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Effects of Constructivist Instructional Approach on Woodwork Students' Academic Achievement and Retention in Government Technical Colleges in Kano State, Nigeria

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Abstract: The main purpose of this study was to investigate effect of constructivist instructional approach on woodwork students' academic achievement and retention in government technical colleges in Kano state, Nigeria. The study adopted quasi-experimental research design in which intact classes were used. Two research questions were raised to guide the study, two hypotheses were formulated and tested at 0.05 level of significance. The sample size was 50 students selected from the two technical colleges in the state. The instrument used for data collection was Woodwork Achievement Test (WWAT) which was validated by three experts with a reliability coefficient of 0.71. Mean was used to answer the research questions while ANCOVA was used to test the null hypotheses. The study found that students in experimental group performed higher than those in control group with 17.18 mean differences. This implies that constructivist instructional approach is more effective than demonstration method in teaching woodwork. The study among others recommends that government and ministry of education should encourage the use of constructivist instructional approach in teaching woodwork trade in Government Technical Colleges in Kano State, Nigeria. National Board for Technical Education should consider reviewing its curriculum to incorporate constructivist method of teaching her programs.

Key words: Constructivist Instructional Approach, Academic Achievement, and Academic Retention

INTRODUCTION

Technical colleges occupy a strategic position in national development through their mandate to produce skilled craftsmen and master craftsmen capable of meeting the demands of industry and self-employment. In Nigeria, technical colleges are established to provide trained manpower in applied sciences, technology, and business at craft, advanced craft, and technician levels (Federal Republic of Nigeria [FRN], 2013). These institutions are equivalent to senior secondary schools and are specifically designed to equip learners with practical skills, basic scientific knowledge, and appropriate work attitudes required for effective performance in various trades (Samuel & Puyate, 2022). Consistent with this view, Gana, Ubale, and Armaya'u (2023) describe technical colleges as institutions where students acquire occupational skills through structured learning experiences that integrate classroom instruction with workshop-based training.

Technical and vocational education involves the study of technologies and related sciences alongside the acquisition of practical skills, attitudes, and knowledge relevant to diverse economic and social occupations (FRN, 2013). The core objective of technical colleges is therefore to prepare graduates for the realities of the workplace by developing competence in the operation, use, and maintenance of tools and equipment.

Furniture Making and General Woodwork, as a practical-oriented trade subject requires instructional strategies that promote active engagement, conceptual understanding, and skill mastery. Traditional teacher-centered methods, which emphasize passive reception of information, may be inadequate for developing the practical competence, academic achievement, and long-term retention

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required in vocational education. In response to this challenge, constructivist instructional approaches have gained prominence as learner-centered strategies that emphasize active participation and meaningful learning. Constructivism shifts the focus of instruction from the teacher to the learner, encouraging students to actively construct knowledge rather than receive it passively (Sarita, 2017). Within this approach, learners interpret new experiences based on their prior knowledge and actively engage in problem-solving, exploration, and reflection during the learning process.

Constructivism is rooted in the innate human tendency to make sense of the world through experience and interaction (Nwafor, 2020). It posits that learning occurs when individuals integrate new information with existing cognitive structures. Supporting this position, Oforma (2019) argues that learners should not be spoon-fed but rather guided to discover solutions independently through well-structured learning activities. Instruction becomes more effective when it stimulates learners' imagination, provokes critical thinking, and encourages active participation. Such conditions are particularly relevant to woodwork instruction, where hands-on activities, experimentation, and guided discovery are essential for developing practical skills and conceptual understanding.

Within the educational context, academic achievement is a key indicator of instructional effectiveness. It refers to the extent to which learners have attained specific educational goals, as measured through test scores, examinations, or teacher evaluations (Chaplin, 2014). Academic achievement reflects both the knowledge acquired and the skills developed in school subjects, including vocational trades. In technical education, high academic achievement signifies not only theoretical understanding but also competence in applying knowledge to practical tasks.

