

COMPUTER BASED INSTRUCTION AND LEARNER ACHIEVEMENT; IMPLICATIONS FOR TRAINING ART AND DESIGN IN KENYA'S SECONDARY SCHOOLS

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ABSTRACT

This study set to investigate the extent to which computer based instruction could improve learner's performance in Art and Design in Kenya's secondary schools. The study design was quasi-experimental. 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 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 instructed using computer based instructional approach. Control group comprised three boys' and three girls' schools both instructed using traditional methods of instruction. The study tools were pre-test and post-test exams. Data were analyzed using statistical Package for Social Scientist version 22. The study found that learners who were taught graphics in Art and Design using computer based approaches showed improved performance as compared to those taught through traditional methods. The study recommend strong support at the national level towards systematic planning for the use of technology in the schools through improving facilities, equipment and training of the Art and Design teachers to gain computer skills.

Keywords: Computer Based Instruction, Learner achievement, Traditional Methods of Instruction, Performance Test.

INTRODUCTION

There is an increasingly global realization of the benefits of technological development in all areas of life including Education. For such, 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. He indicated 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. They believe 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.

The government of Kenya identified education as a vehicle to facilitate economic development and cater for the growing population whereby 70% consists of the youth (Vision 2030; Sessional Paper in Education 2005). This is due to the realization 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).

The inception of ICT Policy (2006) has speeded up significant growth and improved use of ICT in an effort to make Kenya an industrialized 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 industrialize Kenya should be given to all citizens, and especially the youth who may have a variety of talents. 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 and Day, 2004; Farrell and 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).

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. She observed 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. Various factors have been identified as hindrances to the use of computers in schools. According to Achuonye (2011), such include 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 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 realize 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, Super Paint, Corel Draw, Photo Shop, Auto CAD, Page Maker and Designer studio (Bhattacharya and Sharma 2007, Sanyal 2001 and Sharma, 2003).

Odera (2011) supports use of CBI as she 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.

Statement of the Problem

There has been a continuous decline in learners' performance in Art and Design in the last five years in the Kenya Certificate of Secondary Education (KCSE). The year 2014 recorded a drastic drop in the mean score, from 127.61 in 2012 to 106.14 in 2014, a drop of 21.47 in two years. Consequently, 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 & 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 perform poorly 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 selected by very few candidates and is also poorly performed at KCSE throughout the past ten years (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. This opinion is expressed by Wagah, Okwara and Awino (2013) as they argue that teachers should be inventive in their classroom instruction. 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). 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.

PURPOSE AND OBJECTIVES 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. Specifically, the study aimed at establishing whether there is a difference in the performance of learners who were taught Art and Design using CBI and those who were taught using TMI. Based on the objectives, the study operated on a null hypothesis which stated that; 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 TMI.

LITERATURE REVIEW

Benefits of Art and Design in Society

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. 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 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 (Adams, 2014).

The social role played by Art and Design is highlighted by Dissanayake,(2015) as he asserts that the subject serves specific functional roles during festivals, rituals and ceremonies. Johnson (2016) 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 (Vision 2030, 2007). 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). Hetland (2013) points out that Art and Design education can develop creativity and critical thinking skills, thus giving a holistic education to a learner. Similarly, Glenn (2011) observes that the arts have played a significant part in world societies throughout history and that 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. According to Glenn (2011) art education enhances the development of an individual's personality and strengthens social cohesion.

CBI and Learner achievement in Art and Design

Computer Based Instruction (CBI) has the potential of improving learner achievement. A study conducted by 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, nonrandomized, 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 categorized 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. 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 learner's performance in the subject. Nonetheless, Art educators will continually be confronted with the challenge of integrating new technology into Art and Design curriculum. Nyah (2014) contended that various instructional methods and approaches are used by teachers to make the subject matter clearer and better understood by the learners. The question is; how are the Art and Design teachers meeting these challenges and how are they using new technology to improve learners' performance?

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. She purports that computers have been found useful in various subjects namely mathematics, sciences, English language, social studies and graphics. She further suggests 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. Her suggestion is emphasized by Heinich, Molenda and Russel (2002) who pointed out 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 color 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 analyzed 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, color 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.

