera, Gachie and Alumande 2008). For the lecture method to be successful it should be planned as follows;

During the preparation stage, the teacher should consider learners' level of understanding and language so as to achieve the lesson objectives. The teacher should outline the main points, ensure spontaneity, use relevant examples, prepare visuals, short demonstrations and design a systematic way of choosing the best methods to present the concepts to be learnt.

The lesson introduction should be catchy and interesting in order to capture the learners' attention. The teacher can ask provoking questions related to the topic and give a logical outline on what is to be taught. This can be followed by showing illustrative materials and giving of examples that are related to real-life experiences. Giving learners information both orally and visually is an important part of instruction as it involves two of the learners senses simultaneously. The two senses, train learners in listening and observation skills. Illustrative materials enhances understanding of concepts and helps the teacher to assess learner's knowledge as the lesson progresses.

To improve the effectiveness of the lecture, the teacher should be presentable, pronounce words correctly, use gestures effectively, maintain eye contact with learners and read their body language. The teacher should give students time to ask questions about the content in order to clarify ideas. The lecture method is useful in teaching all areas of Art and design especially during lesson introduction and most useful in teaching the history of Art and Design.

2.4.2 Use of Discussion Method in Teaching Art and Design

Discussion method is very useful for teaching all areas of Art and Design. This method of teaching is time consuming and therefore should be carefully planned and organized. David, Paul and Donald (1989) warn that if a discussion is not planned, it may result in nonlearning. It may also result in the students drifting away from the activity. In the classroom, discussions often take place either deliberately or spontaneously. They may occur at brief intervals during an informal lecture, demonstration or during Studio Art work. When planning and organizing a discussion, the teacher should carefully consider goals, decide if the activity would be best implemented in a large group, teacher-led activities, small groups, and student-led activities. The teacher should consider the experience and development of the students and consider time allocation for the activity. This is because the learners need a clear task that requires them to produce something concrete in a short time. Results should be summarized, listed and conclusions drawn.

In a discussion activity, the teacher becomes a facilitator of learning and more of a facilitator. The teacher must ensure the promotion of learning through student interaction and exchange of ideas. This can be accomplished through the teacher carefully initiating, regulating, informing, supporting and evaluating the group

activity. Discussions can be held before creating an imaginative composition, before designing a poster, a logo, brochure, wedding card and programme, drawing a landscape, or even a cartoon (Thungu, Wandera, Gachie, and Alumande, 2008).

2.4.3 Use of Question and Answer Method in Teaching Art and Design

This method is also referred to as the Socratic method. Farrant (2009) asserts that questioning is an important means of teaching. David, Paul and Donald (1989) agree that classroom questioning is the cornerstone of effective teaching. An Art and design teacher may ask a series of questions at the beginning of a lesson to find out how much the learners know about a topic and therefore decide what needs to be emphasized. Questions may be used as the lesson is developed to test the learners' level of comprehension. Learners may also ask questions so that the teacher can clarify a concept that has not been understood. Questions can also be used at the lesson conclusion to help the teacher to get feedback of what has been learned. When asking questions a teacher should begin with interrogative words such as , who, what, where, why, how and when.

One of the best known tools for the classification of questions is the Bloom's Taxonomy of Educational Objectives. According to Bloom, there are six levels of questions. Each level has questions that require a response which uses a particular kind of thought process and level of understanding (David, Paul, and Donald, 1989). A teacher should therefore, formulate questions on each of the six levels in order to encourage learners to employ a variety of cognitive processes.

2.4.4 Use of Demonstration Method in Teaching Art and Design

According to Farrant (2009) demonstration involves showing how something is done and thus, it is a practical form of learning by imitation. It is therefore, showing how something is done, making it a much more effective way of teaching than describing a particular procedure. It is a commonly used method by Art and Design teachers at all stages of lesson development. In demonstration, the emphasis is on learning by observation which is followed by doing; therefore practice is required. Since most Art and Design lessons are mainly practical, demonstration is very useful and practising of the learnt skills during studio art work is equally important. The demonstration method is used to teach skills like painting, graphics illustrations, layout, typography, use of elements of Art and Design just to mention a few.

Demonstrations are appropriate when the skill to be learned is difficult, when materials and equipment are insufficient, expensive or difficult to procure, when time for content coverage is limited, and when it is dangerous for the learners to carry out the activity. Demonstration method comes in handy for the Art and Design teacher and student especially when using the computer for art work. In order to carry out an effective demonstration the teacher should set and analyse the objectives of the demonstration, rehearse the demonstration to avoid failure, determine the time needed and display the procedure to be followed on handouts, screen or writing board. The teacher should keep the demonstration simple, ensure that all needed materials are within reach and every learner can see the demonstration.

Scott and Duane (2010) did research on impact of computer based instruction (CBI) on student comprehension on drafting principles and found that CBI serves to establish more effective learning situations like improving content presentation, learner participation and retention of learned concepts than traditional teaching methods. However this study did not consider learner's retention of drafting principles but measured learner's performance in graphics in Art and Design. No empirical study has been done in Kenya to determine effect of traditional methods of instruction on learners' performance in Art and Design. This study intended to fill this gap.

2.5 CMI and Learners' Performance in Art and Design

Learners' achievement in various subjects has largely been related to teaching approaches among other factors. Chapman (2000) stressed that a learner's performance is highly influenced by the instructional methods employed by the teachers. The choice of appropriate teaching methods enables the learner to participate in the learning process and improve performance in the subject. Otati (2013) supports this argument as she asserts that teaching methods applied by teachers play a major role in influencing positive attitudes and discouraging negative ones among learners. She noted that learners with positive attitudes towards a subject had improved performance more than the learners who had negative attitudes. Muriithi (2013) agrees as he asserts that the instructional approaches and methods used by teachers play a key role in determining learners' achievement in any subject at all levels of learning.

A similar opinion is expressed by Jesse, Twoli and Maundu (2014), as they blame inappropriate teaching approaches that are teacher-centered rather than learner-centered as contributors to poor performance in science subjects. In their study on enhancement of science performance through computer assisted instruction among learners in secondary schools in Kenya, they compared learners' performance who were taught using computers and those who were taught using a combination of conventional methods. They found out that learners who were taught using computers had better results than those who used a combination of conventional methods and computers.

Quasi-experimental design was used, based on the performance in science when the Conventional Instructional Techniques (CIT) are used and when a combination of computer-assisted instruction (CAI) and conventional instructional methods are used. Biology, Chemistry and Physics teachers and Form Two learners from six provincial secondary schools situated in the greater Embu district were involved in the research. Data collected using Standard Students Assessment Tests (SSAT) was analyzed in order to uncover whether there was a significant difference in learners' science performance before and after the treatment. The study found out that learners taught through CAI performed significantly better than learners taught through CIT in science. Based on this study, it was concluded that use of computer-assisted instruction improves secondary school learners' performance in science.

The integration of ICT into teaching and learning processes contributes to increase of interaction and simplifies reception of information (Cabero 2001). Such possibilities suggest changes in the communication models and the teaching and learning methods used by teachers, giving way to new interventions which favour

both individual and collaborative learning. The use of ICT in educational settings, by itself acts as a catalyst for change in this domain. ICTs by their very nature are tools that encourage and support independent learning. According to Reeves and Jonassen (1996), students using ICTs for learning purposes become immersed in the process of learning and as more and more students use computers as information sources and cognitive tools, the influence of the technology on supporting how students learn will continue to increase.

Teaching and learning approaches using contemporary ICTs like computer based instruction (CBI) provide many opportunities for constructivist learning through their provision and support for resource-based, student-centered settings and by enabling learning to be related to context and to practice (Barron, 1998 and Berge, 1998). As mentioned previously, any use of ICT in learning settings can support various aspects of knowledge construction and as more and more students employ ICTs in their learning processes, the more pronounced the impact become. Teachers generate meaningful and engaging learning experiences for their students, strategically using ICT to enhance learning. Students enjoy learning, and the independent enquiry which innovative and appropriate use of ICT can foster. They begin to acquire the important 21st century skills which they need in their future lives. This implies that a learner's talent should be given time, allowed to grow through exposure to modern technology and repeated practice of taught skills to enhance learning and improve learners' performance.

Computer based instruction is such an approach that can be used in Art and Design to provide opportunities to grow a learner's talent in Art and Design and improve learner's performance. None of the studies in Art and Design had looked at

the use of the computer programmes in teaching graphics which were used in this study. This study intended to fill this gap by comparing learners' performance after using the computer programmes, others who combined the programmes with conventional methods of teaching and those who used conventional methods only.

2.6 Gender Effects on Learners' Performance in Art and Design

Education in Kenya is regarded as one of the most instrumental tool to facilitate social and economic development. It is in deed one of the most effective instrument a nation has at its disposal for promoting sustainable social and economic development (Republic of Kenya, 1999). It is no wonder that one of the national goals of education in Kenya is to promote social equality and responsibility. Education should therefore, promote social equality and foster a sense of social responsibility within an education system which provides equal education opportunities for all. Through education, every learner should be exposed to varied and challenging opportunities for collective activities and corporate social service irrespective of gender, ability or geographical environment (KIE 2002).

It is therefore important to ensure that both boys and girls get equal opportunities in education despite the fact that there are innate biological differences between girls and boys which enable them to have varied abilities. In relation to the differences Muriithi (2013) highlights that men are physically stronger, less resilient, have greater spatial, numerical and mechanical abilities and tend to see the world in terms of objects, ideas and theories. Women on the other hand mature physically and psychologically at an earlier stage, are more affiliate and nurturing, have higher and more precocious verbal skills and see the world in personal, aesthetic and moral terms. It is likely that gender differences are influenced by the varied abilities which in turn may reflect in educational outcomes.

Studies have been done to examine the effects of gender on learners performance at different levels and different in subjects in Kenya and other countries. One such a study was carried out by Akabogu and Ajiwoju (2015) in Nigeria on the effects of gender and school location on students' achievement in English vocabulary in junior secondary schools in Akoko South Education Zone, Ondo State, Nigeria. The study used non-equivalent pretest, post-test control group quasi-experimental research design. Purposive random sampling was used to select two schools for the study. Two intact classes from rural and urban schools were randomly selected and used as treatment group. The urban schools comprised of 86 male and female students while the rural schools comprised of 74 male and female students. The results of the study showed that gender had significant effect on students achievement in English vocabulary.

Dermirbas and Dermirkan (2007) carried out a study on learning styles of design students and the relationship of academic performance and gender in design education in Turkey. The study focused on design education using Experiential Learning Theory (ELT) and explored the effects of learning styles and gender on the performance scores of freshman design students in three successive academic years. The findings of the study revealed that the learning style preferences did not significantly differ by gender in all three groups. Further the results indicated that the performance scores of males were higher in technology-based courses, whereas scores of females were higher in artistic and fundamental courses and in the semester academic performance scores (GPA). These findings agree with the varied abilities in relation to gender highlighted by Muriithi (2013). Similarly, Achuonye and Olele (2009) found male dominance in computer usage in another study. This finding is in line with Daramola (2006) who observed that computer assisted learning ensures students motivation and differentiates between students' capability levels.

Another study in Nigeria, carried out by Anulobi (2009) in Fine Arts with Video Compact Disc Instructional Package (VCDIP), had contrary findings. He found out that gender did not have any impact because both the boys and girls had similar scores and none outperformed the other. Another study in Nigeria carried out by Achuonye (2011) showed that the use of computer in the teaching of Biology enhanced learners' academic performance. This was further proved true by the difference in the scores of the control and experimental groups where the experimental group performed significantly better. However, the study also showed that there is no significant difference in the performance of the boys and girls in the use of computer in the learning of Science - Biology. In other words, gender does not affect the use of computer in the learning process. Yusuf and Afolabi (2010) had similar findings in their study on effect of gender on use of CAI. Akanmu (2015) in a study on effect of GeoGebra Package on learning outcomes in mathematics revealed that there was no significant difference in the sampled students' performance based on gender.

2.6.1 Use of CBI and Gender effects on Learners' Performance in Art and Design

In her study on the effect of gender on the use of computer in a science class and its effect on the students' academic performance in Nigeria, Achuonye (2011) found out that the use of the computer is weakened by factors such as gender stereotyping. Results showed that gender had no significant effect on the use of computer, but the use of computer in teaching improved the academic performance of the students. The study therefore, recommended continued use of computers in schools, and suggested that the government with other stakeholders should provide

more computers and train teachers to further enhance computer integration in classrooms. She also unearthed hinderances of computer use in Nigeria as high cost of purchase, unreliable electricity supply, computer illiterate teachers and gender attitudes.

Studies have shown differences in the attitudes of male and female students to the use of computer in schools. According to the study carried out by Spotts et al. (1997) in USA on gender and use of instructional technologies males rated their knowledge and experience with some innovative technologies higher than did females. For frequency of use, no significant differences were found with the exception of video, where females indicated use that is slightly more frequent.

2.6.2 Use of CM and Gender Effects on Learners' Performance in Art and Design

The national curriculum in Kenya requires Art and Design students to record and analyse first hand informations manually. In the past seven years, the Kenya National Examinations Council (KNEC) has recoded disparities in learners' performance between boys and girls in Art and Design. The mean scores show a clear gap in girls' and boys' performance where girls have outperformed boys in seven consecutive years (KNEC 2008; 2009; 2010; 2011; 2012; 2013; 2014). There is need therefore, to find out why girls consistently perform better in Art and Design than boys. Table 2.1 reflects the performance in Art and Design according to gender for a period of seven years.

Table 2.1: Gender and Learners' Performance

Year	2008	2009	2010	2011	2012	2013	2014
Girl's Mean %	66.50	58.76	61.16	57.36	67.23	57.07	53.60
Boy's Mean %	65.55	58.45	58.53	53.57	62.00	55.38	52.74

Source: KNEC 2008 -2014

2.6.3 Use of CMI and Gender Effects on Learners' Performance in Art and Design

James Nairne (2005) in the Journal of Educational Technology & society points out that much of our so called first hand experience is infact mediated. He observes that many countries encourage traditional methods of teaching Art and Design. He cautioned that technology outside the classroom may be changing the way students experience, feel and even perceive the world around them. Most students spend their time with mediated imagery so that to get them in touch with the real thing is difficult. His argument is supporting use of computer based instruction in the classroom.

Studies have been carried out in other parts of the world on gender effects and students' performance. Achuonye (2011) did such a study in Nigeria and compared learners' performance in biology after one group which was the experimental group was taught using the computer while the control group used conventional methods of teaching. The research design used was quasi-experiment which had a pre-test, treatment and post-test. The treatment period was two weeks after which data was analysed using mean scores and t-test. Other studies have been done on impact of computer based instruction (Savicayir, 2007; Molly, 2010). Though these studies

have been carried out, a gap exists as no study has been undertaken to examine the effects of computer based instruction in public secondary schools in Kenya. This study intended to fill that gap by comparing the effect of computer based instruction with traditional methods in ten Counties in Kenya. None of the previously carried out studies had combined computer based method with traditional methods. This study compared the effect of using CBI, CM and CMI to determine their effects on learners' performance in Art and Design.

2.7 School Category and Learners' Performance in Art and Design

According to Ministry of Education circular (2013) Secondary schools in Kenya are classified in four categories namely; National, Extra- County, County and Sub-County. The eighteen sampled schools in this study are organised in three categories because the researcher did not find any Sub-County secondary school offering Art and Design. In the first category we have National schools represented in symbol (N), Extra-County schools represented in (EC) and County schools represented in (C). There are many factors that affect learners' performance in other subjects as well as in Art and Design. Facilities and instructional resources are mostly mentioned as the main causes of improved or poor performance (Wagah, Indoshi and Agak, 2009). School category is an additional factor which remains minimally explored. This study considered school category because the selection of learners who join Form one in secondary schools in Kenya, is guided by the scores they attained in the Kenya Certificate of Primary Education (KCPE). That is how an individual learner is placed in a particular school of a particular category.

This may be an indication that the learners have varied untapped abilities which may be developed through exposure to appropriate facilities and techniques. Considering the fact that Art and Design is not examined at KCPE, it may be difficult to gauge learners abilities and talents at the end of primary school level. This study therefore found it necessary to compare learners' performance in Art and Design in the three school categories and thus examine whether they affect learners' performance.

2.8 Theoretical Framework

The study was guided by Cognitive Load theory which is an instructional theory developed by Sweller in the year 1998. It provides a theoretical basis for understanding the learning process and uses an information processing model to describe how the mind acquires and stores knowledge. This theory describes the learning process in terms of an information processing system involving long-term memory which effectively stores all human knowledge and skills. It also describes working memory which performs the intellectual tasks associated with consciousness (Cooper, 1998).

Cognitive Load Theory is a theoretical notion with an increasingly central role in educational research. The main idea in this theory is that cognitive capacity in working memory is limited, so that if a learning task requires too much capacity, learning is hampered. The remedy is therefore found in designing instructional systems that optimize the use of working memory capacity and therefore , avoid cognitive overloading.

Cognitive load theory has been applied with considerable success in the field of computers learning (Mayer, 2001 and Moreno, 2000). It has advanced educational research considerably and has been used to explain a large set of experimental findings. A series of studies have found that individual working memory performance correlates with cognitive abilities and academic achievement (Yuan 2006). Due to the aforementioned reasons, the researcher found the Cognitive Load Theory relevant to this study.

This theory assumes that the mind is divided into three portions namely sensory, working and long term memory (Cooper, 1998). Sensory memory receives stimuli from the senses including sight, sounds, smell, taste and touch. This memory is short-lived and if the mind is not able to identify and assign meaning to the input, the information is lost. Long term memory holds a permanent and massive body of knowledge and skills. Working memory allows us to think both creatively and logically, and to solve problems. According to Baddeley (1993) working memory gives us consciousness and is the interface between long-term and sensory memory. Knowledge passes through working memory and is filtered through sensory memory before being stored in long-term memory.

