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Effects of Computer Assisted Instruction on the Learning of Introductory Technology at Junior Secondary Schools in Minna Metropolis of Niger State

Abdullahi Muhammad Hassan
School of Technical Education,
Niger State College of Education,
Minna.

Abstract

This paper looks at effects of computer-assisted instruction (CAI) on the learning of introductory technology at Junior Secondary School in Minna, Niger State. The sample for the study consists of two hundred and twenty (220) JSSIII students randomly selected from four secondary schools in Minna metropolis. A 50 item multiple choice Introductory Technology Achievement Test (ITAT) was administered as pretest and posttest. Three hypotheses were formulated in null form and tested at 0.05 level of significance. Reliability coefficient of 0.85 was obtained using Kuder-Richardson (KR-21) formula. The experimental group performed significantly better than the control ($t = 20.6$ $df = 109$, $P< 0.05$). There was no significant difference in performance of boys and girls taught introductory technology using CAI ($t = 1.62$, $df = 54$, $P>0.5$) Based on these findings it could be deduced that the use of CAI package can serve as a viable alternative to conventional lecture method of teaching. The implications of these results are discussed.

Introduction

Science and technology have been conceptualized as a disciplined process by which the resources of knowledge (of material of energy, of technical concept) are used in solving problems identified by human needs (UN, 2003). In the Nigerian educational system, Introductory Technology is one of the new areas of study aimed at teaching the youths the scientific and technological skills that will enable them function effectively in their ever-changing society. (Hussaini and Raji, 2004).

Globally, the advancement of scientific and technological knowledge and skills have continued to expand daily because the economic growth (wealth and resources) of any developed country is the result of their scientific and technological development. (Adeleke, 2002). As a result, the federal government introduced introductory technology at the junior secondary schools to enable students acquire basic scientific and technological skills that would enable them tackle problems of human needs and for economic development, thus, it's objectives include:

(i) To provide pre-vocational orientation for further training in technology.
(ii) To provide basic technological literacy for everyday living.

(iii) To stimulate creativity.

The revolutionary concept of the system is designed to establish a solid base for technological education and training right through the nation's educational structure as well as ensuring its products of economic adaptability through its technological programmes (Abdullahi, 2004).

The Federal Government took several bold measures to ensure the effective implementation of the policy. Some of these include the establishment of a National Implementation Committee and the investment of millions of Naira as loans to the state, in the importation of workshop equipment. (Abdullahi and Danjuma, 2004). The teaching of introductory technology in junior secondary schools is not yet effectively carried out. For instance, from the survey carried out recently, it appears that most teachers of the subject in Niger State are not themselves fully knowledgeable of the concept and objectives of introductory technology (Bull, 2002). The use of computer assisted instruction in the teaching of mathematics and social sciences has proved to be promising method hence, the desire to adopt this method of teaching for introductory technology.

Significance of the Study

This research investigated effects of Computer Assisted Instruction on the learning of introductory technology at Junior Secondary class of the educational system. The study is of great significance because it is hoped that the findings of this research would improve and uplift the standard of teaching and learning of introductory technology at the junior secondary school level of our educational system through the use of computer Assisted instruction (CAI).

Research Hypothesis

Four null hypotheses were formulated and tested in this study

(i) There is no significant difference in the pre-test mean achievement score of experimental and control groups.

(ii) There is no significant difference in the mean achievement scores of students taught introductory technology using Computer Assisted instruction (CAI) and those taught with traditional lecture method.

(iii) There is no significant difference in the mean achievement scores of male and female students taught introductory technology with the computer Assisted Instruction (CAI).

(iv) There is no significant difference in the performance of male and female students taught Introductory Technology using traditional lecture method.

Research Design

A pretest posttest experimental control group research design was adopted for the study.

Samples and Sampling Techniques

The sample for this research consists of two hundred and twenty (220) students randomly selected from four secondary schools in Minna Metropolis of Niger State.

