IMPACT OF INTELLIGENT LEARNING ON STUDENTS' ACHIEVEMENT AND INTEREST IN TECHNICAL DRAWING IN NIGER STATE, NIGERIA

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Abstract: *The study investigated the impact of Intelligent learning on students' achievement and interest in in Technical drawing in Abuja and Niger State, Nigeria. Two research questions were raised and two hypotheses were formulated and tested at .05 level of significance. Pretest-posttest non-equivalent control group design of quasi experimental study was used for the study. The population for the study consisted of 428 National Technical College (NTC) II students. The sample size for this study consisted of 180 students, with 68 students in the experimental group and 112 students in the control group. Purposive sampling technique was used in selecting and assigning Government Technical College, Minna to the experimental group and Simple Random Sampling (SRS) technique was used in selecting and assigning MammanKontagora Technical College (MKTC), Pandogari to the control group. The instruments used for data collection were Technical Drawing Achievement Test (TDAT) andTechnical DrawingInterest Inventory (TDII). The instruments were validated by two experts from Federal University of Technology, Minna and one expert in test development unit, National Examination Council, Minna. The reliability coefficient of TDAT was found to be 0.77 using Pearson Product Moment Correlation coefficient and of TDII was found to be 0.79, using Cronbach's Alpha. Mean was used to answer the research questions; while ANCOVA was employed to test the hypotheses. Findings of the study revealed that Intelligent learning is more effective in improving student's achievement and stimulating student's interest in Technical drawing than conventional teaching method. It was therefore recommended that teachers, especially those teaching Technical drawing should adopt Intelligent learning to teach students at technical colleges.*

Keywords:*Technical drawing, Intelligent learning, Achievement, Interest*

Introduction

Technical drawing is a compulsory trade related subject for engineering and construction trades students in technical colleges in Nigeria. The subject is essentially a language by which technicians, engineers, craftsmen, and industrialist communicate. Apperson*et al.* (2016) defined technical drawing as a universal language that is understood by technicians and engineers all over the world. It is a pictorial language that depends mainly on lines for conveying the intended meaning. The importance of technical drawing cannot be over emphasized as it allows efficient communication among engineers and prospective engineers alike such communication can thus be kept as a record of the planning process. Gambari*et al.* (2018) noted that, there have been continual reports of low achievement in technical drawing amongst technical colleges students. Ogundola (2017) attributed the low achievement in technical drawing to the lack of innovative learning techniques such as Intelligent learning. Intelligent learning could be seen as a learner-centered learning system that provides easy access to learning sources and enhances interaction among learners and between learners and instructor and supports a self-directed learning environment. Li *et al.* (2015) defined Intelligent learning as an intelligent and personalized learning aimed to meet learners' diverse needs and learning styles. Koper (2014) maintained that, the core elements of Intelligent learning the corresponding equipment, tools, technology, media, textbooks, teachers, and students among others. These core elements should be organized according to constructivist learning theory, blended learning theory and modern teaching theory. Hwang (2014) noted that, Intelligent learning improve communication, thinking and problem-solving skills by integrating a new type of e-learning technologies with Intelligent devices. It makes it possible to create and provide a learning environment that is not content and technology-driven but knowledge and learner-driven that enhances learners' academic achievement.

Academic achievement therefore, implies performance in school subject as represented by a score on an achievement test. Oyetunde (2010) refers academic achievement to some methods of expressing a student's scholastic performance. This can be regarded as course or subject grade, an average for a group of subjects in a programme of study. According to Mbah (2002), achievement is dependent upon several factors amongst which are instructional techniques, the learning environment, motivation as well as interest. Agaba (2013) also confirmed that achievement in education is directly connected to students' interest. Interest is a persisting tendency to pay attention and enjoy some activities. It is viewed as emotionally concerned with behavioural trait which determines student's enthusiasm in undertaking educational programmes or other activities (Chukwu, 2002). According to Osuafor (2001), interest is that attraction which forces or compels a student to respond to a particular stimulus. Hidi& Anderson (2002) opined that interest is often tied directly to the content or instructional approach and it also enhances student's achievement. The use of Intelligent learning is important to provide rich atmosphere that will stimulate the interest of technical college students in technical drawing.

