

EFFECT OF THE ACTIVITY-BASED TEACHING METHOD ON STUDENTS' ACADEMIC PERFORMANCE IN METAL WORK TRADE IN SCIENCE AND TECHNICAL COLLEGES IN GOMBE STATE

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ABSTRACT

The study compared the effect of activity-based teaching method on students' academic performance in metalwork trade in science and technical colleges in Gombe State, quasi-experimental was adopted and a simple size of 84 technical colleges NTCII students participated in the study, Purposeful sampling technique was used to select two intact classes of 71 NTCII metalwork trade students from two technical colleges. A 40-item instrument known as metalwork trade performance test (MTPT) was used to collect data on the students' academic performance of metalwork trade. The reliability index of MECPAT was found to be 0.71, to avoid bias the researcher prepared lesson plans that were used for the teaching of the groups. A research assistant was trained on how to use the lesson plans and instructional materials, so as to control variability in the instructional procedure in the study. Four research questions and three hypotheses respectively were raised. The data was analyzed using SPSS, mean and standard deviation were used to answer the research questions while an ANCOVA was used to test the null hypothesis at 0.05 significant differences. Activity-based teaching method improved the mean achievement of students in metalwork trade, as seen in the post-test mean achievement of 77.89 as compared with pre-test mean achievement of 23.46 respectively, for the experimental group. The study also found that there is no significant relationship between the post-test academic achievement of students taught metalwork trade using activity-based and traditional (lecture) teaching method. Few of the recommendation made included: Metalwork trade teachers should adopt activity-based teaching method; The Federal Government of Nigeria through the Ministry of Education and Administrators should ensure that the science and technical colleges have adequate material and teaching resources to enhance the academic performance of metalwork trade students and thereby solving the problem of unemployment and drop-out from schools.

KEYWORDS: Activity-Based Teaching Methods, Students Academic Performance, Technical Colleges.

1. INTRODUCTION

Metal products are an integral part of technology. The development of technology has made some countries in the world known as world powers. The importance of technology to national development cannot be overemphasized, because [1] pointed out that Nigeria cannot develop without well-equipped technical and vocational institutions. He insisted that this is the missing link in Nigeria's development policy. Fortunately, technology can be transferred and acquired by various methods. Teaching one method in which technology can be transferred. Although there are many methods of teaching, activity-based method is teaching method that encourages retention. Retention rate also increases progressively with the use of more interactive and activity-based teaching methods.

Activity-based teaching method (ABTM) is learning methods in which students participate in the learning process [2]. In the activity-based teaching method (ABTM), students actively participate in the learning experience instead of passively sitting. In the words of [3]. Learning activities are based on real life experience. It helps learners to transform information knowledge into personal knowledge that they can apply in different situations [4]. According to [5], ABTM helps learners to build mental models to achieve higher-level performance, such as application problem-solving and the transfer of information and skills. This may be an important issue in the course of metalwork trade, where it is necessary to transfer and apply information in related fields of chemistry and physics.

It is very worth noting that the frequent poor performance of most students is fundamentally related to the use of ineffective teaching methods by teachers to impact knowledge to learners Aduno (2011). [6] It is assumed that the training of metalwork trade students in technical colleges is very theoretical; consequently, graduates avoid employment that may be required to demonstrate their practical skills. [6] It is further emphasized that this is due to the fact that students were not exposed to activity-based skills during their learning activities in technical colleges. These lapses resulted in ill-equipped technical college graduates of metalwork technology who have remained unemployed. Substantial research on the effectiveness of teaching methods indicates that the quality of teaching is often reflected by the achievements of learners.

The lecture method on the other hand, has become almost a traditional method of teaching in Nigeria and is widely being criticized. Its criticisms mostly surround its failure to meet the demands of students of vocational and technical education in learning practical skills [7]. Teaching and learning of metalwork trade continue to suffer as a result of over dependence on lecture method alone. It is essential that the metalwork trade deserves a better teaching strategy by which knowledge and skills could be imparted to learners, this is the concern of this study. In view of these ailing academic students' problems, the researcher seeks for more appropriate and suitable teaching method aimed at driving the objectives of science and technical education in Nigeria and Gombe state in particular.