According to Pavis (1990) visual knowledge is encoded and processed differently from verbal knowledge. He maintains that learning can be increased when the same content is presented simultaneously in verbal and visual representations, especially if the verbal presentation is an aural medium and the visual medium is graphical. This means that memory is partitioned into auditory and visual systems and that working memory capacity can be expanded when both visual and verbal systems are employed (Cooper, 1998). The CBI programmes that were used in this study took advantage of this possibility as they consisted of both visual and verbal media.

Cognitive Load theory was relevant to computer based instruction in Art and Design because it allows the chunking of information into meaningful units, referred to as schema acquisition, which is similar to the way a computer programmer would combine steps in a programme (Shaffer, 2003). The computer based instruction was made of chunks of video clips, sound, demonstrations, virtual galleries, animation, computer programmes, text and graphics. Mayer (2000) defines computer based instruction as the presentation of learning material using both pictorial and verbal form such as spoken and printed text. Computer based instruction (CBI), may include motion, voice, text, graphics and still images (Burton, Dwyer & Moore, 2003). Being a practical subject, Art and Design made use of automation of procedural knowledge in the working memory which results in acquisition of skills. Once a particular skill is acquired through repeated practice, automatic processing can bypass working memory (Merriënboer, Paas, Sweller & Van, 1998). This theory explains that practical work can help the learner to develop skills in Art and Design.

This method of imparting knowledge through practice helped learners to have a clearer understanding as it provided the chance to practice, not only learn from cognitive perspective. Gagne (1985) stresses the importance of emphasizing information presented to the learners. He indicates that distinctive features of what is to be learned should be emphasized or highlighted when the information is presented. Content presented should be chunked and organized meaningfully (Kevin & Kruse, 1999). In computer based instruction, information was displayed using text and graphics and attention focusing devices such as animation, sound and pointers. (Wedman, 1986).

2.9 Conceptual Framework

Figure 2.1 presents the Conceptual framework of the study, which diagrammatically presents the hypothesized model identifying the variables under study, and their relationships.

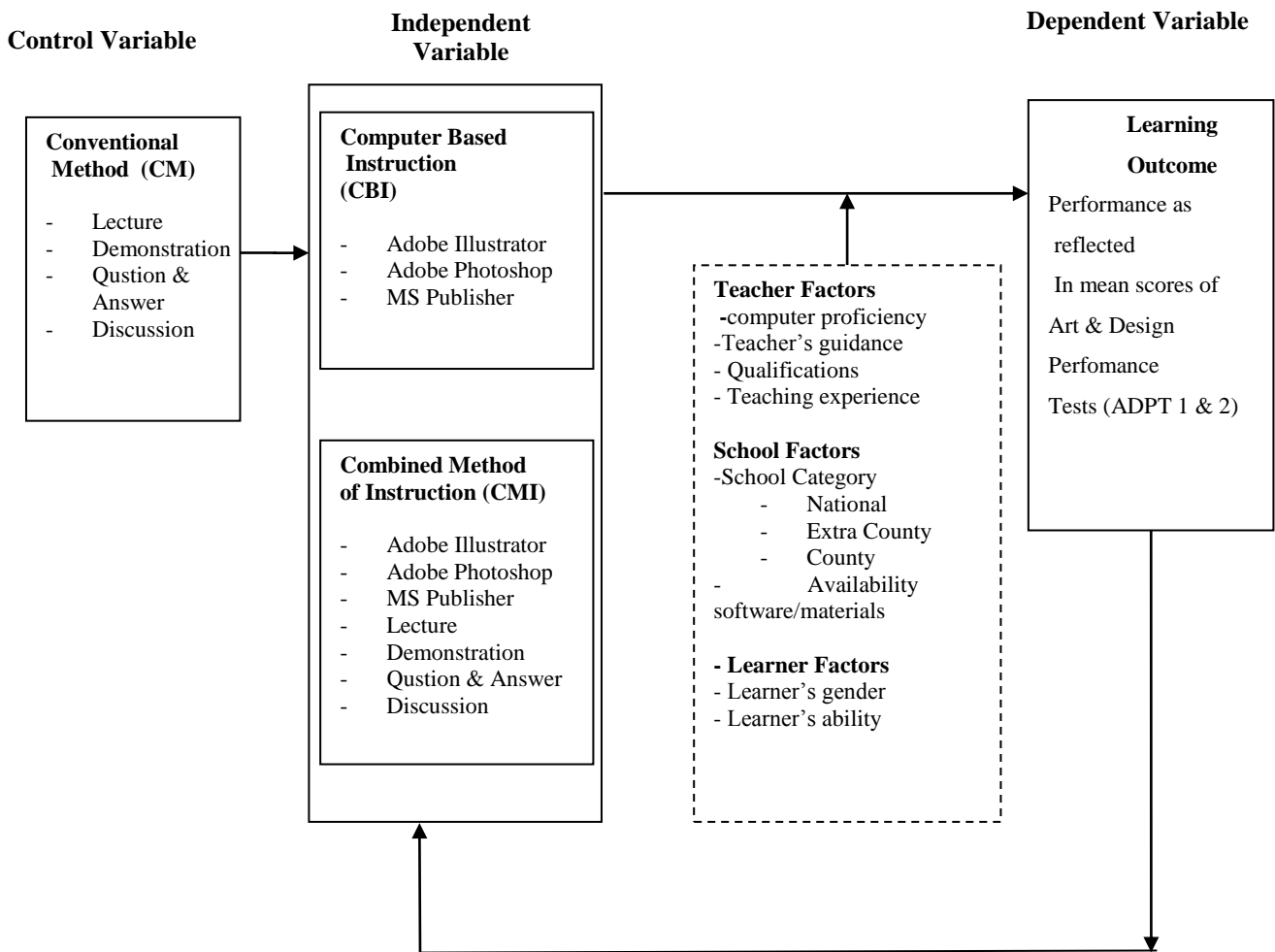


Figure 2.1: Conceptual Framework on the effect of Computer based Instruction on Learners' Performance

The study was based on the assumption that computer based instruction can influence learners' performance positively. The teachers' choice of instructional methods, teachers' proficiency in computer use, learners' gender, school factors influence learners' performance in Art and Design which is reflected in the learning outcome in ADPT 1 & 2 pre-test, and post-test scores. The independent variable is Computer Based Instruction (CBI) used along with Conventional Methods (CM) and Combined Methods of Instruction (CMI). Other factors which may affect the learner's performance are learner's ability, prior computer knowledge, teacher's computer proficiency, guidance, school category, institutional support in form of computer maintenance, provision of software and other instructional materials necessary for effective teaching and learning in Art and Design.

2.10 Summary of Reviewed Literature

The reviewed literature revealed that although Art and Design is recognized globally as a contributor to human development and modern technology, there is imbalance in the use of computers in the instructional situations especially in the developing countries (Daisy, 2007). In Kenya teachers' low level of computer proficiency lack of training, poor infrastructure and inadequate funds are the main causes of under use of computer based instruction in secondary schools (Migwi , 2009).

Odera (2011) points out that the computer was used in giving instruction in the classroom in most subjects in Nyanza. There was no mention of computer use in Art and Design classrooms and therefore there is need to find out if computers are used to teach the subject. Mwanda (2002) found out that the use of the computer in teaching statistics in geography was as equally effective as conventional method. The study did not consider the learners' gender and treatment period was two weeks.

Yusuf and Afolabi (2010) in a study on gender and use of Computer Assisted Instruction (CAI) in Nigeria found that males were not dominating computer usage. This means that females have an equal chance of using computers just like their male counterparts. Achuonye (2011) studied computer use and learners' performance in biology in Nigeria and found out that the use of computer enhanced learners' performance.

Fakomogbon, Omiola, Marakinyo and Ibrahim (2012) studied the effect of Web-based instruction on students' performance in basic technology and found Web-based instruction effective as the students' performance improved significantly. Dermirbas and Dermirkan (2007) carried out a study on learning styles of design students and the relationship of academic performance and gender in design education in Turkey. The findings of the study revealed that the performance scores of males were higher in technology –based courses whereas females performed better in artistic and fundamental courses.

It is evident that use of computers in instructional settings make a positive contribution to learners' performance in most subjects. Use of computers has been found to create more learner participation and exploration, thus giving learners opportunities to be creative while learning. This is evidence that computer based instruction (CBI) is timely in secondary schools in Kenya to contribute positively to learners' performance in Art and Design and in other disciplines.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methodology of the study including the design of the study, the target population, the sample size and sampling procedures, the research instruments, pilot study, the validity and reliability of the research instruments, the data collection procedures, data analysis techniques, and ethical considerations.

3.2 Research Design

This study used quasi-experiment of the non-equivalent control group design. According to Chava and David (1996) quasi-experimental design involves the study of more than one sample, often over an extended period of time. Quasi-experimental design of the non equivalent group helps to compare two or more intact groups before and after the introduction of the treatment variable. This design was suitable for this study because the performance of the groups taught with CBI was compared to the performance of the groups taught with CM and CMI. It is of the non equivalent design because the learners used in the study varied in numbers and characteristics. The non-equivalent control group design does not involve random assignment of subjects to groups. The experiments with CBI and CMI were carried out without disrupting the normal classroom arrangements. Control groups, CM were not interrupted either. Regular teachers were used to teach their normal classes without the presence of the researcher. This helped in controlling the reactive effect since the learners were not aware of their participation in the study. According to Gay (1992)

an advantage of this design is that since the classes are used as they are, possible effects from reactive arrangements are minimised and subjects may not even be aware that they are involved in a study. Borg and Gall (1989) highlight that the researcher does not have to equalise groups by random assignment of subjects. The researcher therefore considered the design suitable for this study because in order to get permission to use school learners in a study, the classes had to be used as they existed as intact groups. School authorities do not allow the classes to be dismantled and be reconstituted for research purposes as is observed by (Gay, 1992; Gall and Borg 2007; Fraenkel, Wallen and Hyun, 2011).

Three groups were set whereby, two were experimental groups and one control group. CBI and CMI formed the experimental groups while CM formed the control group. CBI only used the computer to teach, CMI used both the computer and traditional methods while CM used the traditional methods only. The non equivalent groups, pre-test and post-test approaches were used to partially eliminate the initial differences between the experimental and control groups. This design was suitable for this study because it allowed the comparison of performance of the groups taught with computer based instruction (CBI), those taught using traditional methods of instruction (CM) and those taught using both traditional and computer based instruction (CMI).

Treatment was done without affecting the already existing classes because regular teachers taught their normal classes without the presence of the researcher. The learners were not aware that they were taking part in a study. Pre test and post test were administered to all groups both experimental and control. The performance

was measured against the three teaching methods, which are CBI, CM and CMI. The study had both the control and the experimental groups organised in boys,' and girls' schools categories as shown in Table 3.1 below:

Table 3.1: Treatment and Control Groups

Group	Pre-test	Treatment	Post- Test
CBI _{g1}	p1	exp	p2
CBI _{g2}	P1	exp	p2
CBI _{g3}	P1	exp	p2
CBI _{b1}	P1	exp	p2
CBI _{b2}	P1	exp	p2
CBI _{b3}	p1	exp	p2
CMI _{g1}	P1	exp	p2
CMI _{g2}	p1	exp	p2
CMI _{g3}	P1	exp	p2
CMI _{b1}	p1	exp	P2
CMI _{b2}	P1	exp	P2
CMI _{b3}	p1	exp	P2
CM _{g1}	P1	-	p2
CM _{g2}	P1	-	p2
CM _{g3}	P1	-	p2
CM _{b1}	P1	-	p2
CM _{b2}	P1	-	p2
CM _{b3}	P1	-	p2

CBI_{g1}, CBI_{g2} and CBI_{g3} represents computer based schools for girls who received treatment.

CBI_{b1}, CBI_{b2} and CBI_{b3} represents computer based schools for boys who received treatment.

CMI_{g1}, CMI_{g2} and CMI_{g3} represents combined methods schools for girls who received treatment.

CMI_{b1}, CMI_{b2} and CMI_{b3} represents combined methods schools for boys who received treatment.

CM_{g1}, CM_{g2} and CM_{g3} represents conventional methods schools for girls who did not receive treatment.

CM_{b1}, CM_{b2} and CM_{b3} represents conventional methods schools for boys who did not receive treatment.

P1 represents pre test while.

P2 represents post test.

exp represents experiment used during the treatment period.

CBI and CMI received treatment for a period of eight (8) weeks while CM were the sampled schools in the control group and therefore did not receive treatment but were taught for 8 weeks using conventional methods of instruction. Both control and experimental groups received a post test immediately after the treatment period. Those in the control groups were taught using conventional methods (CM) that are usually used by Art and Design teachers like lecture, demonstration, discussions, question and answer methods. One of the two groups which were treated in the experiment used computer based methods (CBI) which employed computer programmes like Microsoft publisher, Adobe illustrator and Photoshop while the second group (CMI) used combined methods which were conventional and computer based. Nine boys' and nine girls' schools were used in the study. Six boys' schools and six girls' schools were in experimental groups while three boys' and three girls' schools were in the control groups.

3.3 Target Population

The target population comprised of one thousand four hundred seventy eight (1478) Form two students who had selected Art and Design in the 47 Counties in Kenya; during third term when Form two students choose the subjects they preferred

to pursue for KCSE. The study also targeted 145 Art and Design teachers in secondary schools in Kenya. According to Gall, Borg, & Gall (1996), a target population is all the members of a real or hypothetical set of people, events or objects, which the researcher generalises the study on. Kothari (2004) defined target population as all the members or objects involved in the study.

Form two students were targeted during third term after they had selected Art and Design to pursue and be examined in it at KCSE. By third term in Form Two, the learners had been exposed to Art and Design from the time they joined form one and thus, they had tested their ability in the subject for over one and a half years and decided to study it to higher levels and future career. One hundred and forty five teachers who teach Art and Design in secondary schools in Kenya where Art and Design is offered for KCSE were also targeted. Art and Design teachers were found to be suitable respondents as they are the implementers of the curriculum. The sample of the study was therefore purposively selected from the 133 secondary schools offering Art and Design in Kenya as of the year 2014. The researcher got the list of Schools from the Ministry of Education Science and Technology.

3.4 Sample Size and Sampling Procedure

The study adopted purposive sampling procedures. Kothari (2004) indicates that non-probability sampling is known by different names, one of which is purposive sampling. In this type of sampling, items for the sample are selected deliberately by the researcher whereby the researcher's choice concerning the items remains supreme. In non- probability sampling the organisers of the inquiry purposively choose the particular units of the universe for constituting a sample on the basis that

the small mass that they so select out of a huge one will be typical or representative of the whole (Kothari, 2004). Mugenda (2008) defines sample size as a small proportion of a population selected for observation and analysis while it allows making certain inferences about the population characteristics from which it is drawn. This study adopted purposive sampling to select secondary schools because it allows the researcher to use cases that have the required information with respect to the objectives of the study (Mugenda 2008). Purposive sampling was employed to select a sample of 18 out of 133 public secondary schools in 10 Counties in Kenya which offer Art and Design at KCSE. The non-equivalent group design employed in this study uses intact groups that are considered to be similar as treatment and control groups. The researcher purposefully selected 9 boys and 9 girls public secondary schools as the learners were nearly of comparable abilities and facilities available in the schools were of similar levels.

The schools selected for this study were purposively chosen because they were also offering computer studies which meant that they had running computers which were being used for instruction. They also had satisfactorily equipped art rooms. The population of the Art and Design learners had to be adequate too as the researcher had to ensure before selecting a school that they were not less than 25 in number. The researcher called the teachers on mobile phone to ensure that the students from the selected schools were of the required number. Kothari (2004) indicated that the size of the sample can be determined by using the following formula for the finite populations.

$$n = \frac{z^2 \cdot p \cdot q \cdot N}{e^2 (N-1) + z^2 \cdot p \cdot q}$$

Where N = Target population (students 1478, teachers 145 and schools 133)

n = required sample size

z^2 = area under the normal curve for the confidence level of 95 percent (0.05)

e^2 = 2 percent of the true value (0.05)

p = Variance of hypothesized proportion (0.05)

The formula above was used to arrive at the sample size for this study. The sample for the teachers was 18 which is 12% of the target population; learners sample was 450 which was 30% of the target population and schools sample was 18 which was 13% of the total number of the targeted schools. The sample size fell within the recommended range of between 10 and 30 percent (Mugenda, and Mugenda, 2003).

The 18 selected secondary schools were in 10 Counties namely, Kakamega with 3; Kiambu 2; Kirinyaga 2; Kwale 1; Machakos 2; Murang'a 1; Nairobi 2; Nakuru 2; Nyeri 2 and Vihiga 1. The schools allowed the art teachers to teach using computers as they had enough and also had art rooms with basic facilities. The schools also offered Art and Design as an examinable subject at KCSE. Some Counties did not have schools offering Art and Design. The researcher had sampled some three schools in Nakuru and Murang'a but on arrival at the schools, found that they no longer offered Art and Design. Table 3.2 represents the number of schools sampled.

Table 3.2: Sample Distribution of Schools According to County, Gender and Category

County	Boys			Girls			Total
	Schools Category		County	Schools category		County	
	National	Extra County		National	Extra County		
Kakamega	1	1	-	-	-	1	3
Kiambu	-	-	1	1	-	-	2
Kirinyaga	-	1	-	-	-	1	2
Kwale	1	-	-	-	-	-	1
Machakos	-	-	1	1	-	-	2
Murang'a	-	-	-	1	-	-	1
Nairobi	-	1	-	-	1	-	2
Nakuru	-	-	-	2	-	-	2
Nyeri	1	-	1	-	-	-	2
Vihiga	-	-	-	-	1	-	1
Total	3	3	3	5	2	2	18

The researcher involved schools that had twenty five students taking Art and Design. There were three instructional groups CBI, CM and CMI. Each group had three boys' and three girls' schools. Each school had twenty five students, therefore, CBI and CMI experimental groups had one hundred and fifty students each. Three hundred students therefore, were in the treatment groups. CM who were the control groups consisted of three girls' and three boys' schools, each school with twenty five students. One hundred and fifty students were in the control groups. Four hundred and fifty students were involved in the study. Eighteen Art and Design teachers were involved in the study. Only public schools with almost similar resources were

selected. Private schools were not part of the study because they had superior or inferior facilities and some offering a different syllabus, which would have affected the results of the experiment.

