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Effect Of Laboratory Teaching Method On Students' Achievement In Woodwork In Technical Colleges In Delta State

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ABSTRACT
This study investigated laboratory teaching method and students' achievement in woodwork in Technical Colleges in Delta State. The study utilised a pre-test, post-test non-equivalent control group quasi-experimental design. The study's population comprised 6,126 vocational II students from all the Technical Colleges in Delta State. The study employed purposive sampling technique to choose a sample of 105 vocational II students from two Technical Colleges. The data gathering instrument utilised was the Woodwork Achievement Test (WAT). The reliability of the WAT was determined using the Kuder-Richardson 21, which resulted in a coefficient index of 0.79. The data acquired were analysed utilising measures of central tendency such as mean and standard deviation, as well as a statistical test known as t-test. The analysis revealed that there was a notable disparity in the average achievement scores between students who were taught woodwork using the laboratory teaching method and those who were taught using the lecture method. The scores were higher for students taught with the laboratory teaching method. Additionally, there was no significant difference in the average achievement scores between male and female students who were taught woodwork using the laboratory teaching method. The study recommended that educators in Technical Colleges should effectively include laboratory practical activities into their classroom instruction in order to minimise the level of abstraction in the concepts being learned.
Keywords: Laboratory, Laboratory Teaching Method, Students' Achievement, Woodwork

INTRODUCTION

Woodwork is a vocational course offered in Technical Colleges that focuses on practical skills. Woodwork mostly involves the utilisation of timber. Wood is a substance obtained by cutting a complex living organism known as a tree. Before being cut into logs, trees are initially felled. Aliyu (2014) emphasised that these logs are then transformed or cut into different dimensions, rendering them appropriate for building and construction needs. Woodwork is the skilled craft of creating wooden products for use in structures or rooms, including doors, windows, roofs, beds, cupboards, chairs, and tables. Woodwork encompasses the study of timber technology, safety protocols within workshops, the utilisation of tools, and the categorization of materials such as nails, adhesives, and fittings, along with their respective applications. The practical aspects of woodwork include timber preparation,

classification, building joints, forestry and tree products, woodturning, and the repair and maintenance of tools and equipment (Rix, Has & Teixeira, 2008).

Crafting objects from wood is one of the most ancient and enduring professions in human history. Woodwork, as defined by the National Policy on Education (Federal Government of Nigeria [FGN], 2004), encompasses the use of both machine and hand tools in activities such as carpentry, joinery, upholstery, and furniture manufacturing. In previous times, woodwork personnel held a key role in the house building sector as they served as the architects, constructors, and decorators of the home. Woodwork students acquire versatile abilities that can be applied in both workshop and on-site settings, as stated by the Scottish Further Education Unit in 2005. A joiner can produce a wide variety of components, such as doors, screens, windows, and stairs, at a workshop bench. On the construction site, a carpenter will be responsible for constructing various elements of a building, such as partitions, floors, and roofs. Additionally, they will install components that have been crafted by a joiner (Ekunke, 2008). The art of woodworking is rooted in a genuine and palpable heritage, which entails the utilisation of detailed blueprints. Preliminary proficiency in practical geometry, known as working drawings, is essential prior to engaging in the diverse tasks of carpentry and joinery. The development of this talent is imperative and can be obtained through institutions of education (Okoro, 2006).

Technical colleges have the duty of imparting students with the knowledge, mindset, and abilities necessary for securing profitable employment in the workforce (Odu, 2013). Additional establishments in Nigeria that offer technical education include Colleges of Education (Technical), Polytechnics, and Universities. They provide comprehensive training designed to equip students for admission into a wide range of professions (Okoro, 2006). According to Ekunke (2008), woodwork necessitates students to possess technical abilities in order to excel in several aspects, such as the proper utilisation and upkeep of hand and power tools for a specific task. These skills can only be learned when students are exposed to a wide range of practical tasks. The laboratory teaching technique is a teaching approach that emphasises practical practice.

Dienye and Gbamanja (1990) noted that the laboratory technique of teaching is an educational strategy that involves a two-way approach conducted by one or more individuals through the use of exercises and experiments. Both of these approaches are valuable for teaching purposes. The experimental approach allows students to get information through the use of experimental procedures. These processes need meticulous monitoring and evaluation of data. It possesses the attributes of inquiring, exploring, and challenging the unfamiliar.