Closely related to academic achievement is retention, which refers to learners' ability to preserve and recall learned knowledge and skills over time. Retention is particularly critical in vocational and technical education, where sustained recall and application of skills are necessary for effective job performance. Retention is identifies by Mayer (2021) as a key indicator of meaningful learning and a prerequisite for skill mastery. In subjects such as woodwork, inadequate retention can hinder students' ability to transfer classroom learning to real-life technical tasks, resulting in poor performance and reduced career readiness. Consequently, instructional approaches that enhance both academic achievement and retention are essential for improving learning outcomes in woodwork education. Therefore, this study tries to determine the effects of constructivist instructional approach on woodwork students' academic achievement and retention in government technical colleges in Kano state, Nigeria

Statement of the Problem

There is declined in academic achieventamong students in technical subjects inNigerian technial colleges (Eze et al, 2015). This is of great concern to technicaleducators because of its relevance t o individual selfreliance and the national development(technological and industrial). The government t echnical colleges in Kano state are notexception, the shortage of skilled workers and a decline in the qu ality of constructions(woodwork)projects are of great concern. Diraso, et al., (2015) reported that most of the studentsgraduated from technical colleges had poor academic performance. This may be linked with the teachers' incompetence, teachers' methods of teaching, the inadequacy of trainingmaterial, ov er the crowd of students in the classroom to mention. The traditional methodsof teaching, which is use d in these colleges, may not be effective in engaging students andpromoting deep understanding of su bject matter, leading to a lack of interests andmotivation among graduates to pursue a career in the trade, (Tukur, Abba & Saidu, 2019).In an effort to address these challenges, this study explore alternativ e teaching strategiesthat can enhance student engagement and enhance academic performance, and ret ention.

Research Questions

i. What is the academic achievement scores of woodwork students taught woodwork using constructivist instructional approach and those taught with demonstration teaching method in government technical colleges in Kano State, Nigeria?

ii. What is the academic retention scores of woodwork students taught woodwork using constructivist instructional approach and those taught with demonstration teaching method in government technical colleges in Kano State, Nigeria?

Hypotheses

H_{01}: There is no significant difference in the academic achievement scores of woodwork students taught woodwork using constructivist instructional approach and those taught with demonstration teaching method in government technical colleges in Kano State, Nigeria.

H_{02}: There is no significant difference in the academic retention scores of woodwork students taught woodwork using constructivist instructional approach and those taught with demonstration teaching method in government technical colleges in Kano State, Nigeria.

METHODS

A quasi-experimental research design, specifically the pretest–posttest non-randomized control group design, was adopted for this study. This design is suitable for determining the cause-and-effect relationship between the variables under investigation when random assignment of participants is not feasible. In this study, students were grouped into an experimental group and a control group. The experimental group was taught using the constructivist instructional approach, while the control group was taught using the conventional demonstration teaching method. This design is shown below:

Experimental Group	01	X1	02	03
Control Group	04		05	06

O_1 = Pretest scores of the experimental group
O_4 = Pretest scores of the control group
O_2 = Posttest scores of the experimental group
O_5 = Posttest scores of the control group
O_3 = Retention test scores of the experimental group
O_6 = Retention test scores of the control group
X_1 = Treatment (Constructivist Instructional Approach) administered to the experimental group

The instrument used for data collection was the Woodwork Achievement Test (WWAT). The test consisted of 40 multiple-choice questions with four options (A–D). The items were adapted from past questions of the National Business and Technical Examinations Board (NABTEB) in woodwork. Students were required to select the correct option by circling the appropriate letter. Each correct response in the objective section carried one mark, giving a total of 40%, while the practical component accounted for 60% of the total score. The draft instrument was subjected to face and content validation by three experts: two from the Department of Technology Education, Modibbo Adama University, Yola, and one from the Furniture Making and General Woodwork Department, Government Technical College, Kano State. To determine the reliability of the instrument, the test was administered to non-participating woodwork students at Government Technical College, Hadejia. A reliability coefficient of 0.71 was obtained using the Kuder–Richardson Formula 21 (KR-21), indicating that the instrument was reliable for the study.