The sample was selected from a list of secondary schools from the Ministry of Education Science and Technology which teach and offer Art and Design at KCSE. Schools in the experimental groups had operating computers for CBI and CMI use during treatment period. Art and Design teachers in the selected schools taught using CBI, CMI and CM. They administered ADPT 1 and ADPT 2, marked the tests and filled the teachers' questionnaires. A marking scheme constructed and moderated by the 18 selected Art and Design teachers was used to mark the tests. Art and Design students filled a students' questionnaire. Both questionnaires were filled and collected on the day of administering the post test which was the Art and Design Performance Test 2 (ADPT 2).

3.5 Research Instruments

The study used eight instruments to collect data from respondents. The instruments were as follows:

3.5.1 Art and Design Performance Tests

The Art and Design Performance Tests were in two sets, (ADPT 1 and ADPT 2). These instruments were used in two parts. Part I consisted of ten theory questions on graphics while Part II consisted of a practical graphic question. The Art and Design Performance Tests were used to check learners' performance in the tests for pre-test and post-test scores. A pre-test, Art and Design Performance Test 1 (Appendix I), was given to all respondents in the experimental and control groups which were CBI, CMI and CM. The pre-test consisted of ten questions and a

practical graphic design question. ADPT I was marked out of 50 marks. The test was used to look for the learner's knowledge and application of graphic skills before the beginning of treatment period. The study was carried out when graphic design skills are usually taught to Form two students during the school calendar and therefore was in the timetable. Practical work in graphic design was done to give learners an opportunity to practise the skills which they were learning during the three methods of instruction.

All the three groups, Control (CM) and Experimental (CBI & CMI) groups were exposed to instruction for eight weeks. The Control groups (CM) received instruction using the usual methods, the conventional methods for eight weeks. The Experimental groups, (CBI) and (CMI) received treatment where they were exposed to use of the computer programmes for eight weeks. CBI used the computer programmes only while CMI used both the computer and conventional methods. At the expiry of the treatment period, a post-test Art and Design Performance Test 2 (ADPT 2), (Appendix II) was administered to the three groups. The practical question for the CBI groups was done using computers only while the CMI groups used computers and free hand. CM used free hand only to do the practical part of the post-test. This assisted in comparing the scores of the experimental and control groups and therefore indicated significant differences or not among them.

3.5.2 Questionnaires

Both quantitative and qualitative data were collected from teachers and students by way of questionnaires. The researcher found this instrument important in this study because questionnaires allow the researcher to explain the purpose of the study and give meaning to ambiguous items (Best & Kahn, 1998). According to

Kombo and Tromp (2006) questionnaires have the advantage of collecting large samples of information. The study used six questionnaires; three for teachers and another three for students. The teachers' questionnaires were organised according to the three modes of instruction used during the study period as follows;

- i) Appendix III was teacher's questionnaire for the teachers who taught using computer based instruction (CBI) only.
- ii) Appendix IV was for the teachers who taught combining both conventional and computer based methods of instruction (CMI).
- iii) Appendix V was the questionnaire for the teachers who used conventional methods of instruction (CM) only.

The teachers' questionnaires were divided into two sections. Part I contained items on the teacher's demographic data and that of the school. Part II contained information about instructional techniques and classroom practices.

Data from the Form Two Art and Design students was collected using three questionnaires. The student's questionnaires were organised according to the instructional methods used for the eight weeks of undertaking the study as follows;

- i) Appendix VI was student's questionnaire for those who used CBI,
- ii) Appendix VII was student's questionnaire for those who used CMI and
- iii) Appendix VIII was student's questionnaire for those who used CM.

Part I collected demographic information about students while Part II collected prior computer knowledge, preference to use computer only, preference to combine computer with free hand or use free hand only in Art work, abilities and career prospects.

3.6 Validity of Instruments

Validity of the instruments represents the degree to which a test measures accuracy and relevance of inference made based on research results (Mugenda and Mugenda, 2003). An instrument is valid when it actually measures what it claims to measure. It is the extent in accuracy to which an instrument measures what it ought to measure. Earl (2010) refers to content validity as the extent to which an empirical measure adequately reflects the real meaning of the concept under consideration. In this study, triangulation was used to enhance data validity. The two Art and Design Performance tests 1 & 2 (Appendices I and II), the three teachers' questionnaires (Appendices III, IV and V) and the three students' questionnaires (Appendices VI, VII and VIII) used for this study were subjected to a validity test. In order to enhance content validity, the research instruments were appraised by three experienced supervisors from the Department of Educational Communication and Technology, lecturers and Art and Design experts. The items the researcher may have left out were then included and those found not appropriate were deleted as advised.

To further establish content validity and determine the level of difficulty of the questions, a pilot study was carried out in three purposefully selected public secondary schools two for boys,' and one for girls'. The category of the first boys' school was National, girls' school, Extra County and the second boys' school was County. The reason for selecting schools in National, Extra County and County categories was that the schools are at equivalent levels to the schools used for this study. Art and Design Performance Tests (ADPT 1 & 2) were administered for the trial. ADPT 1 was administered for pre-test in the three schools just before the one month treatment period. One boys' school County and one girls' school Extra County were exposed to treatment for one month. The boys County school used CMI while

the girls Extra County school used CBI and the boys' National school used CM also for one month. The three questionnaires for the teachers were filled by the Art and Design teachers according to the mode of instruction they used during pilot study.

After analysing the responses from the respondents, the items found inappropriate were discarded or modified. This helped to improve the quality of the instruments. The instruments were then analysed and content validity further attained through research instruments being revised according to the desired standards as advised by the experts. According to Kumar (2005), content validity of research instruments is judged by the researcher and experts in the field of study. The items found unsuitable were either replaced or modified. The schools used for the pilot study were not used for the main study.

3.7 Reliability of Instruments

The degree to which a research instrument yields consistent results or data after repeated trials is known as reliability, (Borg & Gall, 1989). According to Kothari (2004), a measuring instrument is considered reliable if it provides consistent results. To establish reliability of the research instruments, a pilot study was carried out and the results were used to determine the level of the reliability of the instruments. To determine reliability for the Art and Design Performance Test (ADPT), the split-half method was used. In split-half reliability, all items that purport to measure the same construct were randomly divided into two comparable halves where odd items were put in one half and all even items in the other half. Each subject's score on the two halves was computed and each subject consequently had two scores; a score for the odd items and a score for the even items (Gay, 1992). The two sets of scores were correlated using Pearson r formula;

$$r = \frac{N(\sum XY) - (\sum X)(\sum Y)}{\sqrt{[N(\sum X^2) - (\sum X)^2][N(\sum Y^2) - (\sum Y)^2]}}$$

r = estimated correlation between two halves.

X= Scores of first half Y= Scores of second half N= Total number of items in each half.

The Pearson correlation coefficient, r, can take a range of values from + 1 to -1. A value of 0 indicates that there is no relationship between the two variables. A value greater than 0 indicates a positive relationship which means that as the value of one variable increases, so does the other. A value less than 0 indicates a negative relationship; which means, as the value of one variable increases, the value of the other variable decreases. The positive correlation coefficient can range from 0.00 to 1.00. The closer the r value is to 1.00, the stronger the reliability. The r values for ADPT 1 (pretest) and ADPT 2 (posttest) were computed and found to be 0.79 and 0.81 respectively. According to Mugenda and Mugenda (2003), a reliability of 0.7 or higher is considered acceptable. The results of the correlation were accepted as good indications of reliability.

To determine the reliability of the questionnaires for the teachers and students, the researcher used test-retest method. The test-retest method of assessing reliability of data involves administering the same instrument twice to the same group of subjects, but there is a time lapse between the first testing period and the second testing period (Mugenda, 2008). The questionnaires were administered to the Art and Design teachers and students on two different occasions within an interval of two weeks. The researcher collected the questionnaires the same day to ensure a high return rate. After two weeks, the researcher gave out another set of the same questionnaires to be filled

by the teachers and the students in the pilot schools. The results were scored and the scores of the first sets of questionnaires correlated to the second sets using the Pearson product moment. The reliability for teachers questionnaires and students questionnaires were found to be as follows;

Teachers questionnaires using CBI 0.80

Teachers questionnaires using CMI 0.78

Teachers questionnaires using CM 0.73

Students questionnaires using CBI 0.77

Students questionnaires using CMI 0.76

Students questionnaires using CM 0.75

The values of reliability for ADPT 1 and 2, teachers', and students' questionnaires which were found lie between 0.73 to 0.81. According to Fraenkel and Wallen, (2002) the reliability coefficient should be at least of an alpha value of 0.7 for the instrument to be considered reliable. The instruments were then considered to be reliable for use in the study.

3.8 Procedure for Data Collection

The researcher applied for a research permit from the National Commission for Science, Technology and Innovation (NACOSTI) in order to be given authority to carry out the research. After receiving research permit, the researcher sought County Directors of Education and Principals of the sampled schools in order to be allowed to carry out the study in the selected schools. The researcher requested the school Principals to inform the students' parents and guardians that their children were to take part in a research study. The researcher then met the Art and Design teachers along with the computer teachers in the sampled schools and requested them to be

research assistants. Arrangements on the training of research assistants were made. The training helped the teachers to master how the computer based instruction using Adobe illustrator, Photoshop and Microsoft publisher were expected to be employed to facilitate teaching and learning of graphics layout, lettering and illustration skills.

The researcher agreed with the teachers of each selected school on the suitable day of administering the pretest. The Art and Design teachers administered the pretest (ADPT 1), to all students in the sampled schools at the beginning of the study before treatment was done. The pretest was done using traditional methods, without using the computer. It was (ADPT 1) administered at this point to determine the learner's entry behaviour. It was marked out of fifty scores. Experimental groups were taught for eight weeks using computer based instruction (CBI) and combined methods of instruction (CMI) while control groups were also taught for eight weeks using conventional methods of instruction (CM). At the expiry of the treatment period, control and experimental groups were all given a post test (ADPT 2). It is at this point that the questionnaires were given to the Art and Design teachers and students to fill and were collected the same day to enhance return rate. The test was marked out of fifty scores just like the first one (ADPT 1).

The experiment was carried out during normal teaching time when Art and Design lessons were scheduled on the class timetable. The selected schools in the experimental groups had working/running computers which were used during the eight weeks treatment period. Eighteen(18) Art and Design teachers were selected to participate in this study because they are familiar with Art and Design syllabus, and the setting and marking of Art and Design in KCSE examinations. The four hundred and fifty (450) Form two students were chosen because they had settled in the school

after having been there for almost two years. It is also in Form Two during third term that the Form Two students select Art and Design or dropped it as an examinable subject at KCSE.

Eighteen public secondary schools were involved in the study. Half of the schools were for boys and the other half for girls. The first experimental groups were three boys' and three girls' schools which used CBI, while the second which used CMI also had three boys' and three girls' schools. The control groups in CM had three boys' and three girls' schools. The sample of the study was selected from a list of one hundred and thirty three (133) secondary schools that offer Art and Design at KCSE in Kenya. This list was obtained from the Ministry of Education Science and Technology and included private schools which were not part of the study.

3.9 Data Analysis Techniques

This study generated qualitative and quantitative data through the two performance tests, three teachers' and three students' questionnaires. The study used the Art and Design Performance Test (ADPT 1) and (ADPT 2) as the main instruments of data collection. ADPT 1 and ADPT 2 were each marked out of fifty marks, after which the marks were converted to percentage scores. Each school's mean score was calculated for both control and experimental groups and then compared. It was easy to see which group outperformed the other. In order to test the significant difference, a paired t- test was done. It was considered an appropriate test for the study because the number of the sampled respondents per school was below 30 for each group and therefore was considered small. According to Kothari (2004), a t- test is considered appropriate for judging the significance of a sample mean or for judging the significance of difference between the means of two samples in case of small samples.

The decision to employ paired t-test in this study was influenced by the fact that two samples are related and thus was suited for judging the significance of the mean of difference between the two related samples. Gay (1992) explains that the t-test makes adjustments for the fact that the distribution of the scores for small samples becomes increasingly different from a normal distribution as sample sizes gets decreasing. Qualitative data was summarised in themes by creating detailed descriptions and making use of coding to organise themes into categories. The analysed themes were: learners' performance in Art and Design after using CBI and CM; learners' performance in Art and Design after using CBI and CMI; learners' performance in Art and Design after using CM and CMI; influence of gender on learners' performance in Art and Design and influence of school category on learners' performance in Art and Design. The calculated Student's t-test was compared with p-value in order to test the hypothesis. The hypotheses were tested at 0.05 level of significance.

Quantitative data from the questionnaires were edited and coded before analysing the collected raw data. Numerical values were assigned to responses. Response 'Yes' was given number 1 while response 'NO' was given number 2. According to Kothari (2004) the analysis of data requires establishment of categories, applying the categories to the raw data through coding and classifying it into some usable categories. Quantitative data collected was analysed by use of descriptive and inferential statistics to enable for explanation and interpretations of findings and relating them to research objectives. Statistical Package for Social Sciences (SPSS) was used to assist in analysing data from the questionnaires. Qualitative data was presented in line with the objectives of the study.

3.10 Ethical Considerations

Ethical standards were upheld during the research as the principles of confidentiality; anonymity and informed consent were applied. The researcher obtained a research permit from the National Council for Science, Technology and Innovation (NACOSTI) in Kenya. A copy of the research permit and an introduction letter were given to the County Directors of Education in the selected Counties and Principals of the selected public secondary schools involved in the study. The researcher visited each of the selected schools, discussed with the principals and Art and Design teachers the purpose of the study and the methods to be used to carry out the study. The purpose of the discussions was to ensure that informed consent to work with Art and Design teachers and students was guaranteed. The research assistants were trained and the need to uphold ethical standards emphasised. Assurance was given that the data collected from the respondents will only be used for the intended purpose. Confidentiality of the respondents' identities and the protection of private information given during the study were adhered to.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

4.1 Introduction

This chapter presents an analysis of data collected from the field and draws interpretations based on descriptive and inferential analysis. First, the research instruments return rate from the Art and Design Performance Tests ADPT 1 & 2, secondly teachers and students questionnaires. Descriptive statistics was used to give more information on the items of the questionnaires on the use of CBI, CMI and CM and their effects on learners' performance in Art and Design. In order to test hypotheses, a paired t-test or difference test statistic was used (Kothari, 2004). The t-test was also used to find out the most effective teaching method among CBI, CMI and CM in Art and Design, the effect of gender on learners' performance and the effect of school category on learners' performance. Data analysis was presented on the basis of the research objectives and the corresponding research hypothesis.

4.2 Research Instruments Return Rate

The study aimed at examining the effect of computer based instruction on learners' performance in Art and Design. It further compared the effect of traditional methods of instruction and learners' performance. Combined methods of instruction, which is a mixture of computer based instruction and traditional methods of instruction was explored as well to find out whether it had affected learners' performance. Since the sampled schools were either boys' or girls', gender effects were also considered. Finally school categories were examined if they had any effect on learners' performance in Art and Design. Table 4.1 shows the return rate of research instruments.

Table 4.1: Return Rate of Research Instruments

County	Teachers Questinnaires	% rate	Students Questionnaire	% rate	ADPT 1 Number of students	% rate	ADPT 2 Number of students	% rate
Vihiga	1	100	25	100	25	100	25	100
Nairobi	2	100	50	100	50	100	50	100
Nakuru	2	100	50	100	50	100	50	100
Nyeri	2	100	50	100	50	100	50	100
Kakamega	3	100	55	73	75	100	55	73
Kwale	1	100	25	100	25	100	25	100
Kirinyaga	2	100	50	100	30	60	50	100
Kiambu	2	100	50	100	50	100	50	100
Murang'a	1	100	25	100	25	100	25	100
Machakos	2	100	18	36	35	70	18	36
Total	18	100%	408	90.7%	435	96.7%	408	90.7%
Returned								

The respondents in the sampled schools were (18) eighteen Art and Design teachers and (450) four hundred and fifty Art and Design Form two students. The research instruments were Art and Design Performance Tests 1 & 2. Questionnaires for teachers and students were also administered. All the respondents who were in school on the day of post test administration filled and returned their questionnaires. Responses for ADPT 1 were four hundred and thirty five (435) which was (96.7%) while those who responded in ADPT 2 were four hundred and eight (408) which was (90.7%), which reflects a good representation of the sampled respondents. The short fall in responses occurred because the none respondents were not in the sampled schools on the days of data collection as they had been sent home to collect school fees. The return rate for the teachers' questionnaires was 100%. This was because, all Art and Design teachers were present in their schools as they were administering the post test/ADPT 2. However, students'

questionnaires return rate was 90.7% reflecting the number of respondents in the posttest. According to Kothari (2004), a research instruments return rate of 60 % and above is acceptable. Table 4.1 shows the return rate of the research instruments used in the study and gives a summary of the schools used in the study. The study involved four hundred and fifty (450) students from ten (10) Counties, out of the forty seven (47) Counties in Kenya.

4.3 Demographic Data of the Respondents

This section presents the demographic information of the Art and design teachers and their form two students. In order to understand the respondents and their influence in the three instructional methods, each respondent was requested to indicate personal data. It was necessary to gather this information as it offered relevant data on teacher's gender, age, academic/professional qualifications, teaching experience, nature of training, school category, level of computer literacy, attitude towards instructional methods and comparison of learners' scores after using the three instructional methods with the scores of the previous term. It captures teachers' and students' opinions on the three instructional methods depending on which one was used with the group.

Students were also requested to give their views on instructional methods used by their teachers, to suggest areas of improving and to explain the gains of learning Art and Design. The information enabled the researcher to gather data on the efficiency of each instructional method and its effect on learners' performance. The data collected provided information on the calibre of all the respondents who were involved in the study. Table 4.2 Shows the level of Art and Design teachers' academic qualifications and their gender.

