

EFFECT OF TECHNOLOGY ENHANCED TEACHING STRATEGY ON ACADEMIC ACHIEVEMENT AND INTEREST OF METALWORK TECHNOLOGY STUDENTS IN COLLEGES OF EDUCATION IN SOUTH WEST, NIGERIA

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Abstract

This study investigated the effect of Technology Enhanced Teaching Strategy (TETS) on Academic Achievement and Interest of Metalwork Technology Students in Colleges of Education in South West, Nigeria. Two research questions and two hypotheses were formulated at 0.05 level of significance. The study used post- test quasi experimental research design. 101 students of 200 level NCE Metalwork programme were used as respondents from five accredited Colleges of Education in South West, Nigeria. 41 students were assigned to the control and 61 students assigned to the experimental groups respectively. Both the control and experimental groups were taught Metalwork Technology using the Conventional Teaching Method and Technology Enhanced Teaching Strategy method respectively which was administered using Metalwork Achievement Test and Metalwork Interest Inventory in the post-test. The data from the post-test were analysed using the mean and standard deviation to answer the two research questions and t-test statistics was used to test the two hypotheses in the study. The result of the study revealed that the students in the experimental group taught with blended learning model technologies performed better than the students in the control group. The findings also revealed that technology enhanced teaching strategy are not utilized in Colleges of Education in South west, Nigeria. Recommendations made were that lecturers should adopt technology enhanced teaching strategy in the teaching of metalwork technology for the acquisition of required skills by metalwork students. Hence, increasing teachers' technology integration and improving students' academic achievement and interest, thereby leading to positive social changes among others.

Keywords: Technology, Teaching Strategy, Metalwork, Achievement

Introduction

The National Commission for Colleges for Education (NCCE) approved metalwork technology programme curriculum taught in the teacher institutions known as Colleges of Education in Nigeria as a programme that is aimed to study skills and competencies in courses related areas which include welding and fabrication, foundry and forging, machine shop practice, sheet metalwork practice among others. Metalwork technology education as one of the components of technical education. The NCCE approved Metalwork Technology curriculum is designed to meet requirement necessary to prepare students for teaching employment, self-reliance and or entrepreneurial ventures. The teaching of metalwork involves activities

that equip learners not only with practical skills (Arikpo, AedeHatib & Ogunbe, 2022) but with knowledge, competencies and attitude that are recognised as indispensable for meaningful in the world of work and life. The introduction of new technologies in the World today has necessitated newer strategies in the teaching learning system of metalwork technology.

The new strategies of instruction in education require critical thinking skills as well as technical competency to update necessary scientific knowledge and applied skills in order to promote effective teaching and learning. One of the new strategies introduced into the teaching learning process is Technology Enhanced Teaching Strategy (TETS). The introduction of technology

enhanced teaching strategy into Vocational and Technical Education programme for teaching learning system in Nigerian Colleges of Education is a new development, it is the strategy that involve the use of digital tools and resources to supplement conventional classroom teaching methods so as to enhance learning experience. This includes the use of internet, interactive whiteboards, online collaborative tools, educational games and stimulation among others. These methods can help to create a more engaging and interactive learning experience for students, as well as making it easier for teachers to differentiate instruction and personalize learning based on the needs and abilities of individual students. This implies that the strategy can help to improve students' engagement, interest, retention and achievement while also providing teachers with more effective tools resources to support their teaching efforts. Thereby, helping students to build their knowledge and develop competencies in order to suffice these expectations and to perform crucial learning experience, various learning models, pedagogical approaches and technologies should be utilized.

Gerstein (2014) define technology enhanced teaching strategy is an innovative onsite teaching, and method making with intensive use of technology. This strategy is based on the consequently and permanently use multiple devices (Laptop, tablets or similar devices) during class. Multimedia based materials is excellent to the use in technology enhanced classes. This implies that technology is playing important role today and making education more individualized. The colleges of education are preparing metalwork technology students with new teaching job needs and enable them to respond to new challenges with the support of technology enhanced teaching tools. Focusing on the utilization of technology, it can be found where students acquire knowledge through finding information, resources and asking questions. This makes teacher's role change to facilitator that guides students throughout their learning process. Pogorskiy (2015) stated that ICT can be a powerful tool for personalized learning as it

allows learners access to information in practical skills and process of solving practical work which tend to improve learning achievement.