The data were collected by the researcher with the help of research assistants using a series of experimental procedures:

Step 1: Presentation of Introductory Letter
Step 2: Assignment of Research Assistants
Step 3: Distribution of Lesson Plans
Step 4: Administration of Pretest
Step 5: Administration of Treatment
Step 6: Administration of Posttest
Step 7: Administration of Retention Test

Step 1: Prior to the commencement of the experiment, the researcher visited the selected technical colleges, introduced himself to the principals, and presented an introductory letter seeking permission to conduct the study.

Step 2: The researcher selected and trained research assistants on the procedures for conducting the study. The participating technical colleges were assigned to either the experimental or control group using simple random sampling.

Step 3: Lesson plans and instructional notes were provided to the research assistants according to the teaching method assigned to each group. However, the lesson content remained the same for both groups to ensure uniformity.
Step 4: Before the commencement of the treatment, the researcher and research assistants administered the pretest to students in both groups. The test scripts were collected immediately after the allotted time and marked using the WWAT marking scheme.
Step 5: The experimental group was taught using the constructivist instructional approach for a period of four weeks, while the control group was taught using the demonstration teaching method for the same duration and with the same lesson content.
Step 6: At the end of the four-week experimental period, the posttest was administered using the same WWAT instrument, although the questions were reshuffled. The scripts were collected immediately after completion and marked using the same marking scheme.
Step 7: Two weeks after the posttest, the retention test was administered to both groups using a reshuffled version of the WWAT to determine students' retention of the learned concepts.

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS), version 23. Mean and standard deviation were used to answer the research questions, while Analysis of Covariance (ANCOVA) was used to test the null hypotheses at a 0.05 level of significance. The decision rule was that if the p-value was less than or equal to 0.05, the null hypothesis would be rejected; otherwise, the null hypothesis would not be rejected.

RESULTS

The summary analysis of the data collected to investigate the various research questions and the hypotheses are presented here in a tabular form. Each table is accompanied with the relevant analysis of the data presented and ending with the conclusion(s).

Table 1: Mean difference in the academic achievement of woodwork students

Groups	n	Pre-test ($\overline{X}$)	SD	Post-test ($\overline{X}$)	SD	Mean difference
Experimental	32	10.75	2.57	27.93	2.29	17.18
Control	18	12.52	2.08	26.69	2.37	14.17

n=Number of students, $\overline{X}$ = Mean and SD =Standard deviation

The result presented in Table 1 shows that the experimental group that was taught maintenance of hand tools skills using constructivist instructional approach has a mean score of 10.75 and standard deviation of 2.57 in the pretest and a mean score of 27.93 with a standard deviation of 2.29 in the post-test. This gives a mean difference of 17.18. The control group taught maintenance of hand tools skills with the demonstration teaching method has a pretest mean score of 12.52 with a standard deviation of 2.08 and a post-test mean score of 26.69 with a standard deviation of 2.37 which gives a mean difference of 14.57. The mean difference between the post-test and pretest mean scores of the experimental group is (17.18) which is higher than that of the control group (14.17). Thus, implies that the woodwork students in the experimental group performed better than those in the control group in acquiring overall maintenance of hand tools skills.

Table 2: Mean difference in the academic retention of woodwork students

Groups	n	Post-test ($\overline{X}$)	SD	Retention-test ($\overline{X}$)	SD	Mean difference
Experimental	32	10.63	2.79	31.63	4.28	21.00
Control	18	12.52	2.08	26.69	2.37	14.17

n = Number of students, $\overline{X}$= Mean and SD =Standard deviation

The result in Table 2 reveals that the experimental group that was taught maintenance of hand tools skills using constructivist instructional approach has a mean score of 10.63 and standard deviation of 2.79 in the pretest and a mean score of 31.63 with a standard deviation of 4.28 in the retention-test. This gives a mean difference of 21.00. The control group taught maintenance of hand tools skills with the demonstration teaching method has a pretest mean score of 12.52 with a standard deviation of 2.08 and a retention-test mean score of 26.69 with a standard deviation of 2.37 which gives a mean difference of 14.17. The mean difference between the retention-test and pretest mean scores of the experimental group is (21.00) which is higher than that of the control group (14.17). Thus, implies that the woodwork students in the experimental group performed better than those in the control group in retaining overall maintenance of hand tools skills.