Table 4.2: Level of Art and Design Teachers'academic / Professional**Qualifications**

Responses Percentage 100%	Gender		Frequency (F) N = 18	
	Male	Female		
Diploma in Education	4	2	6	33%
Bachelor of Education	6	4	10	56%
Master of Education	1	1	2	11%
Total	11	7	18	100%

The Table 4.2 reflects that 33% (n=6) of the total sample in the study of Art and Design teachers have a Diploma in teacher Education. Four (n=4) of the teachers are male while two (n=2) are female. A teacher who holds a Diploma in Education is the least qualified to teach in a secondary school. Diploma holders are trained for three years, two of which is theoretical knowledge and one for professional training which is popularly known as teaching practice preparation and teaching practice. Those with Bachelor of Education are ten (n=10) which is (56%) of the total number of teachers of whom six (n=6) are male and four (n=4) are female. The BEd. holders have received university training for four years and have adequate knowledge of content and skills required in teaching Art and Design. Two (n=2) teachers have Master of Education degree which is (11%) of the total number, where one (n=1) is male and the other one (n=1) female. The findings also show that 11 (61%) of the Art and Design teachers are male while 7 (39 %) are female. Four (4) male teachers were teaching in girls' schools and two (2) female teachers were teaching in boys' schools.

It again reflects that seven (7) male teachers were teaching Art and Design in boys' schools and five (5) female teachers involved in this study were teaching Art and Design in girls' schools. This implies that majority of Art and Design teachers involved in this study were male. The findings show that all the Art and Design teachers in the selected schools have the academic and professional qualifications required for teaching the subject in secondary schools. The study sought information on teacher's age. Table 4.3 shows the ages of the Art and Design teachers involved in the study.

Table 4.3 :Art and Design Teachers' Age

Age Category	Frequency	Percentage
20 - 29 years	1	6%
30 - 39 years	4	22%
40 – 49 years	5	28%
50 – 60 years	8	44%
Total	18	100%

The findings in Table 4.3 indicate that the age category of 50-60 years had 8 teachers who represented 44% of the Art and Design teachers involved in this study. This category constituted the highest number. Category 40-49 years followed with 5 teachers who were 28% of the total number involved in the study. Following closely was category 30-39 years with 4 teachers reflecting 22% and lastly, category of 20-29 years where 1 teacher represented 6% of the Art and Design teachers involved in the study. The category with one teacher implies that Art and Design teachers in this category are very few. This may be an indication that the pre-servise teachers who graduate from Art and Design training institutions may not be joining the teaching

career; given that a student who joins a diploma teacher training college like Kagumo where Art and Design teachers are trained may be aged nineteen years at the earliest and may graduate at the age of twenty one years after training for three years. The bachelor of education teacher who trains in a university, most likely Kenyatta university for four years graduates at the age of twenty two years at the earliest. The fresh graduates fall in the 20-29 years age bracket of Art and Design teachers.

Art and Design teachers were also asked to indicate the category of the school where they are teaching. In Kenya secondary schools are classified in four categories. In the first category are national schools, next is extra-county, county and finally sub-county. The findings are presented in Table 4.4.

Table 4.4: Art and Design Teachers' Distribution and School Category

School Category	Male	Female	Total
National	3	5	8
Extra County	2	2	4
County	4	2	6
Total	9	9	18

The data from Table 4.4 indicates that National schools have the highest number of teachers who are eight (n=8) of whom three (n=3) are male and five (n=5) are female. County schools follow closely with six (n=6) teachers four (n=4) male and two (n=2) female. Lastly, extra County schools have four (n=4) teachers, of whom two (n=2) are male and two (n=2) female. The sub-county category schools were not selected for this study because the schools were not offering Art and Design and also had inadequate instructional resources and facilities.

All teachers indicated that they were trained to teach Art and Design as one of their teaching subjects. The Ministry of Education Science and Technology requires that every teacher be trained in two teaching subjects in order to be employable by the Teachers' Service Commission. Kenyatta University is the main trainer of Art and Design teachers in Kenya. The University trains teachers from Diploma in Education, Bachelor in Education, Master in Education to PhD. The BEd. teachers either take double Fine Art or Kiswahili and fine Art. This implies that the double fine Art graduate is not employable by the TSC because they have been trained only in one subject. The teacher who graduates with Kiswahili as a second subject is employable.

Kagumo Teachers' Training College is the other training institution where Art and Design teachers are trained and graduate in Diploma in education. Here fine Art is offered either with Kiswahili or English grammar qualifying the graduates for TSCs employment. However, there is a problem because in secondary schools English grammar is taught with Literature in English. The teacher who graduates from Kagumo has Art and Kiswahili or Art and English grammar. The former teacher is qualified for TSC employment while the latter is not because there is lack of Literature in English component. This means that only the Diploma in Education teacher with Art/ Kiswahili combination is qualified for TSC employment. This explains why there is a shortage of Art and design teachers although there are some BEd. and Dip.Ed. teachers trained to teach the subject but the TSC's hiring Policy cannot allow them to be absorbed in the teaching service.

The other factor considered in this study was Art and Design teachers' teaching experience. Table 4.5 summarized the information.

Table 4.5 :Art and Design Teachers’ Teaching Experience

Years of teaching	Frequency	Percentage
Under 4 years	1	6%
5 – 10 years	4	22%
11 – 20 years	6	33%
21 – 30 years	7	39%
Total	18	100%

Data from Table 4.5 indicates that majority of Art and Design teachers, 39% (n=7) had a teaching experience of between 21 – 30 years. Further, the data indicates that 33 % (n=6) of the Art and Design teachers had a teaching experience of 11 – 20 years while 22% (n=4) of the teachers involved in this study had a teaching experience of between 5-10 years. The category with the least teaching experience of 6% (n=1) had taught Art and Design for under 4 years. This implies that most Art and Design teachers involved in this study are highly experienced in teaching the subject as most of them indicated that they had more than ten years teaching experience. They were all trained to teach Art and Design as one of their two teaching subjects.

There was a questionnaire filled by students which solicited information on the methods preferred for instruction. The other information was related to Art and Design and how learners’ performance can be improved through use of CBI and CMI. On availability of computers in their schools, 300 (66%) students indicated that there were computers in their schools but most of them were used for teaching computer studies and not Art and Design. In schools where computers were used, they were inadequate resulting in sharing among four students and this caused slow working among learners.

On frequency of use of computers by learners, 54 (12%) students responded that they sometimes used computers, this implies that 398 (88%) students do not use the computer at all to learn Art and Design. Most students who used the computer during the experiment 300 (67%) in CBI and CMI groups, indicated that they found the computer useful in learning graphics as it enhanced their performance and gave instant results. Among the 150 students who used CM, 90 (60%) indicated that they would like to use the computer for Art work. The students who indicated that they would opt to do graphics at KCSE if they would be allowed to use the computer to do the examination were 251 (56%) while 400 (89%) indicated that they valued Art and Design as they considered it useful in building their future careers.

4.4 Performance of Learners Taught using CBI and CM

The research objective which guided the findings on whether there is a difference in the performance of learners who were taught Art and Design using CBI and those who were taught using CM in public secondary schools in Kenya invites a comparison of the two teaching methods. Consequently, this section presents findings on comparison of two instructional methods namely; computer based instruction (CBI) and conventional methods of instruction (CM) as reflected by learners performance. The intention was to find out which of the two teaching methods brought about improved learners' performance in Art and Design. This first objective of the study therefore, sought to establish whether statistically there was a difference in the Art and Design scores obtained by students who were taught using CBI and those who used CM. To achieve this objective, data was organised and analysed. The scores were a result of Art and Design Performance Tests (ADPT 1) given as pre test and ADPT 2 given as post test after the expiry of the experiment period of eight

weeks. Learners who were taught using CM formed the control groups and therefore did not receive treatment but were taught using conventional methods which are the commonly used teaching methods in Art and Design. Learners taught using CBI were in the experimental groups which received the treatment for eight weeks.

Data collected from teachers' questionnaires solicited information on the Art and Design teacher's level of computer literacy and frequency of in-service training. One (1) which is 6% of the teachers indicated excellence in computer skills, four (4) 22% felt they were good, seven (7) 39% were of fair competence and six (6) 33% had a low level of computer competence. On the teachers who had undertaken computer and in-service training, only five (5) 28% of the teachers indicated they had received the training. This means that thirteen (13) 72% of the teachers had neither been in-serviced nor undergone computer training. Although there were five (5) 28% of the teachers who had received computer training, only two (2) 11% of the teachers indicated that they sometimes used the computer in giving instructions in graphics and the other areas of Art and Design. Twelve (12) 67% of the teachers agreed that the computer can help to improve instructional skills especially in graphics. The twelve (12) 67% Art and Design teachers from the groups that used the computer for the experiment reported that the learners were motivated as they worked and participated more in learning activities.

All the teachers from the experimental groups reported that there was improved performance as reflected by the learners' scores of the art work they undertook. However, all the Art and Design teachers and students complained that the time usually given on school time table was not adequate for Art and Design activities. They said they had to put in more time during breaks and weekends to finish their

work. The teachers suggested that all students and teachers should be trained on the use of computers so as to gain skills and improve performance especially in Art and Design. Further comments from the teachers were that computer art work is neat, precise, challenges learners' imagination and enhances creativity. Table 4.6 shows the pretest and post test mean scores of learners taught using CBI and learners taught using CM in selected boys and girls schools.

Table 4.6: Pre test and Post test Mean Scores of CBI and CM Groups

<i>Mode of Instruction</i>	<i>Pretest Mean Scores</i>	<i>Standard Deviation</i>	<i>Post Test Mean Scores</i>	<i>Standard Deviation</i>
CBI Boys	20.87	4.58	28.81	6.37
CM Boys	19.49	3.60	19.64	3.88
CBI Girls	28.00	4.87	30.73	4.74
CM Girls	20.90	2.55	21.57	3.12

The purpose of the pretest was to find out the learners' level of mastering graphics knowledge and skills before the experiment was carried out. The results reflected some improvements in all the groups. At a glance on Table 4.6, it is evident that the pretest scores for both boys and girls were lower than post test scores. Boys had 62.60 in the pretest when they had not been exposed to CBI which improved to 86.44 in the posttest after learning with CBI. The group of boys who used CM had 58.48 in pretest and 58.92 in post test which is a small improvement. Girls on the other hand improved from 84.00 in pretest to 92.20 in posttest after exposure to CBI. The girls who used CM had 62.72 in pretest and 64.72 in posttest which is not a notable difference. The observation is that the learners who used CM made very minimal improvement in their performance.

The improvement could have been caused by additional instructional materials provided by the administration to cater for KCSE candidates as this study was carried out during third term. The learners could have practised more and therefore benefitted more as the instructional resources were more this term than before.

The findings further showed that the students taught using CBI performed better at the post test level in ADPT 2. Additional results from the students questionnaires showed that the practice in graphic skills which had increased during this study motivated students and thus, improved performance of the post test. The findings of this study agree with a study that was undertaken by Akanmu (2015) in Nigeria, on effect of GeoGebra Software on learners performance in mathematics. The results had shown improved learners' performance in the post test just like is the case in this study.

Another study agreeing with the findings of this study was carried out by Fakomogbon, Omiola, Morakinyo and Ibrahim (2012) in Nigeria on effects of web-based instruction on upper basic secondary school students' performance in basic technology. Their study found that the experimental group that was exposed to a web-based instruction outperformed the control group which was taught using conventional method. The study used quasi-experimental design, which involved the pre-test, post-test, nonrandomised, and non-equivalent control group design. The study randomly selected two intact classes from sampled schools for the study. Students from the sampled classes were further stratified along gender and the schools were categorised as urban and rural. The study used two researchers designed instruments: a web-based instructional package on metal and wood materials and Basic Technology Assessment Test (BTAT) as treatment and test instrument respectively.

Three research hypotheses were generated and tested using the t-test statistical method. Findings indicated that students taught with a web-based instructional package performed significantly better than those taught without the use of the package. It also revealed that gender factor affects the performance of students when they were exposed to a web-based instruction. This was because there was significant difference between male and female students. Furthermore, school location affects the performance of students' in experimental and control groups because urban school students performed better than their rural school students' counterpart. Based on these findings, recommendations were made on the need to develop relevant WBI for teaching various topics in Basic Technology in Nigerian Upper Basic Schools.

The study also needed to check on whether statistically there was a significant difference in post test mean scores of learners who had been taught using CBI and those who were taught using CM. To do this the data was further analysed by use of t-test. The t-test was found appropriate because only two sets of data were compared. Table 4.7 presents the results of the two groups. The hypothesis on testing if there was a significant difference on learners performance after they were taught using Computer based Instruction (CBI) and conventional methods of instruction (CM) was done. The hypothesis was stated as follows;

Ho₁: There is no significant difference in the mean scores of learners who were taught Art and Design using CBI and those who were taught using CM.

To test this hypothesis, the t-test statistic was used to compare the posttest mean scores of (CBI) learners who were taught using computer based instruction and (CM) learners who were taught using conventional methods of instruction. The results are shown on Table 4.7.

Table 4.7 : t-test of Learners Taught using CBI and CM

Mean	Std. deviation	Std. Error Mean	t Value	df	Sig. (2-tailed)
12.167	6.304	0.515	23.638	149	0.000

Table 4.7 showed the comparison of post test mean scores of the learners exposed to computer based instruction (CBI) and the learners exposed to conventional methods of instruction (CM). The calculated mean when CBI and CM are paired is 12.167, standard deviation 6.304, standard error 0.515, distribution frequency was 149, t-value of 23.638 for the posttest. The level of significance was 0.000 and therefore the null hypothesis was rejected. This implies that there was a significant difference in the mean scores of learners who were taught Art and Design using CBI and those who were taught using CM. This implies that the learners who were taught using (CBI) computer based instruction performed better than the learners taught using (CM) conventional methods of instruction.

4.5 Performance of Learners Taught through CBI and CMI

To investigate whether learners who were taught using CBI outperformed the learners who were taught using CMI, post test mean scores for both groups were compared. Post test (ADPT 2) was administered to CBI and CMI groups immediately after they had completed the eight weeks treatment period. The posttest was administered to enable the researcher to find out whether the methods of instruction had any effect on learners performance who had been exposed to the particular methods used. In this case those learners who were exposed to CBI and CMI. The results of the test showed that learners' pretest mean scores for both CBI and CMI groups had improved considerably but the mean scores for the girls CBI group was the most improved. Table 4.8 shows the comparison between the mean scores of the two groups.

Table 4.8 : Pre test and Post test Mean Scores of CBI and CMI Groups

<i>Mode of Instruction</i>	<i>Pretest Mean Scores</i>	<i>Standard Deviation</i>	<i>Post Test Mean Scores</i>	<i>Standard Deviation</i>
CBI Boys	20.87	4.58	28.81	6.37
CMI Boys	20.36	2.59	29.45	6.12
CBI Girls	28.00	4.87	30.73	4.74
CMI Girls	24.73	5.01	28.69	5.38

Since there was a lot of improvement among the groups in the way they all had performed in the pretest which was done using conventional methods and post test which was done using the computer in the experimental groups (CBI and CMI), this indicates that the learners appreciated the use of the computer. This is because both CBI and CMI methods of instruction allowed the learners to do their graphic assignments using the computer. The learners found new experience in doing graphics using computer programmes because Art and Design is always done using free hand in public secondary schools in Kenya. The summative examination of the subject is done using free hand. Most learners suggested that there could be more learners opting to select Art and design if they were allowed to use the computer when doing the graphics examination during KCSE. Although most of the Art and Design teachers did not have a great deal of computer competence, they all said they enjoyed teaching using CBI and CMI more than CM methods. The teachers were comfortable when giving instructions in the classroom as it was made easier by the help provided by the computer teachers, whom the researcher had requested to be her research assistants.

The information gathered from the students' questionnaire showed that the learners participation and motivation had greatly improved during the experimental period. They had also indicated that very few teachers previously used the computer for instruction. Nonetheless, the teachers were very enthusiastic during classroom

instruction. This is in line with Knaak (2010) who advised that teachers should use technology software to facilitate instruction not only for their progress in teaching but also to help maximize their students' learning potential. Chapman (2000) stressed that a learner's performance is highly influenced by the instructional methods employed by the teachers. The choice of appropriate teaching methods enables the learner to participate in the learning process and improve performance in the subject. Otati (2013) supports this argument as she asserts that teaching methods applied by teachers play a major role in influencing positive attitudes and discouraging negative ones among learners. She noted that learners with positive attitudes towards a subject had improved performance more than the learners who had negative attitudes. Muriithi (2013) is of a similar opinion as he asserts that the instructional approaches and methods used by teachers play a key role in determining learners' achievement in any subject at all levels of learning.

Other information relating to how learners' performance in Art and Design can be improved through use of CBI and CMI was also considered. The students like their teachers suggested that newer types of computers that were fast in speed be procured. They also requested that the computers be adequate to allow the sharing of between two students, if they are not enough for each learner.

To find out whether there was a significant difference between the learners who were taught using Computer Based Instruction (CBI) and those taught using Combined Methods of Instruction (CMI), a test of hypothesis was carried out. The second hypothesis H_{02} was stated as follows;

H_{02} : There is no significant difference in the mean scores of learners who were taught Art and Design using CBI and those who were taught using CMI.

To test the second hypothesis mean scores of learners who were taught using CBI was compared to mean scores of learners' taught using CMI. To make the comparison possible a paired t- test of CBI and CMI was calculated after they were taught Art and Design using computer based instruction and those who were taught using combined methods of instruction which is a mixture of computer based instruction and conventional methods of instruction. To test the above hypothesis, the t-test statistic was used. Table 4.9 presents the t-test statistics which was used to test the second hypothesis (Ho2). It shows the comparison of post test mean scores of the experimental groups which used computer based instruction (CBI) and the experimental groups which used combined methods of instruction (CMI). The calculated probability of t-value of 0.000 for the posttest mean score is significant because 0.05 alpha level is higher than the values. This is an indication that the experimental group CMI, that was exposed to treatment for eight weeks had improved performance but the experimental group which used computer based instruction had the most improved performance. The null hypothesis is therefore rejected as the figures on Table 4.9 reflect. The implication is that there was a significant difference in the performance of learners who were taught Art and Design using CBI and those who were taught using CMI methods of instruction.