1.1 Statement of the Problem

Poor academic performance of Students generally has attracted the attention of educationalists, industries, and researchers; this is also a major problem to science and technological development in Nigeria. [8] Asserted that science technology education have recorded poor academic performance of students in various technical course at most of the level of our educational system over the years. In view of these deteriorating trends in the performance of students generally in schools and colleges, there is no doubt that the situation needs urgent attention.

Gombe State is not exempted from this poor academic performance of students' like its counterparts from other parts of the nation. This downward trend in education is a concern to the researcher because if nothing is done to save the situation it will come to a stage where education will be of no value seeing that their products are being rejected in the industries, higher institutions of learning, labour market, and are neither self-employable. Poor academic performance in Metal Work trade could be attributed to many factors among which the teacher's teaching strategy itself is considered a major factor. This implies that the mastery of metalwork concepts might not be fully achieved without the use of instructional materials. The teaching of metalwork trade without the use of instructional materials may certainly result in poor academic performance of the students. [9] stressed that a professionally qualified technical teachers, no matter how well trained, would be unable to put his ideas into practice if the school setting lacks the tools, equipment and necessary materials for him or her to translate his competence into reality.

The current methods of teaching in Nigeria educational institutions and technical colleges are based on the behavioral learning theories which are content driven, not Activity-based, and do not give students the opportunities to participate in the classroom instruction. These methods seem inadequate to prepare the students for challenges of the workforce. Many students and graduates also are seen roaming the streets without a job because their training is inadequate for social needs [10]. Students taught with methods based on the behavioral theories are unable to neither retain their learning nor apply their knowledge to new situations [11], and [12]. The continuous suboptimal academic performance by the majority of the students has largely been cited to be the result of ineffective teaching methods by their teachers. Therefore, this paper intends to critically examine the effect of Activity-based method on students' Academic Performance in Metalwork Trade in Science and Technical Colleges in Gombe State.

1.2 Purpose of the Study

The purpose of the study is to ascertain the effect of Activity-based teaching method on students' academic performance in science and technical colleges in Gombe State. Specifically, the study sought to:

- i. Determine the mean difference of pre-test and post-test scores of students taught metalwork trade using Activity-based teaching method in Science and Technical Colleges in Gombe State.

- ii. Determine the mean difference of the pre-test and post-test scores of students taught metalwork trade using traditional (lecture) teaching method in Science and Technical Colleges in Gombe State.
- iii. Determine the mean difference of the pre-test and post-test scores of students taught metalwork trade using Activity-based and traditional (lecture) teaching method in Science and Technical Colleges in Gombe State.

1.3 Research Questions

- i. What is the mean difference of pre-test and post-test scores of students taught metalwork trade using Activity-based teaching method in Science and Technical Colleges in Gombe State?
- ii. What is the mean difference of the pre-test and post-test scores of students taught metalwork trade using traditional (lecture) teaching method in Science and Technical Colleges in Gombe State?
- iii. What is the mean difference of the pre-test and post-test scores of students taught metalwork trade using Activity-based and traditional (lecture) teaching method in Science and Technical Colleges in Gombe State?

1.4 Hypotheses

The null hypotheses formulated for the study were tested at 0.05 level of significance

H₀₁: There is no significant effect of teaching methods on students' academic performance in metalwork trade in Science and Technical Colleges in Gombe State.

H₀₂: There is no significant difference in the pre-test and post-test scores of students taught metalwork trade using activity-based teaching method in Science and Technical Colleges in Gombe State.

H₀₃: There is no significant difference between pre-test and post-test mean scores of students taught metalwork using traditional teaching method in Science and Technical Colleges in Gombe State.

2. METHODOLOGY

Design of the study is quasi-experimental design which involves a pre-test, post-test, control and non-equivalent group design, area of the study is Gombe State, which is located in the north-eastern part of Nigeria, the target population size is 84, a purposive sampling techniques was employed and the sample 46 and 30 students from two science and technical colleges in Gombe State, the instrument for data collection was tagged Metalwork Trade Performance Test (MTPT) consist of 40 NABTEB past examination question and each question carries 2.5marks, the MTPT was validated by three experts from the department of Technology Education, MAUTECH, Yola, the instrument was trial tested at on NTC II students of Government Technical College Bauchi and the result found was 0.71, which is very reliable for the purpose of the study, the data was collected by the researcher with aid of research assistants, the data was analysed using mean, standard deviation for research questions while analysis of covariance (ANCOVA) was used for the hypotheses and procedure for data collection was strictly followed.