Table 3: Analysis of Covariance (ANCOVA) for significant difference in academic achievements of woodwork students

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	441.95 [a]	2	220.97	19.51	.00
Intercept	110.45	1	110.45	111.69	.00
Pretest	308.21	1	308.21	20.45	0.00
Teaching Strategy	133.74	1	133.74	7.32	0.01
Error	840.67	46	18.27		
Total	1281.33	22			
Corrected Total	1259.33	48			

F (1,46) = 7.32, p = 0.010

Table 3 presents the analysis of covariance (ANCOVA) results. The F (1,46) = 7.32, p = 0.010 tested at 0.05 level of significance. Since the computed p-value is less than 0.05 alpha-level. Hence, we have good reason to reject null hypothesis H_{01}.

Thus, there was a significant difference between the mean scores of woodwork students taught maintenance of hand tools skills using constructivist instructional approach and demonstration teaching method. Thus, the woodwork students taught using constructivist instructional approach recorded a higher mean score than their counterparts taught using demonstration teaching method

This finding highlights the effectiveness of the constructivist instructional approach in teaching maintenance of hand tools skills. The method likely encouraged active participation, collaboration, and problem-solving, which are essential for mastering practical technical skills.

Table 4: Analysis of Covariance (ANCOVA) for significant difference in academic retention of woodwork students

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	462.59 [a]	2	231.29	21.71	.00
Intercept	110.45	1	110.45	122.59	.00
Pretest	308.21	1	308.21	20.45	0.0
Teaching Strategy	154.38	1	154.38	8.45	0.006
Error	840.67	46	18.27		
Total	1302.33	43			
Corrected Total	1259.33	48			

F (1,46) = 8.45, p = 0.006

Table 4 presents the analysis of covariance (ANCOVA) results. The F-value for the teaching method is F (1, 46) = 8.45 with a p-value of p = 0.006, which is less than 0.05 alpha-level of significance. This leads to the rejection of the null hypothesis H_{02}. Therefore, there was a statistically significant difference exists in the retention test scores between woodwork students taught maintenance of hand tools skills using constructivist instructional approach and those taught with demonstration teaching method.

Thus, the woodwork students taught maintenance of hand tools skills using constructivist instructional approach recorded a higher retention score in the retention test than their counterparts

taught with demonstration teaching method. This finding highlights the highly effects of constructivist instructional approach in teaching maintenance of hand tools skills.

DISCUSSION

Finding from research question 1 revealed that woodwork students taught maintenance of hand tools using constructivist instructional approach improved academic achievement more than their counterparts taught with demonstration teaching method by 17.18 mean differences in government technical colleges in Kano state, Nigeria. It means that constructivist instructional approach is the better teaching method. Also, Analysis of covariance was used to test hypothesis 1 With the p-value of 0.010, which is less than 0.05 confidence levels this implies that there is a statistically significant difference between the mean effect of constructivist instructional approach and demonstration teaching method on students' academic achievement confirming that the difference in the effectiveness of the two methods is statistically significant. This confirmed that constructivist teaching instructional approach has positive effect on student's academic achievement. This is in line with the findings of Peter (2016) that carried out a study on effects of constructivism instructional approach in teaching mechanical related trade subject in western Nigerian technical colleges and found that students taught with constructivism instructional approach scored higher in the post-test than those taught with conventional method which signifies that the components of constructivism instructional approach such as concept cooperative work lead to higher academic achievement in General Metalwork than the conventional method. It is also in agreement with the findings of Akanwa and Ovute (2024) who revealed that students that were taught physics with constructivist method performed better than their counterparts who were taught using conventional method of teaching. A possible explanation for the effectiveness of the constructivist method is the students' active involvement in learning process.