Statement of the problem

It is quite unfortunately that despite the efforts by the government to ensure qualitative education at the technical college level, there have been constant reports of low academic achievement in technical drawing amongst students of technical colleges.The low academic achievement in technical drawing amongst students was attributed to the conventional teaching methods used in teaching which include lecture and discussion methods. One of the proven ways of preventing low academic achievement of students and stimulate their interest in learning is the use of interactive teaching methods (Okoli and Nwosu, 2016). Hence, this study was designed to determine the impact of Intelligent learning on students' achievement and interest in technical drawing in Niger state, Nigeria**.**

Research Questions

1. What is the impact of Intelligent learning on students' achievement in Technical drawing?
2. What is the impact of Intelligent learning on students' interest in Technical drawing?

Hypotheses

H_{O1}: There is no significant difference in the mean achievement scores of students taught Technical drawing using Intelligent learning and those taught with conventional teaching method.

H_{O2}: There is no significant difference in the mean interest scores of students taught Technical drawing using Intelligent learning and those taught with the conventional teaching method.

Methodology

Pretest–posttest non-equivalent control group design of quasi-experimental study was adopted for the study. According to Nworgu (2006), random assignment of subjects in such a design is not required.

The design is symbolically represented as follows:

Experimental	O_1	X	O_2
Control	O_1	-	O_2

Where: **O_1:** Represents pretest (observation or measurement before the treatment);
O_2: Represents post-test (observation or measurement after treatment);
X: Represents experimental treatment (Intelligent learning);
- : Indicates no treatment (that is, the use of conventional methods)

The study was conducted in Niger State, Nigeria. The population for this study comprised of 428 National Technical Certificate (NTC) II students offering Technical drawingduring 2017/2018 session in Niger State, Nigeria. A sample size of 180 NTC II students was selected for the study. Purposive sampling technique was used in selecting and assigning Government Technical College,Minnato the experimental group and Simple Random Sampling (SRS) technique was used in selecting and assigning MammanKontagora Technical College (MKTC), Pandogarito the control group. Two instruments were used for data collection which includes, Technical Drawing Achievements Test (TDAT) and Technical DrawingInterest Inventory (TDII). The TDAT consisted of 50 multiple choice items with four response options and was developed by the researcher based on Technical drawing modules in the NTC II curriculum. TDII consisted of 30 multiple choice items with five response options were used for testing the student's interest in Technical drawing. The items were designed based on five point Likert scale of Strongly Agree = 5; Agreed = 4; Undecided = 3; Disagreed = 2 and Strongly Disagreed = 1 point respectively.

The researchers prepared two sets of lesson plans for the teaching of the module selected for the study. Each set contains eight lesson plans that lasted for a period of eight weeks for the minimum of two hours duration. One set of the lesson plan was written based on Intelligent learningand was used by the teacher for the experimental group, while the second set was prepared based on conventional teaching method and was used by the teacher for the control group. The instruments were subjected to face and content validation by three experts that include two lecturers from the Department of Industrial and Technology Education, Federal University of Technology, Minna, Nigeria and one staff from the Examination Development Department (Technical drawing Unit), National Examination Council (NECO). To ensure the reliability of the TDAT and TDII, a trial test was conducted using NTC III students in Government Technical College, Mada Station, Nasarawa state, Nigeria. Pearson Product Moment Correlation (PPMC) was used to determine the reliability coefficientof TDAT and found to be 0.77. The reliability coefficient value of TDII was determined as 0.79 using Cronbach's Alpha. Nevertheless, Item Analysis was carried out on the 50 items developed in the TDAT to determine the Difficulty and Discrimination Indices of each item in the test. Items having negative discrimination are rejected and items having discriminationindex above 0.20 are ordinarily regarded as satisfactory for use in most tests ofacademic achievement (Boopathiraj &Chellamani, 2013).