Academic achievement is best described as the students' examination grade that can be ascertained through scores at the end of the programme as a result of the out coming teaching and learning process. In a similar vein, Ogunbote & Dawodu (2023) described academic achievement as the outcome that include the extent to which a student accomplished specific goal based on the focus of activities in school. The academic achievement is further defined as the student's grade obtained at the end of a programme. Ogbonna & Ismaila (2021) sees Academic Achievement as the level of performance of an individual in a particular field of study. But achievement of instructional goal in metalwork technology is summarized as the testing of skills and competences achieved. It is an indisputable fact that the TETS improves new strategies of teaching and enable the students to master the knowledge matter. Mastering the skills and knowledge of metalwork technology is an indicator of the effect of teaching method used in imparting knowledge to the students.

The metalwork Students are expected to improve and demonstrate their skills and competencies in the content before they can be allowed to proceed to the next level. As a result, new demand for skilled manpower-needs will be created in metalwork technology education. Thus, emphasis in metalwork technology education and other related trades thereby increase practical knowledge and skills. The employment requirement of metalwork technology teachers in colleges of education in southwest, Nigeria will be based on practical and applied skills in Metalwork Technology Education. The problem of high unemployment of metalwork graduates is due to insufficient practical skills. The concern to improve the required practical skills is necessary in order to overcome these challenges. This suggest that practical skills should be taught in accordance with its component knowledge and skills for effective

teaching. Many instructional models posited the required steps to teach practical skills, it is obvious that these models for teaching practical skills are not explicit enough, not practicable and appear inapplicable in teaching metalwork. The gap is expressed by teaching guide operated by TVET colleges for skilled job in Nigeria is said to be adequate for teaching theoretical contents and inadequate for practical skills components (Olaitan, Asogwa & Abu, 2013). Hence, the paper attempt to examine the effect of technology enhanced teaching strategy on academic achievement of metalwork technology students in colleges of education in southwest, Nigeria.

Statement of the Problem

The curriculum of NCCE accredited Colleges of Education in Nigeria ascribed great importance to the teaching and learning of Metalwork Technology programme at the Nigeria Certificate in Education (NCE) level. This implies that emphasis has been placed on the acquisition of practical skills in order to meet the scientific and technological desires of the nation. However, these desires towards the nation building technologically have not been fully met over the years due to some problems bordering on teaching methodologies at the Colleges of Education and other tertiary institutions in Nigeria. Teaching and learning of technical subjects especially Metalwork Technology continue to suffer as a result of over dependence on lecture method alone and the use of lecture method which has become almost a traditional method of instruction in tertiary institutions in Nigeria is widely being criticized. Its criticisms mostly surround its failure to meet the demands of students in the effective learning of needed practical skills for challenges of the workforce (Dawodu & Ogunbote, 2023).

The failure of this lecture and other non-digital instructional methods have resulted into ineffective teaching, poor academic achievement, low interest in learning, retention and poor performance on the job and making the attainment of the

scientific and technological objectives of the Nation difficult to achieve. In view of these aforementioned challenges, the quest for technology enhanced teaching strategy (TETS) as an appropriate alternative to teaching of metalwork technology becomes utmost importance which has necessitated this study.

Purpose of the Study

The main purpose of this study was to investigate the effect of Technology Enhanced Teaching Strategy (TETS) on achievement of metalwork technology (MWT) students in colleges of education in Southwest, Nigeria. Specifically, the study sought to find out:

1. Mean achievement scores of the students taught Metalwork Technology (MWT) with Technology Enhanced Teaching Strategy (TETS) and those taught with conventional Teaching method (CTM).
2. The mean interest scores of the MWT students taught with the TETS and those taught MWT using CTM.

Research Questions

The following questions guided the study:

1. What are the mean achievement scores of the students taught Metalwork Technology (MWT) with Technology Enhanced Teaching Strategy (TETS) and those taught with Conventional Teaching Method (CTM)?
2. What are the mean interest scores of students taught MWT with TETS and those taught using CTM)?

Research Hypotheses

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

Ho1: There is no significant difference in the mean achievement scores of students taught

Metalwork Technology (MWT) with Technology Enhanced Teaching Strategy (TETS) and those taught MWT with the Conventional Teaching Method (CTM).