Use of CBI in Teaching Art and Design

Several computer based applications can be used to achieve instructional goals of Art and Design. Such may include use of Microsoft Publisher, Adobe and Photoshop. 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 program 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 program 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. The application allows students to create a number of professional looking documents. The program 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.

Adobe illustrator is a vector graphics editor developed and marketed by Adobe Systems. The application can be used 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. It can also be used 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 editions 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. The images created by adobe illustrator 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. The application 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-color a particular subject thus turning it into a work of art that looks as though you drew it freehand.

Adobe Photoshop is a raster graphics editor developed and published by Adobe Systems for windows. A raster graphics editor is a computer program 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 program the capabilities may be extended by use of plug-in software. Adobe Photoshop specializes in the editing of (digital) photographs. It can edit and compose raster images in multiple layers and support mask, alpha compositing and several color 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 program 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 program is used as a tool for enabling students to create valuable artwork.

Use of Lecture Method in Teaching Art and Design

The lecture method is often considered traditional 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 criticized 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 & Alumande 2008). 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.

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. (Cooper, 1998). The main idea in this theory is that cognitive capacity in working memory is limited, so that if 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. The theory has been applied with considerable success in the field of computers learning (Mayer, 2001 and Moreno, 2000). A series of studies have found that individual working memory performance correlates

with cognitive abilities and academic achievement (Yuan, 2006). The 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 Pavio (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 programs that were used in this study took advantage of this possibility as they consisted of both visual and verbal media.

Conceptual Framework

Figure 1 presents the Conceptual framework of the study, which diagrammatically presents the hypothesized model identifying the variables under study, and their relationships.

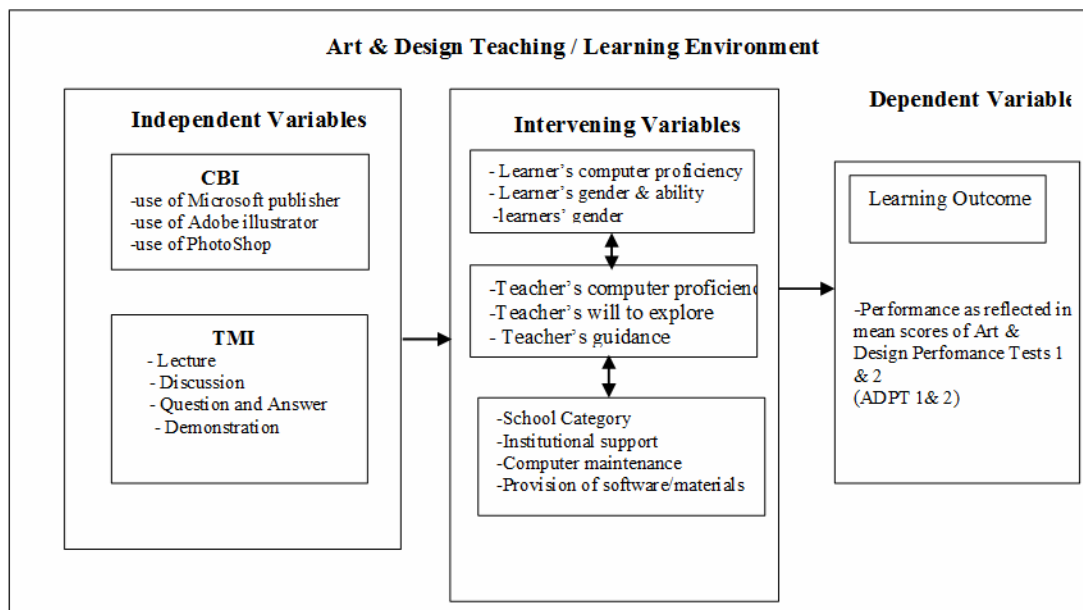


Figure 1: Conceptual Framework on the effect of Computer based Instruction on Learners' Performance

The dependent variable is learners' performance in Art and Design which is reflected in the learner's performance in ADPT 1 & 2 pre-test, and post-test scores. The independent variables are Computer Based Instruction (CBI) and Traditional Methods of Instruction (TMI). Extraneous variables which may affect the learner's performance are learner's ability, prior computer knowledge, teacher's computer proficiency and the nature of school.