Table: Sampled Schools and Students

School	Male	Female	Total
Gov't Girl Sec Sch (Old-Airport) Minna	-	55	55
Gov't Secondary School, Minna	55	-	55
Army Day Secondary School, Minna	30	30	60
Zarumai Model School, Minna	25	25	50
Total			220

Research Instrument

The instrument used for the study consists of 50 test items on introductory technology, which were drawn, based on the topics taught. The topics are Isometric drawings and orthographic drawing. The software package used to teach these topics. A 50 items Introductory Technology Achievement Test was designed and used by the researcher. The instrument covered Introductory Technology topics such as freehand sketching, Isometric drawing, orthographic drawing, hand tools and safety in workshops titled Introductory Technology Achievement Test (ITAT). Each question on the selected topic is followed by five multiple-choice optional answers (A-E) each correct answer earns one mark and the overall score is then converted to percentage. The (ITAT) was administered to both the experimental and control groups as pretest and posttest respectively.

Validation and Reliability of Instrument

The 50 items multiple choice in Introductory Technology was validated by three senior Introductory Technology lecturers from College of Education, Minna. The validators were asked to determine the appropriateness of the content with respect to the objective of the study. A test-retest method was used to determine the reliability of the instrument. A reliability coefficient of 0.86 was obtained using KR-21 formula.

Method of Data Collection

A pretest was administered to both the experimental and control groups to determine entry knowledge equivalence of two groups. The pretest was followed by four (4) weeks instruction on introductory technology to both experimental and control groups. A posttest was administered to both groups after the treatment. The validated marking scheme was used to score students' work.

Method of Data Analysis

The data collected from the pretest and post-test were analyzed using the t-test statistic.

Validation of the Test Instrument

The questionnaire was validated by four experts in technical education. Three of them were drawn from the Industrial Technical Education Department, Federal

University of Technology, Minna, and one from Technical Education Department, College of Education, Minna.

Result and Discussion

Ho_1 There is no significant difference in the mean pretest achievement scores of experimental and control groups.

Table 2: t-test result of the Pre-test for Experimental and Control Groups.

Variable	No. of Paired Samples	DF	Mean (X)	SD	t-Value Calc.	t-Value Crit.	Sign Level	Remark
Experimental Group	110	109	40.49	9.60	0.58	1.66	0.173	n. s
Control Group			41.06	9.71				

ns – Not significant at 0.05 level; DF = degree of Freedom; SD = Standard Deviation

The result in the Table 2 revealed the mean scores of experimental groups as 40.49 and 41.06 for control group. The calculated t-value of 0.58 is less than the critical value of 1.66 at P-value of 0.173. This indicates no significant difference between the mean scores of the experimental and control groups $P<0.05$ level of significance of the pre-test. This revealed that the two group are equivalent with regard to the previous knowledge.

Ho_2 There is no significant difference in the mean achievement scores of students taught Introductory Technology using computer Assisted Instruction and those taught with traditional lecture method.

Table 3: t-test result of the Experimental and Control Groups on post-test.

Variable	No. of Paired Samples	DF	Mean (X)	SD	t-Value Calc.	t-Value Crit.	P	Remark
Experimental Group	110	109	55.70	9.45	20.60	1.66	0.001	s
Control Group			48.00	8.98				

*S = Significant at 0.05 level of significance.

Table 3 shows the t-test comparison for the post-test of Experimental and Control groups. From the Table, there is statistical significant difference between the mean scores of the Experimental group (55.70) and the control group (48.00) ($t_{cal} = 20.607$, t_{crit} 1.66; df = 109, $P< 0.05$). That is, there is significant difference in the mean achievement scores of students taught introductory technology using Computer Assisted Instruction and those taught with traditional lecture method.

This result indicates that the Experimental Group with the mean score of 55.70 performed better than the control group with the mean score of 48.00. It can be deduced

from this study that the use of Computer Assisted Instruction (CAI) for introductory technology instruction has significantly improved the performance of the students taught introductory technology with the use of Computer Assisted Instruction. Therefore Ho_2 is rejected.