2.1 Results

2.1.1 Research Question One

What is the mean difference of pre-test and post-test scores of students taught metalwork trade using Activity-based teaching method in Science and Technical Colleges in Gombe State?

Table 1: Mean and Standard Deviation of Students’ Academic Performance Taught Using Activity-Based Teaching Method

Activity Oriented	N	X	SD	Mean Difference
Pre-test		23.457	7.509	
	46			54.016
Post-test		77.891	7.472	

Descriptive statistics in Table 1 shows that for the group 46 students taught using activity-based teaching method who scored a pre-test mean of 23.46% had impressive improvement in their performance after treatment with a mean post-test score of 77.89%. This post-test mean result clearly shows that the activity –based teaching method had a 54.44% improvement of the students’ performance. This is clear proof that activity-based teaching method highly improved the academic performance of metal works trade students in Gombe States.

2.1.2 Research Question Two

What is the mean difference of the pre-test and post-test scores of students taught metalwork trade using traditional (lecture) teaching method in Science and Technical Colleges in Gombe State?

Table 2: Mean and Standard Deviation of Students’ Academic Performance Taught Using Activity-Based Teaching Method

Traditional Teaching Method	N	X	SD	Mean Difference
Pre-test		21.526	6.250	
	38			23.869
Post-test		45.395	6.934	

Analysis in Table 2 indicated a result of the group of 38 students taught metalwork trade using traditional (lecture) teaching method who scored a pre-test mean of 21.53% and had an improvement after the treatment with a post-test mean score of 45.40%. They had a pre-test and post-test mean difference of 23.87%. This result showed that the traditional (lecture) teaching method had a negligible little percentage improvement, in which when summed together is not up to 50%. This indicates that traditional (lecture) teaching method have improved of only 23.87% on the students of metalwork trade students’ academic performance in Gombe State.

2.1.3 Research Question Three

What is the mean difference of the pre-test and post-test scores of students taught metalwork trade using Activity-based and traditional (lecture) teaching method in Science and Technical Colleges in Gombe State?

Table 3: Mean and Standard Deviation of Students’ Academic Performance Taught Using Activity-Based Teaching Method

	N	Pre-test		Post-test		Mean difference
		X	SD	X	SD	
Activity-Based Teaching Method	46	23.457	7.509	77.891	7.472	54.016
Traditional (Lecture) Teaching Method	36	21.526	6.250	6.935	6.934	23.869

Descriptive statistics in Table 3 presented the mean difference between the experimental and the control group of metalwork trade students taught using activity-based teaching method (experimental group) and traditional (lecture) teaching method (control group). Pre-test mean of activity-based teaching method is 23.46% while the pre-test of the traditional (lecture) teaching method is 21.53% their pre-test mean difference is 1.93% which is very significant before the administration of the treatment. While the post-test mean score of the experimental group is 54.02% and that of control group is 23.87% with a mean difference of 30.15% this is an indication that, the activity-based teaching method supersedes traditional teaching method in terms of improving the academic performance of metalwork trade students in Gombe State.

2.2.0 Research Hypotheses

2.2.1 Hypotheses One

H₀₁: There is no significant effect of teaching methods on students’ academic performance in metalwork trade in Science and Technical Colleges in Gombe State.

Table 4: ANCOVA of Students’ Academic Performance When Taught Using Activity-Based and Traditional (Lecture) Teaching Methods

Source	Type III Sum of Square	Df	F	Sig	(p Partial Squared)
Corrected Model	22074.875 ^a	2	213.267	.000	.840
Intercept	24271.618	1	466.980	.000	.853
Prêt	99.458	1	1.922	.169	.023
Temods	21153.064	1	408.723	.000	.835
Error	4192.078	81			
Total	361682.000	84			
Corrected Total	26266.952	83			

a. R Squared = .840 (Adjusted R Squared = .836)

The result in Table 4 shows that there was a significant effect of teaching methods on students’ academic performance {F (1, 83) = 408.723, p< 0.05} with a large effect size (partial eta squared = 0.835) according to guideline proposed by cohen (1988). This means that null hypotheses was rejected.

