EFFECT OF COMPUTER ASSISTED INSTRUCTION ON TECHNICAL COLLEGE STUDENTS ACADEMIC ACHIEVEMENT AND INTEREST IN METALWORK TECHNOLOGY IN ENUGU STATE.

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Abstract

The study was carried out to determine the effect of computer assisted instruction on the academic achievement and interest of the students in metalwork technology in technical colleges in Enugu State. Two research questions were investigated by the study and two hypotheses were formulated and tested at 0.05 level of significance. A quasi nonrandomized control group, pretest-posttest design was used. The population for the study was 298 second year metalwork students in six technical colleges in Enugu State. The instruments used for data collection were metalwork achievement test and interest inventory. Two research questions were posed and two hypotheses were formulated to guide the study. Mean and standard deviation were used to analyze the data for answering research questions while analysis of covariance (ANCOVA) was used to test the hypotheses of no significant difference at 0.05 level of significance. It was found out that the students taught with Computer Assisted Instruction had higher mean posttest scores in the metalwork achievement test than those taught with traditional method of teaching. Based on this finding, it was recommended that metalwork teachers should always incorporate in their teaching, the use of computer assisted instruction. This will enhance their knowledge of metalwork technology.

Introduction

Metalwork technology is an integral part of Technical and Vocational Education (TVE) programme. It is one of the vocational trades offered in technical colleges. Metalwork trade comprises of both theory and practical that leads to the production of goods and services by the use of tools and metals (NBTE, 2001). The trade covers the following areas Agricultural implement mechanic work, Air conditioning and refrigeration work, Automobile mechanic work, foundry work, mechanical craft (machining) work, welding and fabrication and sheet metalwork. One of the aims of technical education (which metal work technology is a part) as stated by Federal Republic of Nigeria (2004) is to give training and impart the necessary skills leading to the production of craftmen, technicians and other skilled personnel who will be enterprising and self reliant. The emphasis of government on skill acquisition led to the establishment of institutions that emphasize skills acquisition at all levels of educational system (Ogbu, 2007). Among these institutions where metalwork technology is taught are the technical colleges.

Technical colleges are post primary schools where vocational courses are offered by students in order to acquire practical skills. Okorie (2005) explained that technical colleges in Nigeria are established to prepare individuals to acquire practical technical skills and basic scientific knowledge. Okorie (2000) opined that technical colleges are intended to prepare students for entry into various occupations such as operatives, artisans and

craftmen. Kadulur, (1997) observed that the rapid development witnessed in all sectors of the economy after independence makes it mandatory to improve the standard of craftsmanship. Technical colleges therefore are saddled with the task of providing, imparting or teaching practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of the economy and social life. Teaching is the process of helping an individual to learn. The use of computers in classroom teaching as media of instruction could be a means of achieving effective teaching and learning of metalwork.

Computer is an electronic machine that is capable of solving problems or manipulating data by accepting data, performing prescribed operations on the data and supplying the results of these operations (Dantala, 2005). Computer has made knowledge the most prized commodity. It has been found useful in engineering, banking sector, medicine, communication, commerce and industries. The field of education has not been indifferent to the computer revolution (Yusuf, 2005). Parveen (2003) stated that the use of computer could revolutionize the educational system, prepare students for the information age and accelerate national development efforts. Computer can therefore, offer educators the opportunity to provide a new approach to learning, an approach that help students retain what was learnt, develop interest in students to learn, help students to work together through collecting and understanding information together and thereby, using several higher-level thinking skills to solve daily and complex problems. These could be achieved through the use of Computer-Assisted Instruction (CAI) in classroom teaching.

CAI programs use tutorials, drill and practice, simulation, games, discovery and problem-solving approaches to present topics, and they test the students' understanding. Ash (2005) defined CAI as an interactive instructional techniques whereby a computer is used to present the instructional material and monitor the learning that takes place. It is a combination of text, graphics, sound and video in enhancing the learning process. Umaru (2003) defined CAI as a program of instruction presented as computer software for instructional purpose. In line with this, Basturk (2005) referred to CAI as the use of the computer as a tool to facilitate and improve instruction. Computer assisted instruction is a tutorial activity that can present information through interactive approach and illustrate a concept through sound and animation.