Ho_3 There is no significant difference on the achievement of male and female students taught introductory technology using computer Assisted Instruction.

Table 4: t-test of the Posttest Mean Achievement Scores of Male and Female Students Experimental Group

Variable	No. of Paired Sample	DF	Mean (X)	SD	t-Value Calc.	t-Value Crit.	P	Remark
Males	110	109	56.24	9.52	1.62^{ns}	1.68	0. 192	n.s
Female			55.16	9.47				

Ns = Not significant at 0.05 level

Table 4 shows the mean scores and t-values of Boys and Girls on the experimental group to be 56.24, 1.62 and 55.16,1.62 respectively since the calculated t-value of 1.62 is less than the critical value of 1.68, at p 0.05 level of significant, there is no significant difference in the performance of boys and girls taught introductory technology using Computer Assisted Instruction. Therefore, Ho_3 is not rejected. That is, there is no significant difference in the academic achievement of male and female students taught introductory technology using computer Assisted Instruction.

Tables 5: t-test of the Posttest Mean Achievement Scores of Male and Female Students in the Control Group

Variable	No. of Paired Samples	DF	Mean (X)	SD	t-Value Calc.	t-Value Crit.	P	Remark
Male	110	109	48.01	8.99	1.46	1.68	0.162	n.s
Female			47.99	8.98				

Ns = Not significant at 0.05 level of significance

Table 5 shows the t-test comparison of the mean achievement scores of male and female students in the control group. From the Table, there is no statistical significant difference on mean scores of males (48.01) and females (47.99) in the control group at posttest (t-1.46 df = 54, p> 0.05)

Implication of the Major Findings

This study was informed by poor performance of introductory technology students in junior secondary school certificate examination (JSSCE). The poor performance has been associated with many factors, such as the abstract nature of the

subject, large population of students in a class, inadequate instructional materials, inadequate method of teaching among others. Okeke (2003) stated that the poor performance of students in introductory technology was due largely to the absence of equipment and the traditional lecture method adopted by introduction technology teachers. Similarly Ogbuanya (2005) suggested that the use of computer based teaching method is effective because students' interest are aroused, result oriented and promote understanding. Studies by Okeke (2003) have shown improved performance of students in technical drawing through the use of Computer Assisted Instruction (CAI) (Hussaini and Raji, 2004).

However, results from this research have shown that with the use of CAI in the teaching and learning of introductory technology, students could achieve better. On the part of gender difference in introductory technology achievement, the study revealed that difference in sex has no vital role to play in influencing the use of CAI package. This implies that all categories of students could benefit from the use of CAI in the learning of introductory technology; conclusively the use of CAI package is gender independent.

Conclusion

The main focus of this study was to find out the effects of computer-assisted instruction on the learning of introductory technology. A total of two hundred and twenty (220) J.S III students were used for the study. The result showed there exists a significant difference in the performance of students in the two groups and no significant gender difference in the performance of students in the experimental and control groups. This implies that the use of computer assisted instruction on the learning of introductory technology in teaching enhances effective learning and invariably higher performance as well as induce gender parity in introductory technology achievement.

Recommendations

The findings of this study ignited the following recommendations:

(i) Qualified introductory technology teachers that are computer literate should be employed and be well motivated, so that more time energy and resources be channel to increase productivity.

(ii) Parents and guardians should educate and encourage their wards on the needs to be computer literate as pre-requisite for scientific and technology achievement.

(iii) The federal and state government and owner of private school should as a matter of urgency procure personal computers and appropriate software for their schools in order to enhance quality of teaching and learning.

(iv) Technical education experts should be involved in producing effective instructional media such as computer-assisted instruction to improve quality of instructions in the discipline.

(v) The issue of power failure should be addressed because without supply of a dream that is unrealizable.

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