

EFFECT OF MULTIMEDIA INSTRUCTIONAL METHOD ON TECHNICAL COLLEGE STUDENTS ACHIEVEMENT IN TECHNICAL DRAWING

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Abstract

The problem of poor achievement of students in Technical Drawing in external examinations has been a matter of concern to the nation. As part of the contribution to arrest the situation, this study was designed to determine the effect of multimedia projection on technical college students achievement in technical drawing. To carry out the study, two research questions and two null hypotheses were formulated. Design for the study is a quasi-experimental non-equivalent control group pre-test and post-test design. The study was carried out in four technical colleges in Niger State. Sample for the study consisted of 160 (TC II) students from four randomly selected schools. Data for the study were collected through one research developed instruments: Technical Drawing Achievement Test (TDAT). Four intact classes of 40 students each were assigned to experimental group and control group. The experimental group were exposed to multimedia and control group were taught with lecture method of teaching respectively. Data for the study were analyzed using mean, standard deviation and analysis of covariance (ANCOVA) statistics. The null hypotheses were tested at 0.05 level of significance. Findings of the study revealed that multimedia method of teaching enhanced students' achievement in Technical Drawing more than lecture method. The study also revealed that there was no significant difference in the achievement of male and female students in Technical Drawing. Recommendations were made based on the findings.

Keywords: Technical Drawing, Multimedia, Technical College, Achievement

Introduction

Technical Drawing is one of the core subjects in technical school curricula. This justifies the important of Technical Drawing as being essential in the national development. Technical Drawing is the language used to express functional ideas of arts and science, technology. The importance of Technical Drawing in our day-to-day activities such as building construction, tailoring industry, etc cannot be over emphasized. In fact, anything that has to do with contraction is express in Drawing. Abd-El-Aziz & Hassan (2017), Chea (2016), DES (2014) asserted that Technical Drawing do not only serve as a foundation for technological advancement, but also serve as useful tool in the management of life affair. Technical Drawing was therefore developed as a mean for solving the quantitative problems that arise in our rapidly changing and expanding society.

It has been stated that the conventional/traditional method of teaching promotes learning, where the teacher is the only custodian of what is being learnt using chalk and board without multimedia while

multimedia promotes all the senses of hearing, seeing and doing. Multimedia, therefore, has a practical approach to teaching and learning and has a lot of advantages. Multimedia support education or training of people; that instructional multimedia are basically used in one or two ways; either they provide a straight forward presentation of data or they fill a tutorial role in which the student is tested on comprehension (Chang, 2003).

However, performance in Technical Drawing has not been encouraging. Several factors ranging from the abstract nature of the subject, the learners themselves, the teachers, curriculum, method of instruction and instructional materials, and the school environments have been identified through earlier studies (Hassan, Kareem & Bala, 2016) as contributing to poor achievements of the students in Technical Drawing. This situation of under achievement is unacceptable to the government, parents, Technical Drawing teachers and other stakeholders. In fact, attempts have been made by researchers in Technical Drawing to solve the problem of under achievement in school Technical Drawing. These attempts include concretization of learning, the use of multimedia instruction, curriculum reform to reflect the needs of the learners and the society at large (Abd-El-Aziz & Hassan, 2017). Multimedia as an electronic device has revealed new ways of looking at and solving problems. Some useful applications of multimedia are in the field of education, science, engineering, technology, agriculture. the introduction of multimedia in education has improved the quality of learning in schools, reduced the burden of workload on teachers, provides relevant data for research and allows individualized instruction. multimedia can be use as teaching tool through the installation of educational software such as AutoCAD, Pro-e, CAI, CBI, CAD, CAM. This provide bases for creative learning. Research has not adequately exhausted the use of multimedia in the teaching and learning of Technical Drawing. This study is an attempt to determine the impact of multimedia on technical college students achievement in technical drawing performance in Technical Drawing.

Statement of the Problem

Technical Drawing has to do with the study of activities that relate to science, technology and engineering. It is an applied science and a vocational subject offered at the technical colleges, secondary school level and tertiary. Despite, its rich content as stated in the curriculum, there are poor students' achievement in technical drawing.

The result of students of National Business and Technical Examination Board (NABTEB) as shown by Niger State Science and Technical School Board (NSSTSB) (2016), reveals that the academic achievement of students especially in Technical Drawing has reduced drastically. This may be due to the nature of teaching method adopted by teachers in teaching the subject such as lecture method, demonstration method which do not foster critical thinking & creative thinking.