Table 4.9: t- test of Learners' Performance after using CBI and CMI.

Mean	Std. deviation	Std Error	t Value	df	Significance
3.693	8.698	0.705	5.237	149	0.000

Since the hypothesis was rejected, the implication is that the learners who were taught using CBI outperformed the learners who were taught using CMI. This may have occurred because the schools which used CBI have teachers who are competent in computer skills unlike the teachers in the schools which used CMI as a teaching method.

4.6 Performance of Learners Taught Through CM and CMI

This section seeks to compare the performance of learners taught Art and Design through conventional methods (CM) and those taught through combined methods of instruction (CMI). To achieve this intention, learners' pretest and post test scores were compared. The results of post test and pre test (ADPT 1 and 2) in girls' schools showed that there was an improvement in mean scores in all schools after an 8 week treatment. Boys who used combined methods of instruction (CMI) improved from 61.08 during pre test and 88.36 in post test respectively. Girls on the other hand also had improved from 74.20 to 86.08. It was clear that the learners who used conventional methods of instruction had the lowest scores compared to the learners who used combined methods of instruction. Table 4.10 presents the scores of the two groups in both boys' schools and girls' schools.

Table 4.10: Pre test and Post test Mean Scores of CM and CMI Groups

<i>Mode of Instruction</i>	<i>Pretest Mean Scores</i>	<i>Standard Deviation</i>	<i>Post Test Mean Scores</i>	<i>Standard Deviation</i>
CM Boys	19.49	3.60	19.64	3.88
CMI Boys	20.36	2.59	29.45	6.12
CM Girls	20.90	2.55	21.57	3.12
CMI Girls	24.73	5.01	28.69	5.38

From Table 4.10 the mean scores show that the pretest mean scores are clearly lower than the post test mean scores. This implies that the intervention had a positive effect on learners' performance in Art and Design, bringing about improved results of the post test. It is also clear that boys CM mean scores in pretest and post test are almost at the same level while girls too had just a slight improvement of 2.0. However, boys outperformed girls in the post test in CMI groups where girls had 86.08 and boys with 88.36. This improved performance could have happened because the Art and Design teachers from the Boy's schools which used CMI were falling in the 20-39 years age bracket, and had a higher level of computer literacy than the teachers in the girls' schools. The teachers were therefore enabled to instruct learners faster using the computers without having to wait for assistance from the computer teachers.

The test of hypothesis on the difference between learners who were taught Art and Design using conventional methods of instruction (CM) and the learners taught using combined methods of instruction (CMI) was done. The hypothesis was stated as follows;

H₀₃: There is no significant difference in the mean scores of learners who were taught Art and Design using CM and those who were taught using CMI

To test the above hypothesis, a paired t-test was carried out by comparing post test mean scores of the control groups which were taught for eight weeks using conventional methods of instruction (CM) and the experimental groups which were also taught for an equal period using a combination of computer and conventional methods of instruction (CMI). The calculations are shown in Table 4.11.

Table 4.11 : Paired t- test showing Performance of CM and CMI Learners

Mean	Std. deviation	Sd. Error mean	t value	Df	Significance
8.473	6.882	0.562	15.079	149	0.000

Table 4.11 shows the mean of the paired groups as 8.473, the standard deviation as 6.882, the std. Error as 0.562, the t Value as 15.079, the df. as 149 and the significant difference as 0.000. Since the significance is 0.000, the implication is that the null hypothesis that there is no significant difference in the mean scores of learners who were taught Art and Design using CM and those who were taught using CMI is rejected. This means that there was a significant difference in the learners' performance after learning Art and Design using CM and after using CMI. The results showed remarkable improvement after using CMI than when CM was used.

4.7 Gender and Learners' Performance

This section seeks to highlight the findings on the effect of gender on learners' performance in Art and Design after using three methods of instruction, namely computer based instruction (CBI), combined methods of instruction (CMI) and conventional methods of instruction (CM). Since the study was carried out in both boys' and girls' schools, the researcher compared first the post test results in girls' schools. The post-test mean score results from girls who were taught using the three modes of instruction were compared. Figure 4.1 shows the comparison of the mean scores.

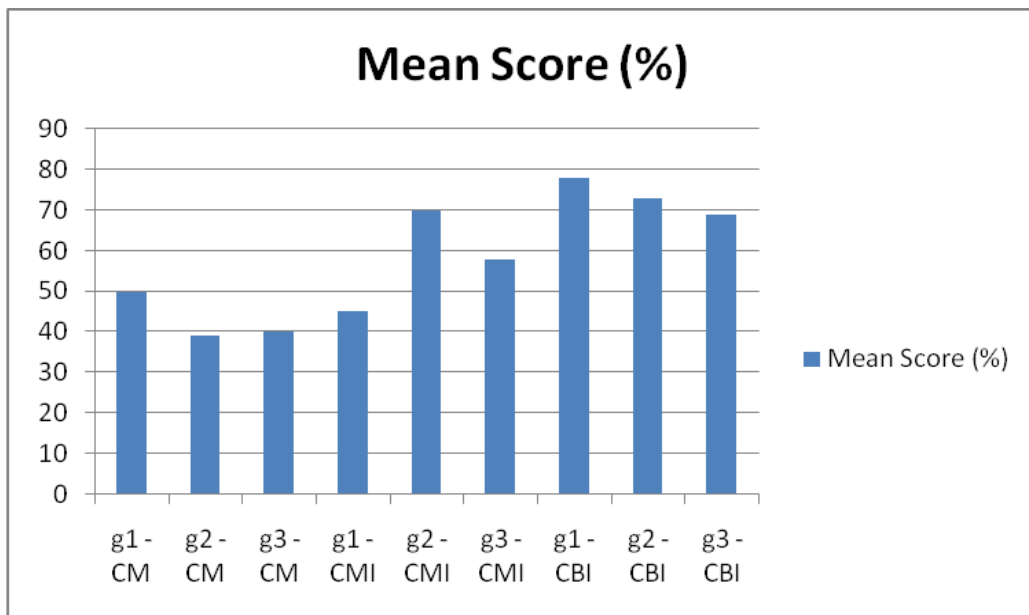
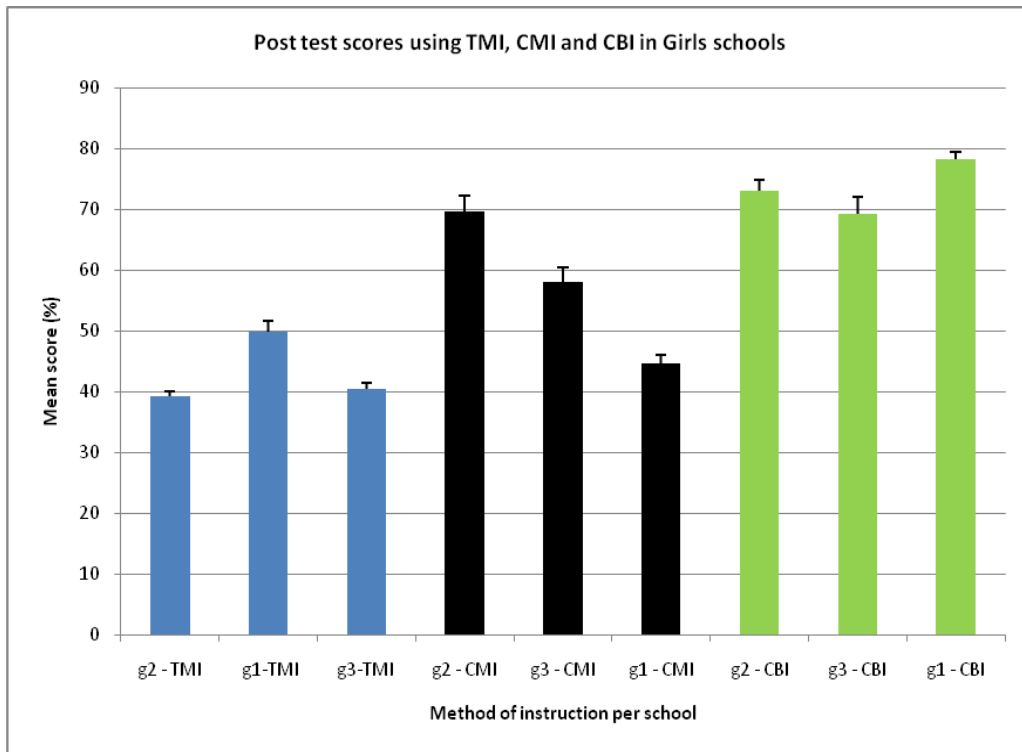


Figure 4.1: Post test mean scores using CM, CMI and CBI in Girls' Schools

Figure 4.1 shows mean score results of post test (ADPT 2) in girls' schools. CMI g2 which had a mean score of 64.96% in the pretest improved to 69.52% in the posttest after using a mixture of CBI and CM during the experiment, the method referred to as CMI. CBI g1 which used computer based instruction (CBI) had a mean score improvement from 64.48% in pretest to 78.24% in posttest. It was clear that

schools using conventional methods of instruction (CM) had the lowest mean scores. The learners who were taught using computer based instruction (CBI) in girls' schools had the highest mean scores while those taught using combined methods of instruction (CMI) came second to the CBI group. It was noted that although the schools which taught using CM were not treated, they too showed a slight improvement in post test results. It is assumed that the Art and Design teachers taught with zeal after the training as research assistants. The training motivated them to try out the new skills with the learners. The learners were keen too as they have indicated in the questionnaires. They indicated that they were excited to use computers in Art and Design. Figure 4.2 shows the results from boys' schools on the use of CBI, CM and CMI on learners' performance in Art and Design.

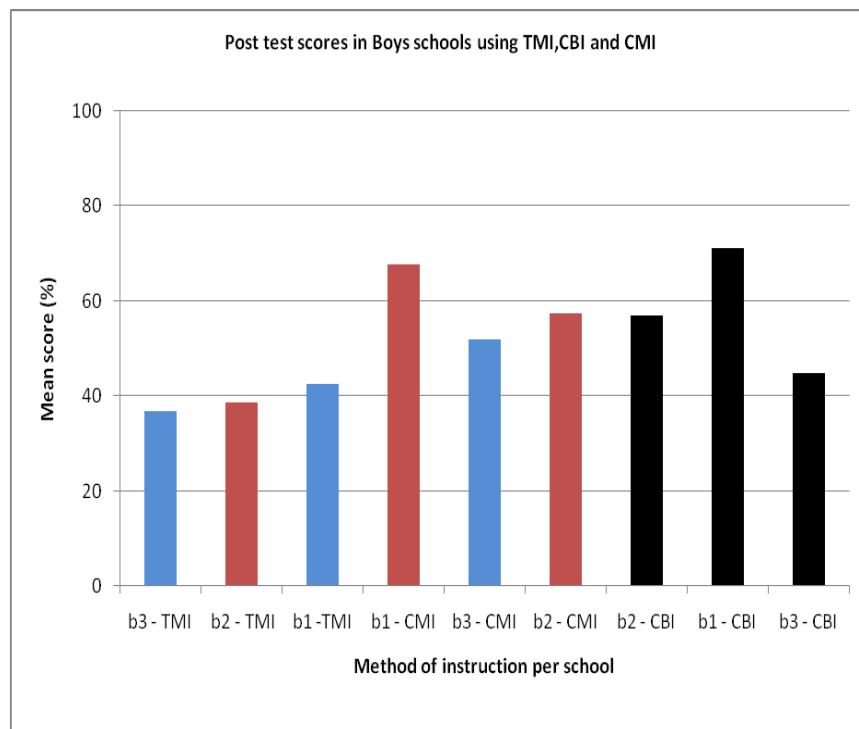


Figure 4.2: Post test mean scores after using CM, CMI and CBI in boys' schools

It is interesting to observe that learners' performance for both boys and girls improved significantly after they were taught using computer based method of instruction (CBI). Another improvement observed was after learners were exposed to combined methods (CMI), which came second to CBI. The least mean scores were reflected by the group which used conventional methods (CM). This translates to mean that CBI was the most effective method of teaching graphics in Art and Design followed by CMI and the learners who had the least improvement were the ones exposed to CM. This reflected in both boys' and girls' mean scores. Computer based instruction should therefore be used to teach graphics and other areas of Art and design in order to improve learners' performance. This is in agreement with Muriithi (2013) as he stresses that the instructional approaches and methods used by teachers play a key role in determining learners' performance in any subject at all levels of learning.

To find out whether gender has any effect on learners' performance in Art and Design after they were taught using CBI, CMI and CM, a t- test was carried out. The fourth hypothesis Ho₄ is stated as follows;

Ho₄: Gender has no significant effect on the mean scores of learners who were taught Art and Design through CBI, CM and CMI.

To find if there was a significant difference in learners performance when the three methods of instruction were used, a t- test was used to compare the performance of female and male learners who were exposed to CMI . Table 4.12 shows the results.

Table 4.12 : CMI Boys and CMI Girls t- test

Mean	Std. Deviation	Std. Error Mean	t Value	df	Significance
-0.773	4.909	.567	-1.364	74	.177

The results shown in Table 4.12 are comparing the mean scores of girls who were taught using CMI and boys who were taught using the same method. Since the Table significance of the 2-tailed test was 0.177 which was greater than 0.05 with df=74 the study did not reject the null hypothesis. There was therefore no evidence that girls who used CMI performed better than boys who used CMI. This result therefore revealed that there was no significant difference in the mean scores of girls and boys who used combined methods of instruction in learning graphics in Art and Design. However, there was a slight difference in mean scores of learners who used CMI with girls scoring 29.47 and boys 28.69. The slight difference is not significant. Therefore, the null hypothesis that gender has no significant effect on the mean scores of learners who were taught Art and Design through CMI is accepted. This means there was no significant difference in male and female learners who used CMI to learn Art and Design.

Another t-test was calculated based on the same hypothesis but comparing the mean scores of girls and boys who used CBI to learn graphics in Art and Design. Table 4.13 shows the results.

Table 4.13: Paired t-test comparing CBI girls and boys mean scores

Mean	Std. Deviation	Std. Error Mean	t Value	df	Significance
7.920	7.964	.920	8.612	74	.000

The Table 4.13 displays the comparison of girls' and boys' mean scores who used CBI as a method of learning graphics in Art and Design. Since the table value of significance, 2-tailed test is less than 0.05 and df is 74 the study rejects the null hypothesis. The results show that gender was statistically significant on the mean scores of learners who were taught graphics in Art and Design through CBI, CM and CMI. It is clear that girls had the most improved performance when exposed to CBI and CMI as compared to their performance when CM was used in giving instructions. Given that CM are the usual conventional methods used to teach Art and Design, the results of this study shows that it is imperative that contemporary methods are employed because they are available and have been proved effective in this study. CBI and CMI have been proved that they can give more improved learners' performance in Art and Design which has been confined to free hand products in the past.

The trend of girls out performing boys in Art and Design in KCSE is evident from the Kenya National Examinations reports (KNEC 2008; KNEC 2009; KNEC 2010; KNEC 2011; KNEC 2012; KNEC 2013; KNEC 2014). In seven consecutive years girls have been outperforming boys in Art and Design at KCSE. Table 4.14 highlights this trend for seven years.

Table 4.14: Gender and Learners' Performance at KCSE

YEAR	2008	2009	2010	2011	2012	2013	2014
Boys	65.55	58.45	58.53	53.57	62.00	55.38	52.74
Girls	66.50	58.76	61.16	57.36	67.23	57.07	53.60

Data analysis results showed that girls' schools performed slightly better than boys' schools in Art and Design with girls' schools scoring 52.77 % while boys' school scored 47.23%. The findings of this study were similar to the Kenya National Examination Council's overall candidate's performance from 2008 to 2014 (KNEC 2008-2014) (See the graphs below)

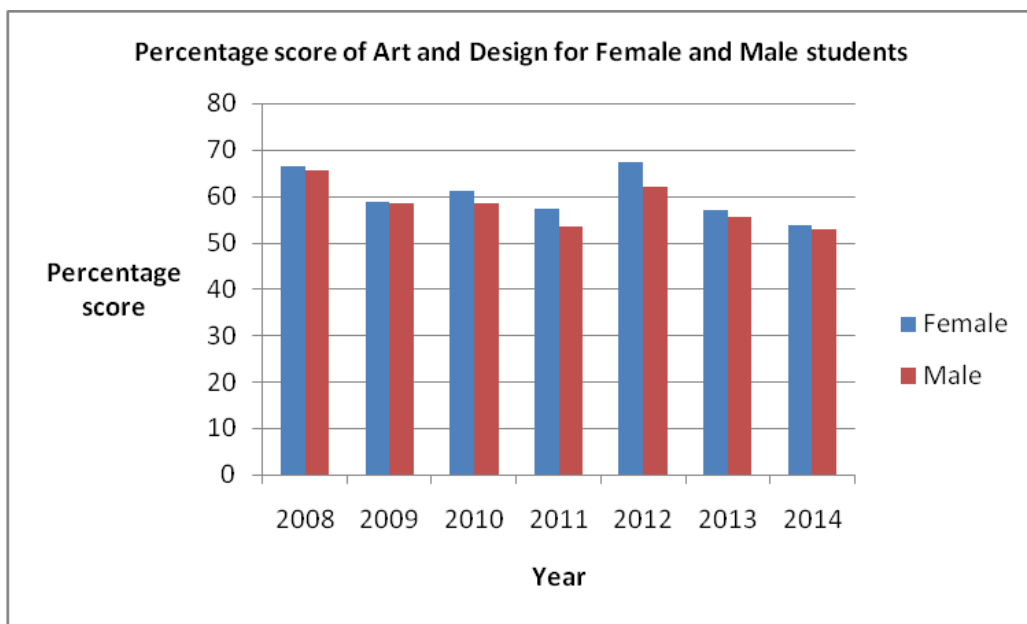


Figure 4.3 : Male and Female Performance

As figures 4.2 and 4.3 reflect the rejection of the hypothesis that gender has no significant effect on the mean scores of learners who were taught graphics in Art and Design through CBI, CM and CMI. The hypothesis was rejected as gender effect was clearly statistically significant on the mean scores of learners who were taught graphics in Art and Design through the three teaching methods. This shows that performance in graphics in Art and Design through all the three teaching methods is higher for girls than for boys.