METHODOLOGY

The study used quasi-experimental design of nonequivalent groups. Both the experimental and control exercises were carried out without disrupting the normal classroom arrangements. Regular teachers were used to teach their normal classes without the presence of the researcher. CBI formed the experimental groups and were taught using only computer based applications while TMI formed the control group. The nonequivalent groups, pre-test and post-test approaches were used to partially eliminate the initial differences between the experimental and control groups. 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. Both quantitative and qualitative data were collected from learners (ADPT 1 and ADPT 2 and Semi-Structured questionnaire). The target population comprised 1, 478 form two students who had selected Art and Design in the 47 Counties in Kenya. The study adopted purposive, stratified random and simple random sampling procedures. Along purposive sampling, stratified random and simple random sampling procedures were employed to select a sample of 18 public secondary schools, (9 for girls and 9 for boys) out of 133 secondary schools in Kenya which offer Art and Design at KCSE. 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. Data was analyzed using Statistical Package for Social Sciences (SPSS).

DATA ANALYSIS, PRESENTATION AND INTERPRETATION

The study set to find out whether statistically there was a difference in the Art and Design scores obtained by students who were taught using CBI and those who used TMI. The scores were a result of Art and Design Performance Tests (ADPT 1) given as pretest and ADPT 2 given as posttest after the expiry of the experiment period of eight weeks. This was as presented in Table 1 below

Table 1: Pretest and Posttest Mean Scores of CBI and TMI Groups

<i>Mode of Instructi</i>	<i>Pretest Mean</i>	<i>Standar d</i>	<i>Post Test Mean</i>	<i>Standar d</i>
CBI Boys	62.60	13.74	86.44	19.11
TMI Boys	58.48	10.80	58.92	11.65
CBI Girls	84.00	14.61	92.20	14.22
TMI Girls	62.72	7.65	64.72	9.36

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 TMI had 58.48 in pretest and 58.92 in posttest 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 TMI had 62.72 in pretest and 64.72 in posttest which is not a notable difference. The observation is that the learners who used TMI made very minimal improvement in their performance. The researcher had met the Art and Design teachers during second term before they ordered for examination materials for KCSE. The teachers could have placed their orders with the experiment in mind and may have requested for more materials. 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 practiced more and therefore benefited 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 learner's 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, nonrandomized, 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 categorized 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.

The study also needed to check on whether statistically there was a significant difference in posttest mean scores of learners who had been taught using CBI and those who were taught using TMI. To do this the data was further analyzed by use of t-test. The t-test was found appropriate because only two sets of data were compared. Table 2 presents the results of the two groups. The hypothesis on testing if there was a significant difference on learner's performance after they were taught using Computer based Instruction (CBI) and traditional methods of teaching (TMI) 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 TMI.

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 (TMI) learners who were taught using traditional methods of instruction. The results are shown on Table 2.

Table 2 : t-test of Learners Taught using CBI and TMI

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

Table 2 showed the comparison of posttest mean scores of the learners exposed to computer based instruction (CBI) and the learners exposed to traditional methods of instruction (TMI). The calculated mean when CBI and TMI 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 TMI. This implies that the learners who

were taught using (CBI) computer based instruction performed better than the learners taught using (TMI) traditional methods of instruction.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The study found significant differences in learner achievement in posttest mean scores after they were taught using CBI and TMI. Learners taught using CBI had higher mean scores than those who were taught using TMI implying that CBI is a more effective method in teaching Art and Design in secondary schools in Kenya. If learners' performance improved after learning using computer based instruction for only eight weeks, then if this method is 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 schools' 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.

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

- a) 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.
- b) 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.
- c) The Ministry of Education Science and technology should support availability and maintenance of computers in public secondary schools in Kenya.
- d) The Kenya Institute of Curriculum Development (KICD) should organize in-service and pre-service courses for secondary school teachers regularly to equip them with computer skills.
- e) The Kenya National Examination Council should set alternative questions that can be done using the computer especially in graphics.

Authors' contributions

GWK designed the study, researched prior literature, performed inductive coding, and contributed and edited the manuscript. SOM assisted in the design of the study, researched prior literature, performed inductive coding and performed the statistical analyses. RM Drafted and edited the manuscript. All authors read and approved the final manuscript.

Competing interests

The authors declare they have no competing interests

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