Basically, teaching – learning process in Technical Drawing should be learner-centred because it is a practically oriented subject mandatory for students to engage in active practical activities. Technical Drawing is susceptible to change, and as society is changing rapidly in the 21st century new ways of thinking are required, especially critical and reflective thinking skills and metacognition. Research has shown that multimedia encourages critical and reflective thinking, which helps to motivate and promote academic achievement of students. Hence multimedia could be used to enhance students' academic achievement. The problem of the study therefore, is to determine its impact on Technical College students academic achievement in Technical Drawing

Purpose of the Study

The main purpose of this study was to determine the impact of multimedia instructional method on technical college students achievement in technical drawing. Specifically the study sought to determine:

1. The effect of multimedia on students' academic achievement in Technical Drawing.
2. The influence of gender on the academic achievement of Technical College students taught Technical Drawing with multimedia method.

Research Questions

The following research questions guided the study;

1. What is the effect of multimedia on achievement in Technical Drawing?
2. What is the mean achievement score of male and female students taught Technical Drawing using multimedia method?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

- H₀₁:** There is no significant difference in the mean achievement scores of students taught Technical Drawing with multimedia and those taught with conventional method.
- H₀₂:** There is no significant difference in the mean achievement scores of male and female students taught Technical Drawing with multimedia method.

Methodology

The design of the study is quasi experimental study. Specifically the study applied pre-test, post-test non-equivalent control group design. Quasi- experimental design is considered appropriate for the study because intact classes was used to avoid disruption of normal class lesson. The pre-test was used to identify initial difference in the two groups and to control selection bias which is a threat to initial validity.

The study was carried out in Niger State. The population for this study consisted of all the technical college two (TC II) students. The number of students was 2761 from the six technical colleges. The choice of TC II was because it is not examination class and teachers can co-operate with the researchers. Sample size for this study was 160 students using a multi-stage sampling technique. Out of the six technical colleges in the state, four (4) technical colleges were purposively selected. A total of four intact classes of 160 Technical Drawing students from the four schools participants in the study.

Out of the four intact classes of 160 students from four schools, two of the intact classes consisting of 80 students from two of the sampled schools were assigned to group I and were treated using multimedia teaching method while the other intact classes from different sampled schools were assigned to group II and were treated using lecture method respectively. Instrument used for data collection was Technical Drawing Achievement Test (TDAT)

The TDAT was based on two topics which were drawn from the technical college II scheme of work and taught to students.

The essence of the (TDAT) was to measure students' achievement in Technical Drawing after the application of multimedia to the experimental group. The TDAT is a 25 item multiple objective test, each question had four options, in which the students were expected to choose one out of the options which is the correct answer.

The TDAT was developed by first constructing a test blue print for the different content specified. The objective of the topics in TC II served as a guide for developing the questions. The items of the instrument were developed to cover lower order questions and higher order questions.

The researchers issued out instructional guides to the regular Technical Drawing teachers (research assistants) in sampled schools for both experimental group and control group in order to ensure that the instructional situation was the same for the four schools selected for the study. Teaching and testing were conducted in all the Technical Drawing classes of TC II in the various schools selected for the study and not just in the intact classes drawn.

The instrument (TDAT) was subjected to trial testing. The trial testing was carried out at Government Technical College, Shiroro which is within the study area. Trial testing was done on a group of 30 selected TC II students, the instrument was re-administered to the 30 students after 7 days (Test Re-test).

The internal consistency of the Technical Drawing Achievement Test (TDAT) which was determined using the Kuder-Richardson formula (K-R=20). An internal consistency of 0.73 was established for the TDAT.

Data for the study was collected through pre-and post tests using the TDAT. The pre-test was administered to the subjects before the treatment to measure the students' group equivalence and to provide the researchers with baseline data about the subject while post-test was administered to the students one week after the treatment. Data collected from the two-test (pre and post) after treatment was used for data analysis.

Mean and standard deviation was used to answer the research questions while Analysis of co-variance (ANCOVA) was used in testing the hypotheses at 0.05 level of significance.

Results

Research Question One

What is the effects of multimedia on students achievement in Technical Drawing?

Table 1: Pre-test and Post test Mean and standard deviation scores of students taught with multimedia and lecture method.

Methods	N	Pre-test		Post-test		Mean Gain
		Mean	Std.Dev	Mean	Std.Dev	
Multimedia	107	9.85	2.94	15.38	5.23	5.53
Lecture	81	11.14	2.96	10.85	4.86	0.29

The summary of result presented in table 1 shows the mean achievement score of students taught with multimedia and lecture method. Students in the multimedia had a mean score of 9.85 and standard deviation of 2.94 for pre-test while a mean score of 15.38 and standard deviation of 5.23 were obtained in their post-test. On the other hand, students in the lecture method recorded a mean of 11.14 and standard deviation of 2.96 in their pre-test and on the post-test they had a mean score of 10.85 and standard deviation of 4.86. Comparatively the achievement mean of students taught with multimedia is higher than those taught with lecture method. The mean gain score of multimedia group is higher than the lecture group which indicates that the multimedia group performed more than the lecturegroup.