CAI can be used either in isolation bearing the whole responsibility for conveying instruction to students, or in combination with conventional, ie., face to face, teaching methods. Etukudo (2009) stated that CAI allows students to progress at their pace, work individually or solve problem in a group and at the same time provide immediate feedback. It also does not allow students to move ahead until they have mastered the learning skills.

The use of CAI in teaching and learning has been embraced by researchers of the developed nations as reported by (Xin, 2000 and Iqal, 2004). Nigeria is still coming up in terms of technological development. Therefore, the use of CAI in teaching and learning has not been fully embraced by technical colleges and metal work teachers in Nigeria. Many research results Xin 2000 and Iqal, (2004) showed that the use

of computer assisted instructional strategies in learning improved students academic achievement. The use of computer assisted instructional strategies in teaching and learning has been widely researched and used in the classroom around the world since 1970s (Iqal, 2004).

But in Nigeria educational system, the use of computer assisted instructional strategies in teaching and learning has not been fully introduced. Most especially, the use of CAI in the teaching and learning of metalwork to improve students academic achievement in Enugu State. Gambari (2010) asserted that teachers can use computer-assisted instruction to arrest and sustain attention, present facts and information, teach concepts and principles, guide thinking and induce transfer of learning. Nyanga (2002) stressed that a teacher can capitalize on media capabilities such as CAI to promote the learners perception, understanding, transfer of learning reinforcement and retention of learnt concepts by the students. Gana in Gimba (2014) stressed that the use of instructional models such as CAI can have great effects on the achievement of students in mathematics. It may also have a great effects on the achievement of student in metalwork.

Metalwork is an important subject that is needed in technical colleges. In respect of this, the Federal Republic of Nigeria (FRN, 2004) stated that metalwork should be taught as a core subject to all mechanical technology students in technical colleges in order to give a sound basis for scientific and reflective thinking, and prepare them for the next level of education.

However, metalwork has since become a puzzle, but some considered it as a friend and to some a foe. One could say that the problems with metalwork started right from the early stages of educational development in Nigeria (Taiwo, 2001). For many years, the factors that affect the effective teaching and learning of metalwork have sparked off discussions and controversy among metalwork educators. These have occupied the minds of educators especially as these relate to metalwork which is an essential tool for scientific and technological development. The poor academic achievement of students in metalwork at NABTEB Examinations has become a source of concern to stakeholders in Enugu State (NABTEB 2016 and NABTEB, 2017). This poor achievement of students in metalwork has implication for labour market, since technical colleges in Enugu no longer produce enough qualified craftmen in metalwork.

Evidence revealed that the achievement of students in NABTEB in Enugu State from 2014-2017 was poor (Chief examiners report). The achievement of students at credit level and above in NABTEB was less than 47% which is not good enough. The mean percentage pass at credit level and above in NABTEB is 39.11(NABTEB OFFICE BENIN). The academic achievement was not encouraging at all. The chief examiners report indicates that achievement of candidates in metalwork continued to slide on a downward trend. This down ward trend could be that the candidates were not adequately groomed for the examination. The chief examiners report (2017) recommended that teaching should be —student-centered‖ and oriented with the use of instructional materials. This could be achieved through the use of computer assisted instruction in the teaching and learning of metalwork. Government adopted the use of

information and communication technology in the national policy on education to apply to all level of education. Such provision is contained in section 5 number 30 which stated as follows, —In recognition of the prominent role of information and communication technology in advancing knowledge and skills necessary for effective functioning in the modern world, there is an urgent need to integrate information and communication technology into education in Nigeria (FRN, 2004).

However, research evidence (Nwaodo, 2016) revealed that metalwork teaching still follows the traditional pattern where teacher directed explanations are used to present materials for new lessons and the teachers and textbooks serve as source of metalwork and evaluators of metalwork instruction. He further stressed that in Nigeria today, teachers, textbooks, chalkboards and traditional facilities are no longer adequate to cope with the amount and type of skills and competencies expected of students. The traditional method of teaching and learning is the popular method of teaching in Enugu State technical colleges. This method has been identified as being ineffective and as one of the factors responsible for the poor achievement of student in metalwork. (Imandojemu, 2008).