For research question 2, the study revealed that woodwork students taught maintenance of hand tools using constructivist instructional approach improved academic retention more than their counterparts taught with demonstration teaching method in government technical colleges in Kano state, Nigeria. The mean difference was 21.00 this implies that the students with constructivist instructional approach performed better in the retention-test than those taught with demonstration teaching method. Meaning that, constructivist instructional approach is the better method of teaching woodwork students. While for the hypothesis 2, calculated p-value is 0.006 which is less than 0.05; this implies that the different between the retention scores of the two groups is statistically significance, which equally means that there is a significant effect of constructivist instructional approach in teaching maintenance of hand tools. This is in line with the findings of Musa and Hassan (2015) who's conducted a study on effect of using constructivist instructional approach on students' academic achievement and retention in Auto mechanics in Yobe state technical colleges. They found that during the pretest, both groups were found to possess equivalent entry behavior, and in post-test experimental group (those that were taught using constructivist method) performed better than the control group (those that were taught using demonstration method of teaching. A possible explanation for the effectiveness of the constructivist instructional approach is the shift from teacher centered to student-centered learning process. Ukpongson and Ezekoye (2015) stated that for developing country like Nigeria to meet the needs of today's workforce TVET programmes must move away from teacher-centered learning environment to one where students have the primary responsibility and play an active role in their learning. It is also in line with Jack (2017) found that the shift from the teacher-centered method of teaching to student-centered activity-based method encourages and develops in the students the spirit of inquiry and thereby improves their performance. The hypothesis tested which found that there is significant difference in the effectiveness of the two teaching methods in teaching woodwork, agrees with the finding of Duyilemi and bolajoko (2014) statistically confirmed that there is statistically significant difference in performance of biology students that were taught with constructivist teaching method and those taught with demonstration method.

CONCLUSION

This study addressed the critical research problem of determining the effects of constructivist instructional approach on woodwork practical skills student's academic achievement and retention in

government technical colleges in Kano state, Nigeria. The study focuses on improving student's academic achievement and retention to demilitarize the shortage of skills workers and the growing decline in quality of wood construction in Kano state. The primary objective was to find out the teaching strategy that could improve academic achievement and retention. The key findings of the study revealed that the constructivist instructional approach improved the academic achievement and retention of woodwork students more than demonstration teaching method.

The implication of this study finding is profound; they underline the urgent need for teachers, students, curriculum planners, wood construction industries and researchers in the field of education. Integrating this instructional approach can enhance students' academic achievement and retention and promote the quality of future wood construction professionals. Future research directions should focus on refining the effects of constructivist instructional approach on academic performance and retention to reduce poor performance and knowledge retention and provide more precise predictions, investigations into region-specific, field-specific and to enrich the current understanding enabling more adaptation. Thus the shortage of skills workers and decline in the quality of wood construction workers demand immediate global attention, proactive and strategic responses, grounded in thorough research ensuring prosperity of the future generations.

LIMITATIONS OF THIS STUDY

This study was subject to some limitations that should be considered when interpreting the findings. The research was conducted in selected Government Technical Colleges, which may limit the generalization of the results to all technical colleges in Nigeria. In addition, the duration of the experimental treatment was relatively short and may not fully capture the long-term effects of the constructivist instructional approach on students' academic achievement and retention. Variations in teachers' experience, instructional competence, and familiarity with constructivist teaching strategies may also have influenced the implementation of the approach. Furthermore, the study focused specifically on woodwork students and did not include other technical trade areas. Some extraneous factors such as students' motivation, learning environment, and availability of workshop facilities and instructional materials were beyond the researcher's control and may have influenced the outcomes of the study.

SUGGESTIONS FOR FURTHER STUDIES

The study suggests the following for further studies:

1. Effects of Constructivist Instructional Approach on Woodwork Students' Academic Achievement and Retention in Federal Colleges of Education (Technical) in North East, Nigeria.
2. Effects of Constructivist Instructional Approach on Metalwork Students' Academic Achievement and Retention in government technical colleges in South West, Nigeria.

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