Research Question Two

What is the mean achievement score of male and female students' taught Technical Drawing using multimedia?

Table 2: Pre-test and Post test mean and standard deviation scores of male and female students' taught with multimedia.

Gender	N	Pre-test		Post-test		Gain score
		Mean	SD	Mean	SD	
Female	59	10.22	2.83	15.90	5.01	5.68
Male	48	9.40	3.04	14.75	5.48	5.35

The data in table 2 show the effect of multimedia on male and female students' achievement in Technical Drawing. The male students had pre-test and post-test mean scores of 9.40 and 14.75 respectively and standard deviation of 3.04 and 5.48 respectively as opposed to their female counterparts who had pre-test and post-test mean scores of 10.22 and 15.90 with a corresponding standard deviation of 2.83 and 5.01 respectively. The female students had a higher achievement mean scores than the male students in their pre-test and post-test. The female students who were taught with multimedia had a gain score of 5.68 while their male students recorded a mean gain score of 5.35. The higher gain score in favour of female students shows that there is difference in the mean achievement score of male and female students in Technical Drawing.

Hypothesis One

There is no significant difference in the mean achievement score of students taught Technical Drawing with multimedia and those taught with lecture method

Hypothesis Two

There is no significant difference in the mean achievement scores of male and female students taught Technical Drawing with multimedia.

Table 3: Summary of ANCOVA for test of significance of the effect of treatment and gender on students achievement in Technical Drawing.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3739.715 ^a	5	747.943	68.118	.000
Intercept	896.942	1	896.942	81.688	.000
Pre test	283.964	1	283.964	25.862	.000
Gender	22.276	1	22.276	2.029	.156
Method	724.339	1	724.339	65.968	.000
method *	6.294	1	6.294	.573	.450
Error	1998.386182		10.980		
Total	39651.000188				
Corrected Total	5738.101187				

a. R Squared = .652 (Adjusted R Squared =.642)

Table 3 shows the significant difference in the mean achievement score of students exposed to multimedia and those taught with lecture method. The obtained value of $F(1,182) = 65.968$ is significant 0.000 for method main effect ($P < 0.05$), thus the null hypothesis is rejected and it was concluded that there is significant difference in the mean achievement score of students taught Technical Drawing using multimedia and those taught with conventional method.

Table 3 shows the achievement scores of male and female students exposed to multimedia. The obtained value of $F(1, 182) = 2.029$ is not significant at 0.156 for gender main effect ($P > 0.05$), thus the null hypothesis is accepted and the researcher concludes that there is no significant difference in the mean achievement score of male and female students exposed to multimedia.

Discussion of the Results

The findings of this study reveal that students that used multimedia performed better than the students in the conventional group. However, there is a significant difference in the mean achievement scores of students taught Technical Drawing using multimedia and conventional method. The trend of the high performance by the multimedia could be that the method helped the students to actively participate in the class (to do it themselves) and to discover new things through their priorknowledge.

It could have also encouraged the students to internalize what they have learnt. The findings of this study is in line with the finding of Akpotu and Okonta (2010), Bas and Beyhan (2010), Umar, Idris, Hassan and Ma'aji (2016) and DES (2014) who in their studies shows that multimedia improves students' achievement in sciences. And also this study agrees with the findings of Hassan, Okwori and Ojo (2016) who reported significant effect of treatment on students' achievement in an aspect of agriculture science.

The findings of this study revealed that female students performed better than the male students in Technical Drawing although; there is a slight mean difference in favour of the female students. A further analysis was carried out using analysis of covariance (ANCOVA) which indicates that gender has no influence on students' achievement in Technical Drawing; therefore, the observed difference in

favour of female students early identified may have occurred as a result of chance. The study has proven that gender does not influence students' achievement in Technical Drawing when taught with multimedia. This shows that multimedia is not gender biased in Technical Drawing.

Conclusion

Based on the findings of this study, the following conclusions were made:

- Students in the multimedia achieved higher than those in the conventional method
- Female students performed higher than male students' in Technical Drawing when taught using multimedia.

Recommendations

On the basis of the findings of this study, the following recommendations are made:

- Since multimedia has been found to improve students achievement in Technical Drawing, teachers should be encouraged to employ it more in the teaching of Technical Drawing.
- Technical Drawing teachers should not introduce gender discrepancies in the classroom. They should as much as possible eliminate contents, instructional techniques and materials that may bring about gender differences in the classroom.
- The curriculum planners should modify Technical Drawing curriculum to include the use of innovative teaching method like the multimedia in order to enhance the participation and achievement of students in Technical Drawing.
- The ministry of education in Nigeria should organize seminars, workshops and conferences for Technical Drawing teachers on how to use multimedia in teaching Technical Drawing.

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