4.8 School Category and Learners' Performance in Art and Design

Public Secondary schools in Kenya are organized in four categories namely national, extra- county, county and sub- county (Ministry of Education 2013). School category is the last factor this study considered since the sampled schools were found in the said categories. It was therefore tempting to compare the learners' performance in the schools. Table 4.15 reflects the information on the schools involved in this study.

Table 4.15: Selected Public Schools in the Study

Category	Frequency		Total	Percentage
	Boys	Girls		
National	3	5	8	44%
Extra county	2	2	4	22%
County	4	2	6	34%
Total	9	9	18	100%

From Table 4.15 there were eight national schools involved in the study, three are for boys and eight are girls'. In the next category, extra County, two boys and two girls schools were involved in this study. The last category was County schools where four boys' and two girls' schools were involved. In total eighteen public secondary schools were selected from ten Counties in Kenya. National secondary schools select the best performing candidates in the Kenya Certificate of Primary Education (KCPE) to join Form one. Extra-County secondary schools are the next in selecting the next lot according to their performance while County secondary schools select the next lot of average performance. Finally Sub-County secondary schools select the KCPE candidates who get the least scores. However, this study found out that no Sub-

County secondary school offers Art and Design in Kenya. It was also discovered that some schools listed as offering the subject had since dropped it. The researcher found one such school in Murang'a County and two others in Nakuru County. A similar occurrence had been recorded by Wagah *et al.* (2009) in their study on challenges on implementing Art and Design curriculum in secondary schools in Kenya. This study compared learners' performance in these three categories of the public secondary schools.

H₀₅: School category has no significant effect on the mean scores of learners who were taught Art and Design using CBI, CMI and CM.

To test the hypothesis H₀₅ paired t- tests were calculated by pairing two categories at a time thus, three tests were done. To begin with Extra- County and County school categories were compared. Table 4.16 displays the results of the calculations between extra- county and county schools.

To test null hypothesis H₀₅, the t- test statistic method was used to analyse the mean score of learners in the experimental groups in extra county and county schools. Table 4.16 shows that the probability t-value of 0.000 post test mean scores is significant because 0.05 alpha level is higher than the values. This implies that the experimental groups in national schools out performed experimental groups in county schools. The null hypothesis H₀₅ is therefore rejected.

Table 4.16: t test for Extra county and County schools

Mean	Std. Deviation	Std. Error	t Value	df	Significance
3.380	4.290	.607	5.571	49	.000

Table 4.17 shows the comparison of posttest between national and county schools. The probability of t-value 0.000 is significant because it is lower than 0.05 alpha level. This implies that there was a difference in the performance of the learners who were in national and county schools. The learners in national schools had the best improvement among the three school categories. This means that better facilities and instructional resources in national schools and better level of computer literacy of the Art and Design teachers in national schools contributed immensely to learners' performance.

Table 4.17: t test of National and County schools

Mean	Std. Deviation	Std. Error Mean	t Value	df	Significance
8.820	4.676	.661	13.338	49	.000

Table 4.18 : t-test for National and Extra County schools

Mean	Std. Deviation	Std. Error	t Value	df	Significance
5.440	2.120	.300	18.141	49	.000

Table 4.18 displays paired t-test between national and extra-county schools. Paired t-test was used to analyse the mean scores of learners in post test. The calculated probability of t-value of 0.000 for the post test mean score is significant because 0.05 alpha level is higher than the t- values. The null hypothesis was rejected and this implication is that there was a difference in learners performance of learners who are in national schools and those who were in extra county schools. The learners in national schools out performed all the other learners in extra county and county schools. The analysed results show that the good performance which made them secure a place in national schools is influencing the learners' performance. The results are clearly reflected in the Figure 4.4.

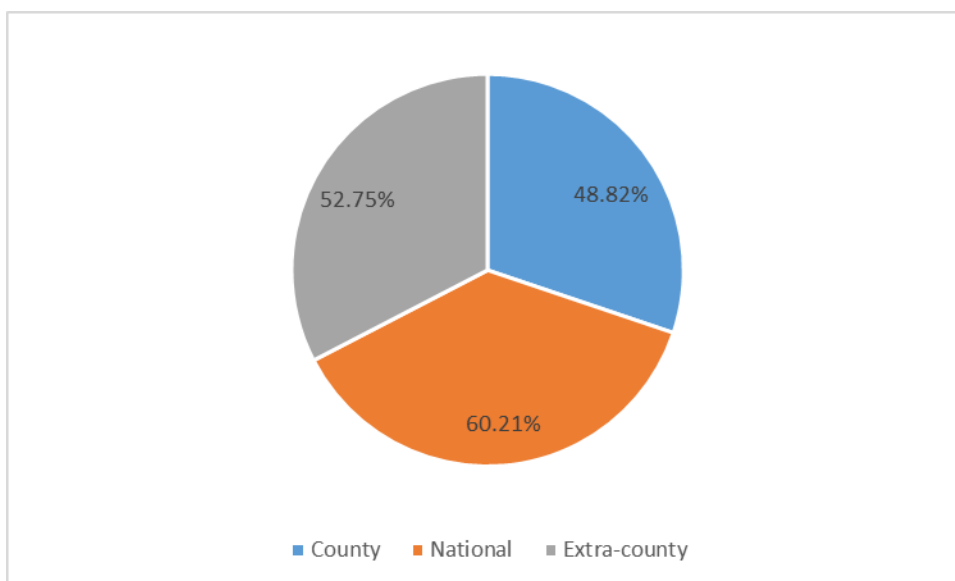


Figure 4.4: School Category and Learners' Performance

Public schools in Kenya are classified in four categories as follows; National, Extra- County, County and Sub- County (Minty of Education, 2013). Sub- County schools were not selected for this study because they do not offer Art and Design. Results of schools category showed that National schools had the highest performance with a mean score of 60.21% followed by Extra-County schools with 52.75% and County schools with 48.82% mean scores. These results indicate that learners' performance was influenced by their ability as previously measured by the summative examination (KCPE) at the end of primary education. This is explained by the fact that National schools select the candidates who get the highest scores, followed by Extra County schools who select the second category of candidates who are second highest in KCPE performance. County schools are third in selecting the third category and lastly the Sub-County schools who choose the lowest level of KCPE performers. However disparities of instructional resources and facilities cannot be ruled out as having some influence among the learners' performance in these schools.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter presents the summary of key findings of the study. It is followed by the conclusions based on these findings and recommendations based on the study. To begin with, a highlight of the summary is presented followed by conclusions and recommendations.

5.2 Summary

This research study purposed to examine whether the computer could be a more effective tool to teach graphic skills using computer programmes, than conventional methods of teaching and thus examining the influence the methods impacted on learners' performance in Art and Design in public secondary schools in Kenya. Secondly, the study was to determine whether the use of computer programmes combined with conventional methods to teach graphic skills could impact on learners' performance than using conventional methods alone. Learners' gender and school category were considered as well to determine whether they had any significant effect on learners' performance when the three methods of instruction were used, that is, CBI, CM and CMI. These methods were used to instruct Form two Art and Design students. The study used quasi- experimental design of the non-equivalent groups design. The population was purposively selected. The reason for purposive sampling was because each selected school for the study was to have working computers, basic Art and Design facilities and instructional resources.

The objectives of the study were to:

- i. Establish whether there is a difference in the performance of learners who were taught Art and Design using CBI and those who were taught using CM.
- ii. Examine whether there is a difference in the performance of learners taught Art and Design using CBI and those who were taught using CMI.
- iii. Investigate whether there is a difference in the performance of learners who were taught Art and Design using CM and those who were taught using CMI.
- iv. Find out whether there is a difference in the performance of male and female learners who were taught Art and Design using CBI, CMI and CM.
- v. Determine whether school category has an effect on the mean scores of the learners who were taught Art and Design using CBI, CMI and CM.

On the first objective, the study found significant differences in learners post test mean scores after they were taught using CBI and CM. Learners taught using CBI had higher mean scores than those who were taught using CM. These are some of the findings shown in the highest scores according to gender ; CM g1 with 24.92 , CM b1 with 21.28 findings; CBI g1 with 39.12 while CBI b1 had 35.52. This implies that CBI is a more effective method in teaching graphics. It means that if CBI improved Form two learners' performance, it could improve learners performance if the Art and Design teachers could start using it from Form one to Form four.

The second objective compares learners' performance after they were taught graphics in Art and Design using CBI and CMI. Post test scores show that learners performance improved more after they were taught using CBI than CMI. This implies that using computer alone rather than combining with conventional methods still gave better results, translating to the fact that CBI is a superior method of instruction to conventional methods and to the combined methods of instruction.

The third objective compares CM and CMI and learners' performance in Art and Design. Here, combined methods of instruction (CMI) were reflected as having higher post test scores than conventional methods of instruction (CM). This implies that the computer causes very positive effects on learners' performance. Although CMI is not as effective as CBI, it was found to create positive impact on learners' performance.

On the fourth objective gender was found to have a significant effect on learners' performance. These results seem to agree with the KNEC results which show girls' performance higher than boys' for seven consecutive years (KNEC 2008, 2009, 2010, 2011, 2012, 2013. & 2014). The implications here are that there must be factors which cause girls to do better in Art and Design than boys. A study to find out these factors should be carried out as soon as possible.

School category was also looked at to find out whether it had any significant effect on learners' performance in Art and Design. It was found out that learners in national schools had the highest mean scores, reflecting the best performance, followed by learners in Extra-County schools while the learners in County schools had the least mean scores which reflected the worst performance among the three categories of schools. This performance may be influenced by learners' abilities as their placement in those schools was guided by their performance at KCPE. The other factor that may have influenced the learners' performance may be availability of instructional resources. This is because as deduced from students' questionnaires, 70% of learners in County schools reported that they did not have adequate instructional resources. Teacher's academic qualifications have no effect as some national schools had teachers with diploma in education yet they had a highly improved performance after using CBI as a method of instruction in Art and Design.

The findings were based on variables that included learners' performance in pre-test and post-test given in two Art and Design Performance Tests, learners' gender, and school category. The variables were measured against the dependent variables which were the three teaching methods (CBI, CM and CMI). The research was carried out using quasi-experimental design to compare learners' performance after they were exposed to CBI, CM and CMI. Survey design was also used to gather data on teachers' teaching experience, level of computer proficiency, academic qualifications and their preferred instructional methods in teaching Art and Design. A survey was also done on learners through a questionnaire to find out whether they considered the computer a useful tool for art work, whether they enjoy using it and whether they would prefer using it instead of the usual conventional methods.

The following research instruments were used to collect data; Art and Design Performance Test 1 for pre-test scores (Appendix I), Art and Design Performance Test 2 for post-test (Appendix II), teachers questionnaire and students questionnaire. Paired t-test was used to analyse data and test hypotheses at p level of 0.05 level of significance. The aim of the study was to improve teaching in Art and Design and learners' performance in the subject in public secondary schools in Kenya. It was necessitated by students' declining performance, especially in graphics design and low candidate enrolment in Art and Design in the Kenya Certificate of Secondary Education (KCSE). The low enrolment of students in the subject means that Art and Design is slowly being dislodged from the secondary school curriculum.

One of the objectives of Art and Design is to enable the learner to integrate acquired skills, concepts and attitudes to enrich their understanding and performance in other fields of study and activities. Consequently, the acquired knowledge, skills and attitudes could be applied for self-reliance in the world of work. Equipping secondary school students with Art and Design skills like weaving, ceramics, sculpture, textile decoration and graphics design, just to name a few, can enable learners to start cottage industries which would later grow, enable them to become employers and hence self-reliant. Such a move would be congruent with Kenya's goal of becoming an industrialised nation by the year 2030. For the learners to acquire knowledge, attitudes and skills, the teacher should choose the most effective instructional approaches and methods. Heinich *et al* (2002) posit that the computer is very useful in teaching graphics yet, there is scarcity of studies in Computer based instruction (CBI) in Art and Design in Kenya. The study results further indicate that the use of computer based instruction facilitates students learning in Art and Design better than the conventional methods of teaching.

5.3 Conclusions

The purpose of this study was to explore the effect of computer based instruction on learners' performance in Art and Design in public secondary schools in Kenya. This study concludes that the use of computer based instruction in teaching graphics in Art and Design is more effective than the conventional methods that are mostly used by Art and Design teachers in public secondary schools in Kenya. This study also found that when computer based instruction is combined with conventional methods of instruction, the cocktail method (CMI) was more effective than conventional methods of instruction but not more effective than CBI.

This implies that computer based instruction (CBI) is an effective method that should be used by teachers in Art and Design. If Form two learners' performance improved after learning using computer based instruction for only eight weeks, then this method if used from Form one to four, it would improve learners' performance in Art and Design at KCSE. This would help improve learner's individual performance and the school's mean score. This translates to mean that schools could stop dropping Art and Design from the secondary school curriculum as it improves the School's mean score. Students would also find the subject useful as it would improve their performance generally, therefore, creating better opportunity for placement for further education and job creation.

Gender was found to have a significant effect on learners' performance as girls mean scores were higher than mean score of boys. This confirms the trend observed from the KNEC reports from the year 2008 to 2014, that girls had performed better in Art and Design than boys. The researcher had no data to use to find out how far back this trend had stretched but it had certainly happened for the seven years as shown by KNEC reports.

Finally, this study considered school category and therefore compared the posttest mean scores of the learners in the experiment groups in the three school categories. The schools were classified as National, Extra -County and County. There were eight National, four Extra- County and six County schools involved in the study. This study found out that National schools had the highest mean scores, Extra-County schools were second highest while County schools learners had the least mean scores among the groups. The disparity is most probably caused by nonuniformity of availability of instructional resources in the said schools.

Overall, understanding and keeping up to date with the changing technological needs of the creative industry is critical in order for learners to be flexible, adaptable and employable. It is important that learners engage with new technology to develop the skills, knowledge and understanding necessary to communicate ideas effectively in a highly competitive, technological world.

5.4 Recommendations

Based on the findings the following are the recommendations from the study:

- i. The Ministry of Education Science and Technology should formulate clear policies to strengthen and support the teaching of creative and visual arts where Art and Design belongs.
- ii. The Ministry of Education Science and technology should device ways and means of clarifying the purpose of Art and Design to policy formulators and to the rest of Kenyan population so that the subject can be given the value it deserves.
- iii. The Teachers Service Commission should accomodate Art and Design teachers who have trained in double Fine Art and employ them despite their lack of a second subject. This would help to cater for Art and Design teacher shortage as it is one of the main reasons that make Art and Design to be dropped by most schools.
- iv. The Ministry of Education Science and technology should support availability and maintenance of computers for teaching Art and Design in public secondary schools in Kenya.
- v. The Kenya Institute of Curriculum Development (KICD) should organise in-service and pre-service courses for secondary school teachers regularly to equip them with computer skills for teaching Art and Design.

- vi. The Kenya National Examination Council should set alternative questions that can be done using the computer especially in graphics.

5.5 Recommendations for Further Research

The following suggestions for further research were recommended:

- i. Research on Computer based instruction in other areas of Art and Design should be carried out since this study covered only graphics.
- ii. More research on computer based instruction in preschools and primary schools in Art and other subjects should be undertaken.
- iii. Additional research on computer based instruction in other subjects at public and private secondary schools in Kenya is recommended.
- iv. More research is recommended for determining the factors that cause gender disparities on learners' performance in Art and design in secondary schools in Kenya.
- v. Since the study did not cover private schools, a similar study could be undertaken in private schools in Kenya.

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APPENDICES

APPENDIX I

ART AND DESIGN PERFORMANCE TEST 1

Answer the following questions:

Time: 2 ½ hours

PART I

1. Define the term graphic design.
.....
2. List the skills you can learn in graphics using the computer.
.....
3. Distinguish between radial and symmetrical balance.
.....
4. How would you use colours to communicate meaning to the viewer?
.....
5. What is meant by pictorial illustration?
.....
6. List the graphic skills that can be practised using the computer.
.....
7. List the three basic hues and explain how they are used to produce secondary colours.
.....
8. What is meant by positive and negative space in a work of art? Give an example in graphics.
.....

Explain how elements are organised in radial balance.

.....

9. What is symmetrical balance?

.....

PART II

10. Design a wedding card measuring 30cm by 21 cm and a wedding programme for the same wedding measuring 11 cm by 30 cm. You may use three colo

APPENDIX II

ART AND DESIGN PERFORMANCE TEST 2

Answer the following questions.

Time:2 ½ hours

PART I

1. Define the term dominance.

.....

2. What is graphics design?

.....

3. Distinguish between typography and calligraphy.

.....

4. What is a poster?

.....

5. Name the skills that can be done using computer tools.

.....

6. Name two complementary colours and explain briefly how they can be used to create a poster.

.....

7. What is the meaning of the word format? List three types of format.

.....

8. What is textual illustration?

.....

9. Explain how you can enhance boldness in a design.

.....

10. Name the three principles of art and design.

.....

PART II

Use only three colours including the paper's colour.

Students who were taught using CBI will use the computer only, those taught using CMI will use computer and free hand while those taught through CM, will use free hand and the usual tools used on paper to do question 11.

11. A youth group in your locality is introducing new road transport company called "Safe

Roadways Transport".