According to Omiko (2015), the utilisation of laboratory facilities in education provides the following advantages:

i. Laboratory instruction enables students to get an awareness of the principles and practices of science and technology, which in turn promotes their knowledge of scientific endeavours and enhances their aesthetic and intellectual comprehension. Dienye and Gbamanja (1990) asserted that science is a methodology that involves observing natural occurrences, quantifying the observations, integrating the quantities, and interpreting the results to derive meaningful insights. The kids possess the ability to recognise cause and effect linkages, which aids in the development of crucial abilities.
ii. Acquiring scientific inquiry abilities that may be applied to many problem-solving contexts (i.e., developing problem-solving skills). One fundamental objective of technical education is to provide students with abilities that can be readily utilised in many real-life scenarios in the future. Therefore, it may be inferred that the process of transferring learned conditions must share certain similarities with the situation in which it would be used.
iii. Students are developing an appreciation for and actively imitating the role of the scientist by acquiring practical skills. The pupils should be granted permission to conduct investigations through: (a) Indirectly observing objects and materials to develop both mental and manipulative skills, such as measuring substances and utilising weighing balances, images, cylinders, etc.; (b) Through iterative experimentation, students can arrive at valuable findings

by manipulating objects and engaging in activities without relying on explicit theories; (c) Students can be directed by the teacher to investigate specific phenomena within a given theory, and based on these observations, create predictions that are probable to happen.

iv. Cultivating interests, attitudes, and values by reflecting on the nature of learning. A field experience has the greatest potential to stimulate a lifelong interest in kids when they are given the opportunity to personally handle genuine objects. Students' curiosity and desire to investigate and explore their environment leads to an increased interest in learning.

In his 2006 study, Hassan advocated for the implementation of a laboratory technique in the teaching of Basic Technology principles. This approach was found to facilitate students' acquisition of knowledge through hands-on encounters with tangible objects. Under these circumstances, the ambiguous hypotheses and hypothetical entities materialise, leading to enhanced comprehension and performance among the students. The utilisation of drill and verbal recitation as a teaching approach results in a tedious and uninspiring learning experience, which fails to foster motivation for continued learning. Therefore, it is crucial to enhance performance in order to assess their impact on the teaching and learning of woodwork.

According to Adeniran (2006), laboratories offer a fresh method for learning science by providing a non-threatening, realistic, and concrete approach, which contrasts with the challenges faced when learning the formal and abstract treatment found in standard textbooks. According to Yadar (2007), students learn most effectively when they are provided with the chance to visually perceive and observe the content being taught to them. The laboratory teaching approach allows students to engage their senses, enabling them to achieve the objectives set by the teacher by the end of the lesson. Whether they are tangible or symbolic, these resources imbue the learning content with significance, ensuring its preservation and enabling information to be disseminated to a limitless number of learners. The utilisation of the laboratory teaching technique offers some advantages compared to the lecture method, which has been traditionally employed for teaching technical education subjects for a considerable period of time.

The lecture technique has been the primary mode of instruction in Nigerian Secondary Schools (Nwabufor, 2005). This approach promotes the mastery of course material by encouraging learners to engage in repetitive practice of facts and drills (Anyafulude, 2014). The strategy ensures timely completion of the course outline, but inadvertently promotes rote memorization and reproduction of learning content rather than deep understanding and integration. Ajaja (2009) characterised the lecture method as a "talk-chalk" method. Additionally, he asserted that the lecture method is applicable to any class size, although it is commonly employed in big classrooms. The lecture method of teaching is a teacher-centered approach in which students receive instruction from the teacher with minimal or no active participation (Roediger & Marsh, 2005). The lecture method is a pedagogical technique that places the teacher at the centre of the teaching and learning process. In this method, the instructor is regarded as an authoritative figure who imparts knowledge to pupils, while the students themselves make minimal or no contributions to the instructional process. Adegoke (2011) criticised the lecture technique, arguing that it mainly benefits diligent pupils. This could explain the frequent occurrence of low academic performance in public exams.

Academic achievement pertains to the level of success a student can attain through the completion of coursework in an educational institution. According to Stiggings (2001), academic achievement refers to the actions or accomplishments of a learner in educational settings such as school, college, or university, including activities in class, laboratories, or field work. According to Wentling (2000), academic performance pertains to individuals' attainment of different forms of knowledge and abilities. Academic achievement typically pertains to the extent or amount of accomplishment or expertise achieved in academic endeavours (Arora, 2016). It motivates the students to exert effort and acquire further knowledge. Academic achievement pertains to a student's educational progress, encompassing the acquisition of knowledge and the development of abilities during their academic journey. This progress is evaluated by educational institutions through the use of tests, either created by teachers or standardised. Several research have demonstrated that the laboratory teaching technique has a substantial positive

impact on students' academic performance in several subjects, such as Technical Education (Katcha & Wushishi, 2015; Nwangi, 2016).