Experimental procedure

The study involved two main stages, which include the administration of pre-test and post-test. The study was conducted for a period of eight weeks during which eight topics in Technical drawing were covered. The pre-test was administered in the first week of the research exercise to the whole students before the experimental and control groups are subjected to the treatments. After the administration of the pre-test, students in the experimental group were taught using the Intelligent learning and students in the control group were taught using the conventional teaching method. Both groups were taught by their regular teachers. The teaching process lasted for eight weeks after which a post-test was administered to all the students to determine their mean achievement and interest scores in Technical drawing. Extraneous variables such as Hawthorne effect was controlled by the use of regular subject teachers, influence of subject interaction was controlled by the use of intact classes, pre-test sensitization was control by re-arrangement of items in the TDAT after the administration of the pre-test.

Method of data analysis

The data collected for this study were analyzed using the Statistical Package for Social Sciences (SPSS) version 23.0. Descriptive and inferential statistics were used to analyze the data. General Linear Model (univariate) function was used to perform the Analysis of Covariance (ANCOVA). Group with higher mean value irrespective of the closeness in the mean value of the other were taken to have performed better in achievement test or showing much interest in Technical drawing. Significant of F less than 0.05 implies that, the null hypothesis should be rejected and significance of F greater than 0.05 implies that, the null hypothesis should be accepted.

Result

Table 1: Mean of Pre-test and Post-test Scores of Students Taught Technical Drawing Using Intelligent learning and Those Taught with Conventional Teaching Method in the Achievement Test

Group	N	Pre-test Mean	Post-test Mean	Mean Gain
Experimental	68	10.93	42.17	31.24
Control	112	11.00	30.27	19.27

Table 1 shows that the experimental group had a mean score of 10.93 in the pre-test and a mean score of 42.17 in the post-test with a pre-test, post-test mean gain in experimental group to be 31.24. The control group had a mean score of 11.00 in the pre-test and a post-test mean of 30.27 with a pre-test, post-test mean gain of 19.27.

Table 2: Mean of Pre-test and Post-test Scores of Students Taught Technical Drawing Using Intelligent learning and Those Taught with Conventional Teaching Method in Interest Inventory Test

Group	N	Pre-test Mean	Post-test Mean	Mean Gain
Experimental	68	98.85	129.56	30.71
Control	112	98.92	106.03	7.11

Table 2 shows that the experimental group had interest mean score of 98.85 in the pre-test and interest mean score of 129.56 in the post-test with a pre-test post-test gain in the experimental group to be 30.71. The control group had interest mean score of 98.92 in the pre-test and a post-test interest mean score of 106.03 with a pre-test post-test gain of 7.11.

Table 3: **Summary of Analysis of Covariance (ANCOVA) for Test of Significant Difference between the Achievements Mean Scores of Students Taught Technical Drawing Using Intelligent learning and Those Taught with Conventional Teaching Method**

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3918.69[a]	2	1959.35	27.20	.00
Intercept	4640.42	1	4640.42	64.41	.00
Pretest	43.33	1	43.33	.60	.44
Group	3763.40	1	3763.40	52.24	.00*
Error	12751.86	177	72.04		
Total	223325.00	180			
Corrected Total	16670.55	179			

Where:

a. R Squared = .235 (Adjusted R Squared = .226)

*Significant (F less than .05)

Table 3 shows the F-calculated value for the effect of instructions on the cognitive achievement of studentstaught Technical drawing using Intelligent learning and those taught with conventional teaching method. The F calculated value for the groups is 52.24 with a significant of F at **.**00 which is less than **.**05. The results indicated that there is statistically significant difference between the achievement mean scores of students taught Technical drawing using Intelligent learning and those taught with conventional teaching method.