Achievement is when somebody has succeeded in doing something, especially after a lot of effort. It is the measurement of the effects of specific programme of instruction or training (Kulbir, 2005). It can also be defined as an act of finishing something successfully. Relating this to academic achievement in this context means success in metalwork when computer assisted instruction is used as a media of instruction in class room teaching and learning. Computer assisted instruction as an instructional strategy could arouse the students interest in metalwork.

Interest is an important variable in learning because when one becomes interested in an activity, one is likely to be more deeply involved in that activity. Interest is a subjective feeling of concentration or curiosity over some thing (Harbor-Peters, 2001). Relating this to this study, interest is the motivation of students to like metalwork through the use of computer-assisted instructions.

Statement of the Problem

The achievement of students in metalwork has been quite unsatisfactory over the years in Nigeria particularly in Enugu State technical colleges. National Business and Technical Examination Board (NABTEB) have repeatedly reported the poor academic achievement of students in metalwork. The picture emerging from research reports, Examiner‘s reports and NABTEB results (2014-2017) show that the students have difficulty in answering metalwork questions. All these may be as a result of deficiency in methods of teaching used by the teachers. Therefore, it is necessary to determine the effects of computer assisted instruction as alternative teaching method on academic achievement of metalwork students in technical colleges in Enugu State.

Purpose of the Study

The purpose of this study therefore, is to determine the effects of computer assisted instruction on academic achievement of students in metalwork in technical colleges in Enugu State. Specifically, the study sought to:

1. Determine the effect of computer assisted instruction on the mean achievement score of technical college students in metalwork

compared to those taught the same metalwork using the traditional method.

2. Determine the effect of CAI on the mean interest score of technical college students in metalwork compared to those taught the same metalwork using the traditional method.

Method

Two research questions were investigated by the study and two hypotheses were formulated and tested at 0.05 level of significance. This study adopted a quasi experimental research design. Specifically, non-randomized control-group, pretest, post test design was used for this study, due to the fact that a true experimental research design which involved subjects' randomization will disrupt academic activities of the technical colleges involved in the study area during the time of study. Such random selection in true experimental design according to Ezudu and Ezeh (2008) is hardly permitted by the authorities of the school used for the research. A non randomized group (intact classes) was used for this study. The study was carried out in technical colleges in Enugu State, Nigeria. The choice of this area was because not much educational research work has been carried out especial interms of instructional methods, achievement and interest in metalwork despite the high rate of failure in the area.

The population for the study was the six technical colleges offering metalwork consisting of 298 metalwork students in second year. The sample was two technical colleges obtained from six technical colleges through purposive sampling techniques. Thus the two technical colleges that satisfied the following conditions were purposively selected:

- The colleges must have been presenting candidates for NABTEB final year examination for the last four years consistently.
- The colleges that the principals and teachers must be willing to cooperate and participate in the study.

The two technical colleges had 98 students made up of two intact classes of metal work students. Metalwork Achievement Test (MAT), Computer Assisted Instruction lesson plan, traditional lesson plan and interest inventory were the instrument for the study. Computer assisted instruction lesson plan was used to teach experimental groups while the traditional lesson plans was used to teach control groups. MAT has forty multiple choice items while interest inventory has twenty statements based on technical college curriculum content for year two students.

Three lecturers from the Department of Industrial Technical Education, University of Nigeria Nsukka helped to validate the instrument for the study. A trial test of the instrument was carried out for the purpose of determining the coefficient of stability of the Metalwork Cognitive Achievement Test (MWCAT) using test retest reliability technique. The instrument was administered on twenty two NTC II Metalwork Technology students in Government Technical College, Abakaliki Ebonyi State. The objective answer sheets were marked by the researcher and scores kept. After two weeks MWCAT was readministered to be same sample at Government Technical College, Abakaliki in Ebonyi State. The objective answer sheets were also marked by the researcher and scores obtained. The first and second scores of the tests were correlated. The reliability coefficient of the MWCAT was determined using Pearson Product Moment correlating coefficient. Reliability coefficient of 0.76 was gotten showing that MWCAT was stable.