Ho2: There is no significant difference in the mean interest scores of students taught MWT with TETS and those taught MWT with CTM.

Methodology

Post-Test quasi experimental research design was used for the study. Sambo, (2008) described Post-Test quasi experimental design as the Ex- Post Facto research design which requires two assigned groups of respondents, each assigned to different conditions and uses post-test only without any pre-test to generate data for the study. The researchers compare the data of the respondents that experience the use of Technology Enhanced Teaching Strategy (TETS) and those that used the lecture method and establish the cause of the difference between the groups in the study. This study was carried out in Four (4) NCCE accredited Colleges of Education that offer Metalwork Technology programme at NCE level in the Southwest geo-political zone of Nigeria. These institutions include Federal College of Education (Technical), Akoka, Lagos state; Oba Sikiru Adetona College of Science and Technology Education, Omu Ijebu, Ogun State; Pa Alayande College of Education, Oyo.

Oyo State and Kwara state College of Education (Technical), Lafiagi, Kwara state. The population for the study consisted of all the 200 level students of Metalwork Technology of NCE programme in the five NCCE accredited Colleges of Education offering the programme in the Southwest Geo-political zone of Nigeria. The stratified random sampling technique was used to generate 101 respondents from the classes of the participating Colleges of Education for both the experimental and control groups to represent the entire population of the study. A Metalwork Achievement Test (MEWAT) instrument was developed by the researchers and was subjected to face and content

validation by Three (3) Metalwork Technology lecturers from the department of Industrial Technical Education, Tai Solarin University of Education, Ijagun Ijebu, Ogun State using a 40-item test instrument. All observations, suggestions and corrections were incorporated in the final draft of the instrument used for the study. The mean scores of the students' achievement in both the control and experimental groups in the pilot study which was carried out in Delta State College of Education using students of NCE 200 level assigned to each group. The reliability of the test instrument (MEWAT) using Pearson's product moment correlation coefficient to determine the reliability coefficient. The reliability values established were 0.86 and 0.87 for the control and experimental groups respectively. Before the treatment, the pre-test which was the achievement test on selected metalwork technology topics were administered on the two groups before the treatment. The experimental group was taught using TETS while the control group were taught using conventional teaching method.

The pre-test was administered in the first week to the two groups. The instrument MEWAT and MWTII consisting of 30-items objective test were administered to both the experimental and control groups for the study. Post-test of the two groups (both Experimental and Control groups) were analysed using Mean and Standard deviation and was used to answer the two research questions while t-test statistics tool was used to test the two hypotheses at 0.05 level of significance. Data used in the study were analysed using Statistical Package for Social Sciences (SPSS) software.

Results

Research Question one

What are the mean achievement scores of students taught MWT with Technology Enhanced Teaching Strategy (TETS) and those taught with Conventional Teaching Method (CTM)?

Table 1: Mean Score and Standard Deviation of Control and Experimental Groups in Post-Test MEWAT.

Groups	N	Post-test	SD
Experimental	61	26.57	3.09
Control	40	16.72	3.70

Table 1 shows that the mean post-test scores 26.57 of the students taught using TETS is higher than Post-test mean scores of 16.72 for those taught with conventional teaching method. This indicates that TETS is more effective and that students taught with Technology Enhanced Teaching Strategy have higher academic achievement when

compare with students taught using the conventional teaching method.

Research Question Two

What are the mean interest scores of students taught MWT with Technology Enhanced Teaching Strategy and those taught with Conventional Teaching Method?

Table 2: Mean Score and Standard Deviation of Control and Experimental Groups in Post-Test Metalwork Technology Interest Inventory

Groups	N	Post-test	SD
Experimental	61	26.66	2.99
Control	40	16.66	3.76

Table 2: Shows the post-test interest mean scores 26.66 of students taught metalwork technology using TETS which was higher than post-test interest mean score of 16.66 of students taught using lecture method. This implies that metalwork technology students taught with Technology Enhanced Teaching Strategy developed more interest than those taught MWT using Conventional Teaching Method.

Hypothesis one

Ho1: There is no significant difference in the mean achievement scores of students taught Metalwork Technology (MWT) with Technology Enhanced Teaching Strategy (TETS) and those taught MWT with the Conventional Teaching Method (CTM).