Table 4: Summary of Analysis of Covariance (ANCOVA) for Test of Significant Difference between the Interests Mean Scores of Students Taught Technical Drawing Using Intelligent learning and Those Taught with Conventional Teaching Method

Source	Type III Sum of Squares	*df*	Mean Square	F	Sig.
Corrected Model	7735.12[a]	2	3867.56	849.51	.00
Intercept	161.47	1	161.47	35.47	.00
Pretest	14.92	1	14.92	3.28	.07
Group	7734.73	1	7734.73	1698.93	.00*
Error	805.83	177	4.55		
Total	2651913.00	180			
Corrected Total	8540.95	179			

Where:

a. R Squared = .906 (Adjusted R Squared = .905)

*Significance (F less than .05)

Table 4 shows the F-calculated value for the effect of instructions on the interest of studentstaught Technical drawing using Intelligent learning and those taught with conventional teaching method. The F calculated value for the groups is 1698.93 with a significant of F at **.**00 which is less than **.**05. The results indicated that there is statistically significant difference between the interest mean scores of students taught Technical drawing using Intelligent learning and those taught with conventional teaching method.

Findings of the study

1. The students taught Technical drawing using Intelligent learningobtained higher achievement mean scores than the students taught with conventional teaching method.
2. The students taught Technical drawing using Intelligent learningobtained higher interest mean scores than the students taught with conventional teaching method.
3. There is significant difference in the achievement mean scores of students taught Technical drawing using Intelligent learning and those taught with the conventional teaching method.
4. There is significant difference in the interest mean scores of students taught Technical drawing using Intelligent learning and those taught with the conventional teaching method.

Discussion of findings

The results presented on student's achievement mean scores in Technical drawing revealed that the students taught using Intelligent learningobtained higher achievement mean scores than the students taught with conventional teaching method in the Technical drawing achievement test. The finding is in-line with the findings of Beck *et al.* (2012) that revealed Intelligent learning environment promotes learning by supporting student's cognitive processing and improvement of detailed mental representations in several ways which consequently improve the achievements of students. Moreover, Shyu (2000) revealed a related view concerning the finding that,Intelligent learning helped students to understand what they learned through the improvement of problem-solving skills.

The summary of Analysis of Covariance (ANCOVA) for the test of significant difference between the achievement mean scores of students taught Technical drawing using Intelligent learning and those taught with conventional teaching method revealed a statistically significant difference. The finding is in conformity with the findings of Adenkunle (2013) that found significant difference in the achievement mean scores of student in the experimental group and the control group.

The results presented on student's interest mean scores in Technical drawing revealed that the students taught using Intelligent learningobtained higher interest mean scores than the students taught with conventional teaching method in the Technical drawing achievement test. The finding confirmed the findings ofHasselbring and Moore (2006) which revealed the Intelligentlearning environments could be of high interest to students with poor literacy skills.

The summary of Analysis of Covariance (ANCOVA) for the test of significant difference between the interest mean scores of students taught Technical drawing using Intelligent learning and those taught with conventional teaching method revealed significant difference. The finding is in conformity with the findings of Oyetunde (2010)thatrevealed similar findings ofsignificant difference between the mean interest score of the students taught Technical drawing using model and students taught using conventional teaching methods.

Conclusion

The results obtained revealed that cognitive achievement and interest of students were enhanced and stimulated using Intelligent learning. Consequently, Intelligent learning has the potential to enhance learning via Intelligent learning technology. The use of Intelligent learning has value as an instructional tool for Technical drawing. Therefore, it is concluded that Intelligent learning has positive impact on student's achievement and interest in Technical drawing.

Recommendations

1. National Board for Technical Education as a body concern with curriculum development should incorporate Intelligent learning into the teaching of Technical drawing.
2. Teachers especially those teaching Technical drawing should adopt Intelligent learning to teach students at technical colleges to stimulate student's interest and enhance student's cognitive achievements in Technical drawing.

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