Experimental Conditions

1. **Experimental Bias:** The following conditions were laid down to minimize experimental bias: (a) There is a lesson plan for the experimental groups and another lesson plan for the control groups. (b) the same achievement test was given to both groups at the same time in order to avoid experimental bias; (c) the students had no pre knowledge of their involvement in the experiment; (d) the researcher was not directly involved in the test administration.

altogether. The topics were selected based on the class used for the experiment. The experimental group was taught with five computer assisted instruction lesson plans, while the control group was taught with five traditional lesson plans. Each lesson plan lasted for 90 minutes. The treatment lasted for five weeks. At the end of the treatment, MAT was administered to both experimental and control groups to collect data. The data collected from the students were analyzed using mean scores and standard deviation for answering research

Research Question 1 with computer assisted instruction and those taught What is the difference between the mean with traditional method.

achievement scores of students taught metalwork

Table 1: **Mean and Standard Deviation Scores of pre-test and post-test scores of CAI and Traditional Groups in the Metalwork Achievement Test.**

		Pretest		Posttest		
METHOD	N	Mean	SD	Mean	SD	Mean Gain
Experimental	50	26.86	8.48	60.25	9.22	33.39
Control	48	30.24	9.27	31.15	10.04	0.91

2. **TeacherVariability**: Computer Assisted Instruction lesson plan was prepared by the researcher and the traditional lesson plan was prepared by the teacher concerned in order to control invalidity that could be caused by teacher variability.
3. **Training of teachers**: One-week intensive briefing was organized for the participating teachers by the researcher on how to use computer assisted instruction lesson plans for effective teaching of metalwork to students.

questions and analysis of covariance (ANCOVA) to test the hypotheses of no significant difference.

Results

The following research questions were answered and the hypotheses tested.

Experimental Procedure

The intact groups were used for the experiment. The trained teachers were supplied with materials and the scheme of work. Topics to be taught were selected from the scheme of work for metalwork. Five topics were selected

Table 1 shows that the group taught metalwork with CAI had a mean score of 26.86 and standard deviation of 8.48 in the pre-test and a mean score of 60.25 and standard deviation of 9.22 in the post test making a pretest, post test

mean gain in the CAI to be 33.39. The Traditional group taught metalwork had a mean score of 30.24 and standard deviation of 9.27 in the pretest and a posttest mean score of 31.15 and standard deviation of 10.04 with a pretest, posttest mean gain of 0.91. With these results, the CAI techniques is more effective in improving students achievement in metalwork than traditional method.

Research Question 2

What is the difference between the mean interest scores of students taught metal work with CAI and those taught metalwork with the Traditional method.

Table 2: **Mean and Standard Deviation of the Interest scores for Experimental and Control Groups.**

		Pretest		Posttest		
GROUPS	**N**	**Mean**	**SD**	**Mean**	**SD**	**Mean Gain**
Experimental	50	49.56	5.38	69.58	5.42	20.02
Control	48	39.15	5.45	50.23	5.64	11.08

Table 2 shows mean and standard deviation of the interest scores for experimental and control groups. From the results, the mean and standard deviation of pretest and posttest scores of the experimental group is 49.56 ± 5.38 and 69.58 ± 5.42 respectively. This gives a mean gain score of 20.02 in favour of post test. Similarly, the mean and standard deviation of the pretest and posttest scores of the control group is 39.15 ± 5.45 and 50.23 ± 5.64 respectively. The experimental group had a pre-test / post-test mean gain of 20.02 which is higher than that of the control group with mean gain difference of 11.08.

Hypothesis 1

There is no significant difference between the mean achievement scores of students taught metalwork with computer assisted instruction and those taught with traditional method.

Table 3
ANCOVA Result of Experimental and Control Group.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	63543.484[a]	2	31771.742	245.129	.000
Pretest	166.991	1	166.991	1.288	.257
Treatment	59947.625	1	59947.625	462.514	.000
Error	38494.933	96			
Corrected Total	102038.417	98			

a. Adjusted value

Table 3 reveals that the main effect treatment of technical college students taught metalwork using the CAI (experimental) and those taught the same metalwork using the traditional (control) produced F=462.514 and this value is significant at 0.000. The treatment using computer assisted instruction produced significant difference on achievement, hence the hypothesis which states that there is no significant difference in the mean achievement score of technical college students taught metalwork using the CAI and those taught metalwork using the traditional teaching method was therefore rejected.