- i. Design a logo for the company measuring 14 cm by 15 cm.
- ii. Design a brochure incorporating the logo measuring 30 cm by 21 cm when open.

APPENDIX III

TEACHER'S QUESTIONNAIRE FOR CBI EXPERIMENTAL GROUPS

INSTRUCTIONS

This questionnaire is designed to gather data on the effectiveness of computer –based instruction (CBI) on learner's performance in Art and Design in public secondary schools in Kenya. Please answer all questions as honestly and accurately as possible. The information you give will be treated as confidential and will be used only for the purposes of this study. Some questions have more than one answer. Indicate the appropriate answer(s) by use of a tick () in the box provided. Where appropriate, fill the spaces provided with your responses.

PART I

1. What is your gender?

Male ()

Female ()

2. How old are you?

20 – 29 years ()

30 -39 years ()

40 – 49 years ()

50 – 60 years ()

3. What are your academic qualifications?

MA. ()

MEd. ()

BEd. ()

Dip Ed. ()

Others ()

Specify.....

4. In which category is your school?

National ()

County ()

Sub- County ()

5. Teaching experience

Under 2 years ()

5- 10 years ()

10-20 years ()

Over 20 years ()

6. Were you trained to teach Art and Design as one of your teaching subjects?

Yes ()

No ()

7. How would you rate yourself on computer literacy?

Excellent ()

Good ()

Fair ()

Poor ()

PART II

8. How often have you attended training in the use of computers?

Recently ()

2 years ago ()

5 years ago ()

10 years ago ()

Never ()

9. How often do you use computer based instruction (CBI) to teach Art and Design lessons?

Always ()

Frequently ()

Sometimes ()

Rarely ()

Never ()

10. In your opinion, how useful is CBI compared to traditional methods of teaching graphics and other areas of Art and Design?

.....

11. What marked differences did you find in teaching graphics using CBI as compared to traditional methods or the usual methods of teaching?

.....

12. How do you rate learner participation during Art and Design lessons when using CBI?

Very active ()

Moderate active ()

Inactive ()

Not interested ()

13. How do you rate learners' performance when taught graphics using CBI?

Excellent ()

Good ()

Fair ()

Poor ()

14. Highlight the difficulties you faced while teaching graphics using CBI.

.....
.....

15. List the benefits of teaching graphics using CBI.

.....
.....

16. What computer tools or programs did you find useful when teaching graphics in Art and Design?

.....
.....

17. Is there a general improvement in learners' performance now that you are teaching using CBI?

Yes ()

No ()

18. What was the mean score last term when you were not using CBI?

.....

19. What is the mean score this term?

Thank you.

APPENDIX IV

TEACHER'S QUESTIONNAIRE FOR CMI EXPERIMENTAL GROUPS

INSTRUCTIONS

This questionnaire is designed to gather data on the effectiveness of combined methods of instruction (CMI) on learner's performance in Art and Design. Please answer all questions as honestly and accurately as possible. The information you give will be treated as confidential and will be used only for the purposes of this study. Some questions have more than one answer. Indicate the appropriate answer(s) by use of a tick () in the box provided. Where appropriate, fill the spaces provided with your responses.

PART I

1. What is your gender?

Male ()

Female ()

2. How old are you?

20 -29 years ()

30 -39 years ()

40 – 49 years ()

50 – 60 years ()

3. Please indicate the category of the school where you are teaching.

National ()

County ()

Sub County ()

4. Please indicate your academic qualifications.

MA. ()

MEd. ()

BEd. ()

Dip Ed. ()

Others ()

Specify.....

5. Teaching experience

Under 2 years ()

5- 10 years ()

10-20 years ()

Over 20 years ()

6. Were you trained to teach Art and Design as one of your teaching subjects?

Yes ()

No ()

7. How would you rate yourself on computer literacy?

Excellent ()

Good ()

Fair ()

Poor ()

PART II

8. How often have you attended training in the use of computers?

Recently ()

years ago ()

5 years ago ()

10 years ago ()

Never ()

9. How often do you combine the use of computer with the usual teaching methods in Art and Design lessons?

Always ()

Frequently ()

Sometimes ()

Rarely ()

Never ()

10. In your opinion, how useful is CMI as a method of teaching graphics and other areas of Art and Design?

.....

11. What marked differences did you find in teaching graphics using CMI as compared to the other methods you had used previously?

.....

12. How do you rate learner participation during Art and Design lessons when using CMI?

Very active ()

Moderate active ()

Inactive ()

Not interested ()

13. How do you rate learners' performance when taught graphics using CMI?

Excellent ()

Good ()

Fairly ()

Poor ()

14. Highlight the difficulties you faced while teaching graphics using CMI.

14. List the benefits of teaching graphics using CMI.

.....

15. What computer tools or programs did you find useful when teaching graphics.....

16. Is there a general improvement in learners' performance now that you are teaching using CMI ?

Yes ()

No ()

17. What was the mean score last term when you were not using CMI?

.....

Thank you.

APPENDIX V

TEACHER'S QUESTIONNAIRES FOR CM CONTROL GROUPS

INSTRUCTIONS

This questionnaire is designed to gather data on the effectiveness of traditional methods of instruction (CM) on learner's performance. Please answer all questions as honestly and accurately as possible. The information you give will be treated as confidential and will be used only for the purposes of this study. Some questions have more than one answer. Indicate the appropriate answer(s) by use of a tick () in the box provided. Where appropriate, fill the spaces provided with your responses.

PART I

1. What is your gender?

Male ()

Female ()

2. Please indicate the category of the school where you are teaching.

National ()

County ()

Sub- County ()

3. What are your academic qualifications?

MA. ()

MEd. ()

BEd. ()

Dip Ed. ()

Others ()

Specify.....

3. Please indicate your teaching experience.

Under 2 years ()

5- 10 years ()

10-20 years ()

Over 20 years ()

5. Were you trained to teach Art and Design as one of your teaching subjects?

Yes ()

No ()

6. How would you rate yourself on computer literacy?

Excellent ()

Good ()

Fair ()

Poor ()

PART II

7. How often have you attended training in the use of computers?

Recently ()

2 years ago ()

5 years ago ()

10 years ago ()

Never ()

8. In your opinion, how useful is CM as a method of teaching graphics and other areas of Art and Design?

.....

9. Have you ever considered using the computer to teach graphics other than traditional methods (CM)?

Yes ()

No ()

10. If your answer is yes, explain why you made that consideration.

.....

11. How do you rate learner participation during Art and Design lessons when using CM as an instructional method?

Very active ()

Moderately active ()

Inactive ()

Not interested ()

12. How do you rate learners' performance when taught graphics using CM?

Excellent ()

Good ()

Fairly ()

Poor ()

13. Highlight the difficulties you face while teaching graphics using CM if any.

.....

.....

14. List the benefits of teaching graphics using CM.

.....

15. Suggest possible improvements in the use of CM so as to enhance learners' performance in Art and Design.

16. Is learners' performance improving as you continue using CM as a teaching method?

Yes ()

No ()

18. What was the mean score last term?

19. What is the mean score this term?

Thank you.

APPENDIX VI

STUDENT'S QUESTIONNAIRE FOR CBI

This questionnaire seeks your views on the use of teaching methods in Art and Design in your school. Your response to this questionnaire is very important and will be treated with strict confidence. Please go through all the questions and mark with a tick () in the brackets. If you think a question is not applicable, write a short explanatory comment to that effect.

PART 1

1. Please indicate your gender.

Male ()

Female ()

2. In which category is your school?

National ()

County ()

Sub-County ()

3. How often do you learn Art and Design using the computer?

Always ()

Frequently ()

Sometimes ()

Rarely ()

Never ()

4. Name the skills or areas in Art and Design where your teacher uses the computer in teaching.

.....

5. How many computers are used for Art and Design lessons in your school?

.....

6. List the benefits of learning Art and Design using the computer if any.

.....

7. What problems do you experience while learning Art and Design using CBI?

.....

PART II

Read each statement and indicate the extent to which you agree or disagree with it by ticking:

SA (Strongly Agree), A (Agree), U (Undecided), D (Disagree) or

SD (Strongly Disagree).

	SA	A	U	D	SD
Art and Design is an interesting subject					
Graphics is my favourite area in Art and Design.					
Art and Design is a useful subject for my future career.					
Graphics is the most difficult area in Art and Design.					
I would have opted to take graphics at KCSE if we were taught using the computer.					
We learn Art and Design especially graphics using the computer.					
Although we have computers in our school we never use them to learn Art and Design.					

Art and design especially graphics is enjoyable when we learn through traditional methods.					
My performance improved when we were taught and produced graphics using both the computer and traditional methods.					
I performed better when we learned graphics using the computer.					
Our performance in art and design especially in the area of graphics is always good although we never use the computer.					

Thank you.

APPENDIX VII

STUDENT'S QUESTIONNAIRE FOR CMI

This questionnaire seeks your views on the use of teaching methods in Art and Design in your school. Your response to this questionnaire is very important and will be treated with strict confidence. Please go through all the questions and mark with a tick () in the brackets. If you think a question is not applicable, write a short explanatory comment to that effect.

PART 1

1. What is your gender?

Male ()

Female ()

2. How often do you learn Art and Design using the computer?

Always ()

Frequently ()

Sometimes ()

Rarely ()

Never ()

3. Name the skills or areas in Art and Design where your teacher uses the computer in teaching.

.....
.....

4. How many computers are used for Art and Design lessons in your school?

.....

5. List the benefits of learning Art and Design using the computer and free hand if any.

.....

.....

6. What problems do you experience while learning Art and Design using the computer?

.....

PART II

Read each statement and indicate the extent to which you agree or disagree with it by ticking:

SA (Strongly Agree), A (Agree), U (Undecided), D (Disagree) or SD (Strongly Disagree).

	SA	A	U	D	SD
Art and Design is an interesting subject					
Graphics is my favourite area in Art and Design.					
Art and Design is a useful subject for my future career.					
Graphics is the most difficult area in Art and Design.					
I would have opted to take graphics at KCSE if we were using the computer.					
We learn Art and Design especially graphics using computer.					

Although we have computers in our school we never use them to learn Art and Design.					
Art and Design especially graphics is enjoyable when we learn using traditional methods.					
My performance improved when we learned graphics using both the computer and traditional methods.					
I performed better when we learned graphics using the computer.					
Our performance in art and design especially in the area of graphics is always good although we never use the computer.					

Thank you.

APPENDIX VIII

STUDENT'S QUESTIONNAIRE FOR CM

This questionnaire seeks your views on the use of teaching methods in Art and Design in your school. Your response to this questionnaire is very important and will be treated with strict confidence. Please go through all the questions and mark with a tick () in the brackets. If you think a question is not applicable, write a short explanatory comment to that effect.

PART 1

1. Please indicate your gender.

Male ()

Female ()

2. How often do you learn Art and Design using the computer?

Always ()

Frequently ()

Sometimes ()

Rarely ()

Never ()

3. Name the skills or areas in Art and Design where your teacher uses the computer in teaching.

.....

4. How many computers are used for Art and Design lessons in your school?

.....

5. List the benefits of learning Art and Design using the computer if any.

.....

6. What problems do you experience while learning Art and Design using CBI?

.....

PART II

Read each statement and indicate the extent to which you agree or disagree with it by ticking:

SA (Strongly Agree), A (Agree), U (Undecided), D (Disagree) or SD (Strongly Disagree).

	SA	A	U	D	SD
Art and Design is an interesting subject					
Graphics is my favourite area in Art and Design.					
Art and Design is a useful subject for my future career.					
Graphics is the most difficult area in Art and Design.					
I would have opted to take graphics at KCSE if we were taught using the computer.					
We learn Art and Design especially graphics using the computer.					
Although we have computers in our school we never use them to learn Art and Design.					
Art and design especially graphics is enjoyable when we learn through traditional methods.					

My performance improved when we were taught and produced graphics using both the computer and traditional methods.					
I performed better when we learned graphics using the computer.					
Our performance in art and design especially in the area of graphics is always good although we never use the computer.					

Thank You.

APPENDIX IX

SCHEME OF WORK FOR CM CONTROL GROUP

TOPIC: GRAPHIC DESIGN

Week	Lesson	Subtopic	Objectives	Learning activities	Resources	Reference	Remarks
1	1 & prep	ADPT 1	At the end of the test, the learner should be able to answer questions & make a graphic product.	Answering questions creating a graphics product	Test	KCSE past papers	
	2&3	Elements & Principles art and design	At the end of the lesson, the learner should be able to:- -Use elements and principles of art and design appropriately -Solve graphic problems by planning and executing	Sketching, drawing,composing, illustrating, types, layout, formatting & Colour application	Paper, pencils, rulers, rubbers, pen ink, cartridges, geometric instruments, paint,water brushes & palettes	Mazrui, E.C.O. (1994) A revision course in Art and design.	
	4	Illustrations Layout	At the end of the lesson, the learner should be able to:- -Solve graphic problems by planning and executing.	Drawing, composing,illustrating, lettering, formatting, colour application	Pencils, geometric instruments, paints,brushes, palettes,water, rugs.	KNEC (2012) Regulations for the K.C.S.E. Digolo,O.O.& Mazrui-Orchardson, E. C.(1995) Art & design for form 3 & 4.	

2	1	<ul style="list-style-type: none"> -Elements & principles of design. -Layout types, symmetry, assymetry, radial. 	<p>At the end of the lesson, the learner should be able to:-</p> <ul style="list-style-type: none"> -Explain the role of elements & principles of design. -plan & execute. -Describe types of layout. -Solve graphic problems. appropriately. 	<ul style="list-style-type: none"> -Define graphic design -Discuss role of design in society. -Take Notes. 	<p>Visual aids on balance.</p> <p>Types,layout, formats.</p>	<p>Art &Design Course book for form 2 (K.I.E.)</p> <p>Mazrui, E.C.O. (1994) A revision Course in art & design for secondary schools.</p>	
	2&3	<p>Illustrations</p> <p>Definition,</p> <p>Types,</p> <p>textual/ pictorial.</p> <p>Techniques of making graphic design</p> <p>Role of colour.</p>	<p>At the end of the lesson, the learner should be able to:-</p> <ul style="list-style-type: none"> -Explain role of illustrations. -State types, role and methods creating illustrations. - Use colour appropriately. 	<ul style="list-style-type: none"> -Discussion -Note taking -Make simple illustrations. - Use colour to create simple illustrations 	<p>Pencils, rubbers, rulers, paints, brushes,inks, cartridges, caligraphic pen,papa, water.</p>	<p>Art & design course work book for form 2 (K.I.E.)</p> <p>Revision Course book E. O. Mazrui</p>	
	4	<p>Typography</p> <p>Characteristics of letter-forms.</p>	<p>At the end of the lesson, the learner should be able to:-</p> <ul style="list-style-type: none"> -learn basics of lettering. -construct letters uniformly. -use relevant letters to communicate. 	<ul style="list-style-type: none"> -Discussion Demonstration on different letter types. -Construction of types. 	<p>Pencils, rubbers, rulers, paints, brushes,inks, cartridges, caligraphic pen,paper, water.</p>	<p>K.I.E. Art & design course book for form 2 (2008)</p> <p>Mazrui E.O. (1996)</p> <p>Revision course book Digolo O.O.& E.O. Mazrui (1995) Art and Design for form 2&3.</p>	

3	1	Graphic Illustrations & Typography	At the end of the lesson, the learner should be able to:- -Make illustrations. -Harmonise illustrations with letters.	Discussions Practically creating a graphic illustration.	paints, brushes, inks, cartridges, calligraphic pen, paper, water.	K.I.E. Art & design course book for form 2 (2008) Mazrui E.O. (1996) Revision course book	
	2&3	Graphic Illustrations, Typography & Colour application.	At the end of the lesson, the learner should be able to:- -make illustrations appropriately. -relate letters to illustrations. - choose & apply colours.	Solving problems in graphics.	Calligraphic pens, ink, paint, brushes, water, sponge.	K.I.E. Art & design course book for form 2 (2008) Mazrui E.O. (1996) Revision course book.	
4	4	ADPT 2	At the end of the lesson, the learner should be able to answer all questions & produce a graphic design.	Answer questions & execute graphic skills.	Writing materials, drawing & colouring tools.	Question Paper	
	1 & prep	ADPT 1	At the end of the test, the learner should be able to answer all the questions & make a graphic product.	Answering questions creating a graphics product using freehand.	paint brushes, calligraphic pen, ink.	Past KCSE Papers.	
	2&3	Elements & Principles of art and design	At the end of the lesson, the learner should be able to:- -Use elements and principles of art and design appropriately -Solve graphic problems by planning and executing	Discussion Question/answer Teacher demonstration. Using elements & principles to make graphic designs.	Sketching, drawing, composing, illustrating, types, layout, formatting & Colour application	Mazrui, E.C.O. (1994) A revision course in Art and design.	

	4	Illustrations and Typography.	At the end of the lesson, the learner should be able to:- -Make illustrations using freehand - Create typography using calligraphic pen. -use typography & illustrations creatively to make appropriate compositions.	Using	paper paints palettes brushes calligraphy pen ink sponge rugs water	Jonassen,D.,Peck,K.L.,& Wilson,B.G. (1999). Learning with technology: A Constructive perspective. Upper Sandle River,NJ:Prentice Hall.	
6	1	Graphic lettering.	At the end of the lesson, the learner should be able to:- -produce 2D/3D implied letters successfully for any graphic product. -relate illustrations, letters & colours to a given theme.		Charts	G. Talabi (1979) Art teaching in African schools.	
	2&3	Illustrations, typography	At the end of the lesson, the learner should be able to:- -Use free hand to illustrate -Use letters correctly to create an attractive graphic piece.	Creating graphic design	Free hand	San Jose, C. (1996) Post experimental phases IT across the curriculum projects,	
	4	Illustrations Typography	At the end of the lesson, the learner should be able to:- -Create illustrations using free hand to solve graphic problems.	Discussions, teacher demonstrations. Question & answer.	Calligraphic pen, paper, brushes pencil rubber paint,water .	Digolo O.O.& E.O. Mazrui (1995) Art and Design for form 2&3.	