Table 3: Summary of t-test analysis of significant difference in the mean achievement scores of students taught Metalwork Technology (MWT) with Technology Enhanced Teaching Strategy (TETS) and those taught MWT with the Conventional Teaching Method (CTM).

Groups	N	Post-test (x)	SD	df	t-cal	t-crit	decision
Experimental	60	26.57	3.09	99	13.87	1.96	significant
Control	41	16.72	3.70				

The result in table 3 shows that, the mean Achievement scores of students taught MWT with TETS was 26.57 and standard deviation of 3.09 whilst the students taught MWT with Conventional teaching method had a mean score of 16.72 and a standard deviation of 3.70. The table also revealed that, the calculated t-value obtained was 13.87 while the t-critical value at 0.05 level of significance was 1.96. Since the calculated t-value of 13.87 is greater than the t-critical value of 1.96, therefore there is a significant

difference between the academic achievement of the experimental and control groups. Thus, the hypothesis that states there is no significant difference in the mean achievement scores of students taught Metalwork Technology (MWT) with Technology Enhanced Teaching Strategy (TETS) and those taught MWT with the Conventional Teaching Method (CTM).is hereby rejected in favour of the experimental group since students taught with TETS obtained a higher mean score in MEWAT.

Hypothesis Two

H O 2: There is no significant difference in the mean interest scores of students taught

MWT with TETS and those taught MWT with CTM.

Table 4: Summary of t-test analysis of significant difference in the mean interest scores of students taught MWT with TETS and those taught MWT with CTM.

Groups	N	Post-test (x)	SD	df	t-cal	t-crit
Experimental	60	26.66	2.99	99	14.08	1.96
Control	41	16.66	3.76			

The result presented in table 4 shows that, the mean interest scores of students taught MWT with TETS was 26.66 and standard deviation of 2.99. The students taught MWT with Conventional teaching method had a mean score of 16.66 and a standard deviation of 3.76. The table also revealed that, the calculated t-value obtained was 14.08 while the t-critical value at 0.05 level of significance was 1.96. Since the calculated t-value of 14.08 is greater than the t-critical value of 1.96, there is a significant difference between the students' interest of the experimental and control groups in metalwork technology. This hypothesis that states there is no significant difference in the mean interest scores of students taught MWT with TETS and those taught MWT with CTM is hereby rejected and is in favour of the experimental group students since they obtained a higher mean score in Metalwork Interest Inventory (MWII).

Findings

In research question one, the results of the students' academic achievement in Metalwork technology in the experimental group taught with TETS had higher academic achievement compared with students taught MWT using conventional teaching method. This implied that the students in the experimental group that were taught MWT using TETS performed better than those in the control group. This was because the students taught with MWT TETS obtained higher mean score of 26.57 as compared to the mean score of 16.72 in the control group. In MWAT. In

research question two, the results of the students' interest taught metalwork technology had post-test Interest mean scores of 26.66 in experimental group while the control group had post-test interest mean scores of 16.66. The findings in research question 2 revealed that, the students in control group interest was too low when compare with their counterparts in the experimental group. Using TETS in teaching metalwork had motivated and aroused the student's interest greatly. The findings in research hypothesis one revealed that, there was a significant difference in the academic achievement of students taught Metalwork technology with Technology Enhanced Teaching Strategy and those taught with the conventional teaching method at the Colleges of Education Level in southwest Nigeria. This hypothesis was rejected since the calculated t-value (13.87) was greater than the table t-value (1.96) obtained at 0.05 level of significance. The findings in research hypothesis two revealed that, there was a statistically significant difference in the mean performances of the students in control group and experiment group taught MWT with TETS and CTM. This hypothesis was rejected because the calculated t-value (14.08) was greater than the t-critical value (1.96) at 0.05 level of significance. The significant difference was in favour of the students taught MWT with TETS since they obtained higher mean score compared to their counterparts in the control group taught with conventional teaching method.