Hypothesis 2

There is no significant difference in the mean interest score of students taught metalwork using computer assisted instruction and those taught the same metalwork using the traditional method.

Table 4: ANCOVA Result of the mean interest score of Experimental and Control Group.

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	71.981[a]	4	17.995	303.550	.000
Pretest	.321	1	.321	5.411	.021
Group	1.200	1	1.200	20.240	.000
Error	17.488	94	0.59		
Corrected Total	89.469	98			

a. Adjusted value

Table 4 reveals that the main effect treatment of interest score of students taught metalwork using the CAI and those taught the same metalwork using the traditional method produced F =20.240 and this value, is significant at 0.000. The treatment using computer assisted instruction produced significant difference on interest, hence the hypotheses which states that there is no significant difference in the mean interest score of students taught metalwork using CAI and those taught the same metalwork using the traditional method was therefore rejected.

Discussions of Findings

The findings on research question 1 revealed that Computer Assisted Instruction is more effective in improving students achievement in metalwork than the traditional method. The implication of this findings is that Computer Assisted Instruction is more effective than Traditional method in enhancing students achievement in metalwork. The findings is in line with Xin (2000) and Iqal, (2004) who in their study revealed that students taught with Computer Assisted Instruction performed significantly better than those taught with Traditional method in mathematics. The findings further revealed that Computer Assisted Instruction has positive effect on students achievement which is similar to the findings of Nyanga (2000) and Gana in Gimba (2014) who in their study found out that the adoption of Computer Assisted Instruction in the teaching of mathematics students improved the students achievement in mathematics than the students taught with traditional method. A possible explanation for the effectiveness of CAI is the students active involvement in learning process. The analysis of covariance indicates that there is a significant difference between the mean achievement scores of students taught metalwork with CAI and those taught with Traditional method in favour of CAI with high mean gain score of 33.39.

The findings on research question 2 show that experimental group had higher mean interest scores than the control group in the posttest. However, the differences in the mean interest scores between the experimental and control groups occurred as a result of treatment given. The finding indicated that Computer Assisted Instruction has a positive effect on students interest in metalwork which is similar to the findings of Mehmet and Mehmet (2006) and Gambarl (2010) who in their study found out that the adoption of Computer Assisted Instruction in the teaching of physics students improved the students interest in physics than the students taught with the traditional method. The findings on hypotheses 2 confirmed that significant difference exist between the mean interest scores of experimental and control groups in the posttest. The significant different is attributed to the treatment. This is an indication that Computer Assisted Instruction has positive effects on students interest. This means that Computer Assisted Instruction is more effective than the Traditional teaching method when it comes to sustaining the interest of students. The finding is in line with the work of Afolabi, (2010), and Etkudo (2009) who showed that the interest of students exposed to CAI was better than their counterparts exposed to conventional classroom instruction.

Conclusion

This study was set out to determine the effect of Computer Assisted Instruction on the academic achievement and interest of the students in metalwork technology in Technical Colleges in Enugu State. The study revealed that Computer Assisted Instruction is more effective in improving academic achievement and interest in metalwork than the traditional teaching method. These results therefore showed that Computer Assisted Instruction is viable alternative to the teacher centered method of teaching metalwork. Thus, if Computer Assisted Instruction is adopted to teach metalwork in Technical Colleges, students will, undoubtedly, be equipped with knowledge and skills in metalwork as well as perform and cope more effectively with requisite metalwork skills needed for work in the industry, for self reliance and present world of work.

Based on the Findings of this study, the following recommendations are made:

- The study recommends the teaching/learning of metalwork via Computer Assisted Instruction.
- Seminars, workshops and in-service programs should be organized by all examination boards (NABTEB and NBTE) to enlighten technical teachers and improve their knowledge and skills on the use of Computer Assisted Instruction for improving students performance in metalwork.

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