			- use a calligraphic pen & ink to create an appealing graphic piece.				
7	1	Logo design	At the end of the lesson, the learner should be able to:- -Use correct format,layout & typography. - create a relevant Logo.	Discussion Problem solving using the computer & printer.	Paints, inks brushes Paper, pencils Rubber	Mazrui, E.C.O.(1994) Arevision Course in art and design for secondary schools. Nairobi: East African Educational Publishers.	
	2&3	Graphic Illustrations, Typography &Colour application.	At the end of the lesson, the learner should be able to:- -make illustrations appropriately. -relate letters to illustrations. - choose & apply colours.	Solving problems in graphics.	Caligraphic pens, ink, paint, brushes, water, sponge.	K.I.E. Art & design course book for form 2 (2008) Mazrui E.O.(1996) Revision course book.	
8	4	ADPT 2	At the end of the lesson, the learner should be able to answer all questions	Answer questions	Art materials.	KCSE Past Papers	

APPENDIX X

SCHEME OF WORK FOR CBI EXPERIMENTAL GROUP

TOPIC: GRAPHIC DESIGN

Week	Lesson	Subtopic	Objectives	Learning activities	Resources	Reference	Remarks
1	1 & prep	ADPT 1	At the end of the test, the learner should be able to answer questions & make a graphic product.	Answering questions and making a graphics product.	Test	K.C.S.E. past papers	
	2&3	Illustrations Typography	At the end of the lesson the learner should be able to:- - make simple illustrations using the computer adope illustrator programs. -Create typography using the computer.	Discussion Question/answer Method Using computer to create graphic product.	Computer, hardware, software, paper & printer.	Jonassen,D.,Peck,K.L.,& Wilson,B.G.(1999). Learning with technology: A Constructive perspective. Upper Sandle River,NJ:Prentice Hall.	
	4	Illustrations, typography Colour choise /application.	At the end of the lesson, the learner should be able to:- -Use computer photoshop -Use AutoCAD & other programmes to produce graphics work.	Class Discussion Teacher demonstration. Using the computer to make graphics work.	Computer hardware /soft wa Computer printer.	Talabi, G. (1979) Art teaching in African schools. Wheeler, S.(2001) ICT& the changing role of the teacher.	
2	1	Illustrations Typography Colour application.	At the end of the lesson, the learner should be able to:- -Use AutoCAD to solve graphics problems.	Teacher demonstration. Using computer	Downloaded example.	Wheeler, S.(2001) ICT& the changing role of the teacher.	

			-Create graphic illustrations.				
	2&3	Illustrations/ Use photoshop	At the end of the lesson, the learner should be able to:- Use photoshop Make appropriate illustrations	Discussions Teacher demonstration.	Downloaded examples	Sharma, R.(2003) Barriers in using technology for education.	
	4	Book Cover design practical.	At the end of the lesson, the learner should be able to:- -use correct format, layout & lettering. - create an attractive book cover.	Discussions Using computer Teacher's guidance.	Computer , paper & print	San Jose, C. (1996) Post experimental phasesof IT across the curriculum projects,	
3	1	Book Cover design	At the end of the lesson, the learner should be able to:- -use correct format, layout & lettering. -Use colour appropriately. - make printouts.	Discussion Answering Questions Using computer	Computer hardware/soft are,printer& paper,	Mazrui, E.C.O.(1994) Arevision Course in art and design for secondary schools.Nairobi:East African Educational Publishers.	
	2&3	Logo design	At the end of the lesson, the learner should be able to:- -Use correct format,layout & typography. - create a relevant Logo.	Discussion Problem-solving using the computer & printer.	Computer hardware/ software, paper & printer.	Mazrui, E.C.O.(1994) Arevision Course in art and design for secondary schools.Nairobi:East African Educational Publishers.	
	4	ADPT 2	At the end of the lesson, the learner should be able to:- -answer all questions -Create a graphic product.	Answer questions Create graphic product.	Computer hardware /softwa re&printer.	Question Paper	

5	1 & prep	ADPT 1	At the end of the test, the learner should be able to answer all the questions & make a graphic product.	Answering questions & creating a graphics product using the computer	Computer hardware/ software, printer paint brushes, cligraphic pen,ink.	Past KCSE Papers.	
	2&3	Elements & Principles of art and design	At the end of the lesson, the learner should be able to:- -Use elements and principles of art and design appropriately -Solve graphic problems by planning and executing	Discussion Question/answer Teacher demonstration. Using elements & principles to make graphic designs.	Sketching, drawing, composing, illustrating, types,layout, formatting& Colour application	Mazrui, E.C.O. (1994) A revision course in Art and design.	
	4	Illustrations and Typography	At the end of the lesson, the learner should be able to:- -Make illustrations using computer adope illustrator programme. - Create typography using the computer. -use typography & illustrationscreatively to make appropriate compositions.	Using computer to create graphic product.	Computer hardware, software, paper & printer	Jonassen,D.,Peck,K.L., & Wilson,B.G.(1999). Learning with technology: A Constructive perspective. Upper Sandle River,NJ:Prentice Hall.	

6	1	Graphic lettering.	At the end of the lesson, the learner should be able to:- -produce 2D/3D implied letters successfully for any graphic product. -relate illustrations, letters & colours to a given theme.		Computer hardware & software	G. Talabi (1979) Art teaching in African schools.	
	2&3	Illustrations, typography	At the end of the lesson, the learner should be able to:- -Use a computer photoshop programme to illustrate -Use letters correctly to create an attractive graphic piece.	Computer hardware/software, paper, printer	Computer, paper printer.	San Jose, C. (1996) Post experimental phases of IT across the curriculum projects,	
	4	Illustrations Typography	At the end of the lesson, the learner should be able to:- -Create illustrations using the computer to solve graphic problems. - use a calligraphic pen & ink to create an appealing graphic piece.	Discussions, teacher demonstrations. Question & answer.	Calligraphic pen, paper, brushes, pencil, rubber, paint, water .	Digolo O.O.& E.O. Mazrui (1995) Art and Design for form 2&3.	
7	1	Logo design	At the end of the lesson, the learner should be able to:- -Use correct format,layout & typography. - create a relevant Logo.	Discussion Problem solving using the computer & printer.	Computer hardware/ software, paper & printer.	Mazrui, E.C.O.(1994) Arevision Course in art and design for secondary schools.Nairobi:East African Educational Publishers.	

	2&3	Graphic Illustrations, Typography & Colour application.	At the end of the lesson, the learner should be able to:- -make illustrations appropriately. -relate letters to illustrations. - choose & apply colours.	Solving problems in graphics.	Computer soft ware	K.I.E. Art & design course book for form 2 (2008) Mazrui E.O. (1996) Revision course book.	
8	4	ADPT 2	At the end of the lesson, the learner should be able to answer all questions	Answer questions	Art materials.	KCSE Past Papers	

APPENDIX XI

SCHEME OF WORK FOR CMI EXPERIMENTAL GROUP

TOPIC: GRAPHIC DESIGN

Week	Lesson	Subtopic	Objectives	Learning activities	Resources	Reference	Remarks
1	1 & prep	ADPT 1	At the end of the test, the learner should be able to answer all the questions & make a graphic product.	Answering questions & creating a graphics product using both the computer & freehand.	Computer hardware/software, printer paint brushes,cligraphic pen,ink.	Past KCSE Papers.	
	2&3	Elements & Principles of and design	At the end of the lesson, the learner should be able to:- -Use elements and principles of art and design appropriately -Solve graphic problems by planning and executing	Discussion Question/answer Teacher demonstration. Using elements & principles to make graphic designs.	Sketching, drawing, composing, illustrating, types,layout, formatting & Colour application	Mazrui, E.C.O. (1994) A revision course in Art and design.	

	4	Illustrations and Typography.	At the end of the lesson, the learner should be able to:- -Make illustrations using computer adope illustrator programme. - Create typography using the computer. -use typography & illustrationscreatively to make appropriate compositions.	Using computer to create graphic product.	Computer hardware, software, paper & printer	Jonassen,D., Peck,K.L.,& Wilson,B.G. (1999). Learning with technology: A Constructive perspective. Upper Sandle River,NJ: Prentice Hall.	
2	1	Graphic lettering.	At the end of the lesson, the learner should be able to:- -produce 2D/3D implied letters successfully for any graphic product. -relate illustrations, letters colours to a given theme.		Computer hardware & software	G. Talabi (1979) Art teaching in African schools.	
	2&3	Illustrations, typography	At the end of the lesson, the learner should be able to:- -Use a computer photoshop programme to illustrate -Use letters correctly to create an attractive graphic piece	Computer hardware/software, paper, printer	Computer, paper printer.	San Jose, C. (1996) Post experimental phasesof IT across the curriculum projects,	

	4	Illustrations Typography	At the end of the lesson, the learner should be able to:- -Create illustrations using free hand to solve graphic problems. - use a calligraphic pen & ink to create an appealing graphic piece.	Discussions, teacher demonstrations. Question & answer.	Calligraphic pen,paper, brushes,pencil rubber paint,water.	Digolo O.O.& E.O.Mazrui (1995) Art and Design for form 2&3.	
3	1	Logo design	At the end of the lesson, the learner should be able to:- -Use correct format,layout typography. - create a relevant Logo.	Discussion Problem-solving using the computer & printer.	Computer hardware/software, paper & printer.	Mazrui, E.C.O.(1994) Arevision Course in art and design for secondary schools.Nairobi: East African Educational Publishers.	
	2&3	Graphic Illustrations, Typography &Colour application.	At the end of the lesson, the learner should be able to:- -make illustrations appropriately. -relate letters to illustrations - choose & apply colours.	Solving problems in graphics.	Calligraphic pens, ink, paint, brushes, water, sponge.	K.I.E. Art & design course book for form 2 (2008) Mazrui E.O. (1996) Revision course book.	

4		Design a logo of a milk packing company	At the end of the lesson, the learner should be able to answer all questions	Answer questions	Art materials.	KCSE Past Papers	
5	1 & prep	ADPT 1	At the end of the test, the learner should be able to answer all the questions & make a graphic product.	Answering questions & creating a graphics product using both the computer & freehand.	Computer hardware/software, printer paint brushes,cligraphic pen,ink.	Past KCSE Papers.	
	2&3	Elements & Principles of art and design	At the end of the lesson, the learner should be able to -Use elements and principle of art and design appropriately -Solve graphic problems by planning and executing	Discussion Question/answer Teacher demonstration. Using elements & principles to make graphic designs.	Sketching, drawing, composing, illustrating, types,layout, formatting & Colour application	Mazrui, E.C.O. (1994) A revisio course in Art and design.	
	4	Illustrations and Typography.	At the end of the lesson, the learner should be able to:- -Make illustrations using computer adope illustrator programme. - Create typography using the computer. -use typography & illustrationscreatively to make appropriate compositions.	Using computer to create graphic product.	Computer hardware, soft ware, paper & printer	Jonassen,D., Peck,K.L.,& Wilson,B.G. (1999). Learning with technology: A Constructive perspective. Upper Sandle River,NJ: Prentice Hall.	

6	1	Graphic lettering.	At the end of the lesson, the learner should be able to:- -produce 2D/3D implied letters successfully for any graphic product. -relate illustrations, letters & colours to a given theme.		Computer hardware & software	G. Talabi (1979) Art teaching in African schools.	
	2&3	Illustrations, typography	At the end of the lesson, the learner should be able to:- -Use a computer photoshop programme to illustrate -Use letters correctly to create an attractive graphic piece.	Computer hardware/software, paper, printer	Computer, paper printer.	San Jose, C. (1996) Post experimental phases of IT across the curriculum projects,	
	4	Illustrations Typography	At the end of the lesson, the learner should be able to:- -Create illustrations using free hand to solve graphic problems. - use a calligraphic pen & ink to create an appealing graphic piece.	Discussions, teacher demonstrations. Question & answer.	Calligraphic pen, paper, brushes, pencil, rubber, paint, water .	Digolo O.O. & E.O. Mazrui (1995) Art and Design for form 2&3.	

7	1	Logo design	At the end of the lesson, the learner should be able to:- -Use correct format,layout & typography. - create a relevant Logo.	Discussion Problem solving using the computer & printer.	Computer hardware/software, per & printer.	Mazrui, E.C.O.(1994) Arevision Course in art and design for secondary schools. Nairobi:East African Educational Publishers.	
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8	4	ADPT 2	At the end of the lesson, the learner should be able to answer all questions	Answer questions	Art materials.	KCSE Past Papers	

APPENDIX XII

PERMISSION LETTER FOR CONDUCTING RESEARCH

Gladys Wanjiru Kinyua
University of Nairobi
Faculty of Education
Educ. Com. & Technology Dept.
P. O. Box 30197
NAIROBI.

The Principal
(School's Name)
P. O. BOX
Dear Sir/Madam,

RE: VISIT FOR RESEARCH ACTIVITY IN YOUR SCHOOL

I am a Doctor of philosophy student at University of Nairobi, Faculty of Education, Department of Educational Communication and Technology. I wish to use form two students who have selected Art and Design in your school to conduct a study on the Effect of Computer based Instruction on learners' performance in Art and Design in Public Secondary Schools in Kenya. The purpose of the study is mainly to gather data for research. The results of the experiment will strictly be used to report for the study of my PhD thesis and will not be in any way used otherwise.

Thank you in advance.

Yours faithfully

Gladys Wanjiru Kinyua.

APPENDIX XIII

Summary of the paired sample t-test

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	CM g1 (Pre-test) - (Post-test)	-.840	3.300	.660	-2.202	.522	-1.273	24	.215
Pair 2	CM g2 (Pre-test) - (Post-test)	-.800	2.784	.557	-1.949	.349	-1.437	24	.164
Pair 3	CM g3 (Pre-test) - (Post-test)	-.360	1.440	.288	-.954	.234	-1.250	24	.223
Pair 4	CMI b1 (Pre-test) - (Post-test)	-11.920	5.098	1.020	-14.025	-9.815	-11.690	24	.000
Pair 5	CMI b3 (Pre-test) - (Post-test)	-6.480	4.806	.961	-8.464	-4.496	-6.742	24	.000
Pair 6	CMI b2 (Pre-test) - (Post-test)	-8.880	4.613	.923	-10.784	-6.976	-9.626	24	.000
Pair 7	CMI g2 (Pre-test) - (Post-test)	-2.280	3.646	.729	-3.785	-.775	-3.127	24	.005
Pair 8	CMI g3 (Pre-test) - (Post-test)	-5.800	4.320	.864	-7.583	-4.017	-6.712	24	.000
Pair 9	CMI g1 (Pre-test) - (Post-test)	-3.800	2.614	.523	-4.879	-2.721	-7.268	24	.000
Pair 10	CM b3 (Pre-test) - (Post-test)	.720	2.807	.561	-.438	1.878	1.283	24	.212

Pair 11	CM b2 (Pre-test) (Post-test)	- 1.040 -	2.791	.558	-2.192	.112	-1.863	24	.075
Pair 12	CM b1 (Pre-test) (Post-test)	-.120 -	4.304	.861	-1.897	1.657	-.139	24	.890
Pair 13	CBI b2 (Pre-test) (Post-test)	- 8.640 -	4.609	.922	-10.542	-6.738	-9.374	24	.000
Pair 14	CBI b1 (Pre-test) (Post-test)	- 12.12 0	4.216	.843	-13.860	-10.380	-14.373	24	.000
Pair 15	CBI b3 (Pre-test) (Post-test)	- 3.080 -	4.966	.993	-5.130	-1.030	-3.101	24	.005
Pair 16	CBI g2 (Pre-test) (Post-test)	- 3.280 -	3.577	.715	-4.756	-1.804	-4.585	24	.000
Pair 17	CBI g3 (Pre-test) (Post-test)	- 3.040 -	5.135	1.027	-5.160	-.920	-2.960	24	.007
Pair 18	CBI g1 (Pre-test) (Post-test)	- 6.880 -	4.409	.882	-8.700	-5.060	-7.801	24	.000

APPENDIX XIV

Research Permit

**THIS IS TO CERTIFY THAT:
MS. GLADYS WANJIRU, KINYUA
of UNIVERSITY OF NAIROBI, 104-511
Ongata Rongai, has been permitted to
conduct research in Kakamega,
Kiambu, Kirinyaga, Kwale, Machakos,
Muranga, Nairobi, Nakuru, Nyeri
Vihiga Counties.**

**on the topic: EFFECTS OF COMPUTER
BASED INSTRUCTION ON LEARNERS'
PERFORMANCE IN ART AND DESIGN IN
PUBLIC SECONDARY SCHOOLS IN KENYA**

**for the period ending:
31st August, 2016**

**Applicant's
Signature**

CONDITIONS

- 1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit**
- 2. Government Officers will not be interviewed without prior appointment.**
- 3. No questionnaire will be used unless it has been approved.**
- 4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.**
- 5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.**
- 6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.**

**Permit No : NACOSTI/P/15/8108/7110
Date Of Issue: 30th July, 2015
Fee Received : Ksh. 2000**



Director General

**National Commission for Science
Technology & Innovation**



REPUBLIC OF KENYA



**National Commission for Science
Technology and Innovation**

**RESEARCH CLEARANCE
PERMIT**

Serial No. A 6005

APPENDIX XV

Research Authorization



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref: No.

Date:

30th July, 2015

NACOSTI/P/15/8108/7110


Gladys Wanjiru Kinyua
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *"Effects of computer based instruction on learners' performance in art and design in public secondary schools in Kenya,"* I am pleased to inform you that you have been authorized to undertake research in selected Counties for a period ending 31st August, 2016.

You are advised to report to the County Commissioners and the County Directors of Education of the selected Counties before embarking on the research project.

On completion of the research, you are expected to submit two hard copies and one soft copy in pdf of the research report/thesis to our office.


DR. S. K. LANGAT, OGW
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioners
Selected Counties.

The County Directors of Education
Selected Counties.