Students' gender has been found as another characteristic that affects their achievement in woodwork. Sex encompasses the biological and psychological traits that distinguish males and females, categorising them as distinct sexes (Prince, 2005). The term "sex" in this study specifically pertains to students who are either male or female. Sexual concerns in education have continued to be a subject of interest for numerous studies. The literature presents varying outcomes on the impact of laboratory teaching methods on the academic performance of male and female students. This differing viewpoint serves as one of the justifications for conducting this investigation. Put simply, the study aimed to investigate if the laboratory teaching method has a differential impact on the achievement of male and female students. However, it is important to note that in this study, sex is considered a moderator variable. This study was conducted to investigate the effect of laboratory teaching method on students' achievement in woodwork in Technical Colleges in Delta State.

Statement of the Problem

Technical colleges play a crucial role in producing highly skilled and competent workforce for the wood industry. Graduates from Technical Colleges are expected to possess the necessary abilities to excel in their respective fields of study. Nevertheless, a significant portion of the graduates from Technical Colleges lack proficiency in applying their skills in practical settings. A significant number of Technical College graduates, particularly those specialising in woodwork, are currently unemployed. The reason they are unemployed is not due to a lack of work prospects, but rather because they lack the necessary skills to secure teaching and industrial positions that are currently accessible. Furthermore, this implies that Technical College graduates lack the necessary skills to secure career opportunities as they are not self-sufficient.

Regrettably, despite the government's extensive efforts to guarantee a high standard of education at Technical Colleges and produce highly skilled individuals in both academics and employability, there have been consistent reports of a significant rate of student failure. The current increase in student failure rates may be related to the students' inadequate performance in woodwork practicals. According to Abdullahi (2010), the reason why students lack the practical abilities needed to establish and manage their careers is because there is a growing disconnect between their classroom experiences and the actual work environment as a result of ineffective teaching method adopted by instructors. Hence, this study aimed to examine the effect of the laboratory teaching method on students' achievement in woodwork at Technical Colleges in Delta State.

Purpose of the Study

The primary objective of the study was to examine the impact of the laboratory teaching approach on students' academic performance in woodwork. The study aimed to ascertain the following:

1. Whether there is a disparity in the average achievement scores of students who were taught woodwork using the laboratory teaching method compared to those taught using the lecture method.
2. Whether there is a disparity in the average achievement scores of male and female students who were taught woodwork using the laboratory teaching method.

Hypotheses

Two hypotheses were formulated and evaluated at a significance level of 0.05.

1. There is no statistically significant disparity in the average achievement scores of students who were instructed in woodwork using the laboratory teaching approach compared to those who were taught using the lecture method.
2. There is no statistically significant disparity in the average achievement scores of male and female students who were instructed in woodwork utilising the laboratory teaching method.

RESEARCH METHODS

The study utilised a pre-test, post-test non-equivalent control group quasi-experimental design. Table 1 displays the design model.

Table 1: Design of the Study

Group	Pre-test	Treatment	Post-test
Laboratory teaching method (Exp)	O_1	X_1	O_2
Lecture (Ctrl)	O_3	X_2	O_4

Where,
O_1 = pre-test of laboratory teaching method group
O_2 = post-test of laboratory teaching method group
O_3 = pre-test of lecture method group
O_4 = post-test of lecture method group
X_1 = Treatment with laboratory teaching method
X_2 = Treatment with lecture method

The population of the study consisted of 6,126 vocational II students enrolled in all the Technical Colleges in Delta State. The study included a sample size of 105 vocational II students who were selected from two Technical Colleges using the purposive sampling technique. The data gathering instrument utilised in this study was the Woodwork Achievement Test (WAT). WAT was assessed for reliability using the Kuder Richardson 21, resulting in a reliability coefficient of 0.79. The intervention in this study consisted of instructing the students in the experimental group in woodwork using the laboratory teaching method, whereas the students in the control group were instructed in woodwork using the lecture method. Prior to the intervention, pre-test was conducted using the Woodwork Achievement Test (WAT). Following the treatment, post-test was provided using the same test. The acquired scores were collected and analysed using statistical measures such as mean, standard deviation and t-test.

RESULTS

Hypothesis 1

There is no statistically significant disparity in the average achievement scores of students who were instructed in woodwork using the laboratory teaching approach compared to those who were taught using the lecture method.

Table 2: t-test comparison of pre-test achievement scores for laboratory and lecture-taught woodwork students

Group	N	$\bar{x}$	SD	df	t-cal.	Sig. (2-tailed)	Decision
Laboratory method (expt)	49	22.20	9.39	103	0.317	0.752	Not Significant
Lecture method (ctrl)	56	22.79	9.37				

Table 2 indicates no statistically significant distinction in the average achievement scores before the test between students who were taught woodwork using the laboratory teaching technique and those who were taught using the lecture approach. The t-value is 0.317, and the p-value (0.752) is greater than 0.05. Thus, the first null hypothesis was examined using a t-test.