Discussion of Findings

The findings revealed that the Metalwork Technology Students in the experimental group taught with TETS performed better than those students taught metalwork technology in the control group using conventional teaching method performed far below. This finding was in line with that of Dawodu & Ogunbote (2023) which revealed that, the students in the experimental group taught metalwork technology using activity –based instructional approach performed better than those students in the control group that were taught using conventional method of teaching. The findings of Dawodu & Ogunbote were in conformity with the experimental group students' mean scores that were greater than that of their counterparts in the Control group. Similarly, this finding was also in agreement with the study of Ado & Amoor (2021) who found that effectiveness of blended learning model technologies in increasing the achievement of students' skills and developing the practical performance of skills. The findings revealed that, the students in the experimental group taught with blended learning model technologies performed better than the students in the control group that were not exposed to this model. The finding also revealed that technology enhanced teaching strategy are not utilized in Colleges of Education in southwest, Nigeria. This is in line with the findings of Karzan, Chra, and Nsar (2017) who found that average of students' GPA in classroom technology is 83.3%, but in the classroom without technology decrease to 60.4%, the result also showed that the learning increased 22.9% by using technology. They further stated that besides all, students were highly motivated and boost their interest. By extension, the students with technology based enjoyed and participated actively in classroom technology and most of them learned more material with technology.

The students' academic achievement in colleges of education cannot be compare with other institutions where the technology enhanced teaching facilities were available and adequate in number and quality for staff

and students. In hypothesis one, the findings revealed that, there was a significant difference in the academic achievement and interest of students taught MWT with TETS and those taught with lecture method. This finding was in agreement with the study of Wright (2017) who conducted research to investigate the blended learning students' perception of face to face and online EFL lessons. An analysis of covariance on the post-test scores with pre-test scores as covariates showed that, the TI plus CAI group performed significantly better than the TI alone group. The findings indicated that, there was a statistically significant difference in the performances of the subjects in the experimental and the control groups. In hypothesis two, the finding revealed that there is significant effect of TETS to stimulate students' interest in the experimental group compare with those taught with lecture method. This finding was in agreement with that of Ezenwafor, Onwusa & Eze (2020) that also conducted study to assess the effect of Computer Assisted Instruction on Students Academic Achievement and Interest of Auto-Mechanics Technology in Technical Colleges. They further agreed that the students taught MWT with TETS in experimental group differed significantly from control group in students' interest skills in favour of the experimental group. Nwokolo, Anyachebelu, and Anemelu, (2012) which found a significant difference in the knowledge retention mean posttest scores of students with computer stimulation technique and those taught with demonstration method in favour of the experimental group. The finding was also in agreement with the study of Nwocha and Tanko reported in Umeoduagu (2000) on the State of resources for Communicating Science, Mathematics and Technology in State Schools in Niger State. The study revealed that, the state and private schools lacked adequate human and materials resources for teaching and learning Science, Mathematics and Technology. They observed that, the situation is similar to other states and negatively affects the performance of students in such schools.

Conclusion

Based on the revealed findings of this study that technology enhanced teaching strategy improves students' academic achievement and interest using appropriate technologies in teaching metalwork technology for the award of Nigeria Certificate in Education (NCE) at Colleges of Education level. The developed TETS used in the study for teaching has significant influence on students' academic achievement and interest in MWT at NCE programme level. The owners of public colleges of education also have significant influence on the academic achievement and interest of students taught MWT with TETS when compare with the use of conventional methods which has always been the usual practice at the colleges of education level. This could be in terms of implementing the recommendations of NCCE teams at the end of every programme accreditation carried out by technology enhanced teaching facility provisions and quality of teaching staff employed.

Recommendations

The following recommendations were made based on the findings of the study.

- i. The proprietors of public owned Colleges of Education offering NCCE accredited metalwork technology NCE programme should ensure that, the institutions have adequate number of functional technology enhanced teaching facilities for teaching and learning. The Centre should also have active internet facilities that promote effective learning.
- ii. All students and teaching staff of colleges of education should be computer literate to enable them use TETS for instructions and learning. Also, lecturers in institutions of colleges of education should be computer literate to be able to develop Computer-Assisted Instructional packages and use them to teach students,

- iii. Educational institutions such as Colleges of Education and other institutions should organize seminars, workshops and conferences on digital teaching methods for Lecturers. This will keep them abreast of current and relevant teaching methods that will meet the needs of contemporary society and students.
- iv. The use of TETS packages should be made compulsory for teaching Metalwork Technology in colleges of education.
- v. National Commission for Colleges of Education (NCCE) should adopt and enforce the use of TETS as a model for designing similar packages for teaching other courses.

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