Table 3: t-test comparison of post-test achievement scores for laboratory and lecture-taught woodwork students

Group	N	$\bar{x}$	SD	df	t-cal.	Sig. (2-tailed)	Decision
Laboratory method (expt)	49	60.47	14.45	103	3.119	0.002	Ho_1 is rejected
Lecture method (ctrl)	56	51.46	15.02				

Table 3 shows a notable disparity in the average achievement scores after the test between students who were taught woodwork using the laboratory teaching technique and those who were taught using the lecture approach. The statistical analysis yielded a t-value of 3.119 and a p-value of 0.002, which is less than the significance level of 0.05. Therefore, HO_1 is rejected. Consequently, there exists a substantial disparity in the average achievement scores of students who were instructed in woodwork using the laboratory teaching technique compared to those who were taught using the lecture method. The laboratory teaching method yielded superior results for the students.

Hypothesis 2

There is no statistically significant disparity in the average achievement scores of male and female students who were instructed in woodwork utilising the laboratory teaching method.

Table 4: t-test comparison of post-test achievement scores of male and female laboratory-based woodwork students

Sex	N	$\bar{x}$	SD	df	t-cal.	Sig. (2-tailed)	Decision
Male	30	59.97	14.94	47	0.303	0.763	Ho_2 is rejected
Female	19	61.26	14.02				

Table 4 indicates no statistically significant disparity in the average achievement scores of male and female students who were taught woodwork using the laboratory teaching technique. The t-value is 0.303, and the p-value (0.763) is greater than the significance level of 0.05. Therefore, HO_2 is accepted. Consequently, there is no substantial disparity in the average achievement scores between male and female students who were instructed in woodwork utilising the laboratory teaching approach.

DISCUSSION

The initial discovery of this study indicates a substantial disparity in the average achievement scores between students instructed in woodwork using laboratory teaching method and those instructed using lecture method, with a preference for students taught with laboratory teaching method. These findings suggest that students who were instructed in woodwork using the laboratory teaching method had better results compared to their peers who were taught using the lecture method. This can be attributed to the fact that the laboratory teaching technique offers students the chance to engage in a range of practical tasks, such as manipulating equipment, apparatus, specimens, and live things, in order to obtain a deeper understanding of woodwork principles. Consequently, the students were actively engaged in the process of both teaching and learning. The utilisation of the laboratory teaching approach not only offers additional information to students as a supplement to classroom instruction, but also facilitates the process of students solidifying their understanding of abstract concepts learned in the classroom. The greater achievement scores of students who were taught woodwork using the laboratory teaching approach (experimental) compared to their counterparts who learned with the lecture method (control) may be attributed to the practical work they were exposed to. This study's finding supports the conclusion reached by El-Rabadi (2013). In a study conducted by El-Rabadi (2013) titled "Effects of laboratory experiments on grade 10 students' achievement in Physics," it was found that students who were taught Physics together with laboratory experiments outperformed their peers who were taught Physics without laboratory experiments. This discovery provides additional support to the findings of Alake (2015), who observed that students who were taught using laboratory instructional strategies achieved higher academic outcomes compared to those who were taught using standard teaching methods.

The study ultimately demonstrated no substantial disparity in the average achievement scores between male and female students who were instructed in woodwork utilising the laboratory teaching approach. This suggests that the laboratory teaching approach is not influenced by gender. Put simply, the laboratory teaching technique has an equal positive impact on the academic performance of both male and female students in the field of woodwork. The observed phenomenon may be attributed to the laboratory teaching style, which encourages active student engagement in the teaching and learning process. The

equitable participation of both male and female students in the teaching and learning process likely contributed to their comparable achievement on the Woodwork Achievement Test.

CONCLUSION

The study concluded that laboratory teaching method significantly enhances students' academic performance compared to traditional lecture-based instruction. The laboratory teaching method did not show a significant difference in terms of students' achievement in woodwork between males and females. Put simply, the laboratory teaching method improves the average achievement scores of both male and female students to a similar extent.

RECOMMENDATIONS

The study recommended the following based on its findings:

1. In order to minimise the abstract nature of learned concepts, it is important for instructor at technical colleges to effectively incorporate laboratory practical tasks alongside classroom instruction.
2. Administrators of technical institutions should ensure that all schools have sufficient laboratory facilities in order to enhance students' learning.
3. Technical colleges' teachers should strive to improvise laboratory materials to ensure effective implementation of laboratory method of teaching.

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