2.2.2 Hypotheses 2

H₀₂: There is no significant difference in the pre-test and post-test scores of students taught metalwork trade using activity-based teaching method in Science and Technical Colleges in Gombe State.

Table 5: T-Test Scores of Metalwork Trade Students’ When Taught Using Activity-Based Teaching Method.

	N	X	SD	Df	T	Sig(p)
Pre-test activity Oriented	46	23.4565	7.50912	45	-	0.000
					40.393	
Post-test activity Oriented	46	77.8913	7.47211	45		

The result in Table 5 shows that there was a significant difference between the pre-test and post-test mean scores of the students taught metalwork using activity-based teaching method { t (45, 46) = n-40.393, p<0.05}. This means that the null hypotheses of no significant difference were rejected.

2.2.3 Hypotheses 3

H03: There is no significant difference between pre-test and post-test mean scores of students taught metalwork using traditional teaching method in Science and Technical Colleges in Gombe State.

Table 6: T-Test Scores of Metalwork Trade Students’ When Taught Using Activity-Based Teaching Method.

	N	X	SD	Df	T	Sig(p)
Pre-test traditional	38	23.4565	7.50912	37	-	0.000
					15.684	
Post-test traditional	38	77.8913	7.47211	37		

The result of the analysis in Table 6 shows that there was a significant difference between the pre-test and post-test mean scores of the students taught metalwork trade using traditional teaching method {t (38, 37) = -15.684, p<0.05}. This means that the null hypothesis of no significant difference was rejected.

3. Findings of the Study

The results of the finding indicate that there was improvement in the academic performance of students in the experimental group in their post-test mean result. The treatment effect of the activity-based teaching method on metalwork trade students in science and colleges shows that their post-test mean performance is 77.89 which reveal that the experimental group performed excellently well with a 78% in their academic performance.

The students that were taught metalwork trade using traditional (lecture) method scored a mean 45.39 which is a 45% academic performance. This performance is minimal, the result of their pretest mean score showed that the students scored 21.53 when deducted, the mean score reads 23.86, which is 24%, this proves that the traditional teaching method has very minimal effect on the metalwork trade students’ academic performance.

The results obtained when the students mean scores were paired showed that at their post-test stage, students were able to retain 78% of the concepts taught compared to their colleagues in traditional (lecture) method group who could only retain 45%, this indicated that, the activity-based teaching method has the capacity to improve the academic achievement of metalwork trade students.

There was a significant effect of teaching methods on the students’ academic performance in metalwork trade in science and technical colleges in Gombe State. Both the two teaching methods

affect positively on the performance of the students where activity-based had 54% while traditional method has 24% improvement effect

There was a significant difference in the post-test scores of students taught metalwork trade using activity-based teaching method. The pre-test was 23.46 whereas the post-test was 77.89, the significant difference was 25 and the t-calculated -40.39 is less than 0.05. This implies that there was a significant difference in academic performance of students when taught using activity-based teaching method.

There was a significant difference in the pretest scores of students taught metalwork trade using traditional method. The pretest score was 21.53, post-test score was 45.39 with a significant difference of 37, and a t-calculated of 0.-15.68 is less than 0.05. This shows that there were significant differences in the pre-test-post-test mean scores of the students when taught using traditional (lecture) method.

3.1 Discussion of Results

Research question one sought to determine the mean score difference of the pretest and post-test scores of students taught in metalwork trade using activity-based teaching method in science and technical colleges in Gombe State where their mean score difference result showed that there was a significant difference of 54% in the performance of the students been taught using activity-based teaching method. These findings are in agreement with [14] who observed that students exposed activity-based achievement significantly higher than their counterparts taught with lecture method. On the basis of these findings, he recommended that teachers should use activity-based instructional strategy in their teaching as it enhances achievement and retention among students. The findings are also in line with [15] who stated that experiential learning (activity-based teaching method) promotes acquisition of social skills by providing opportunities for learners to work cooperatively and collaboratively.

The result of these findings with regard to research question two revealed that the students taught metalwork trade using traditional (lecture) method performed very minimally. The students scored 21.53 in their pre-test mean score, while they scored 45.39 in their post-test result. This result indicates a 24% in the academic performance of the students. This little change found in the mean performance of the students in the control group proves that the traditional teaching method has a minimal effect on the students' performance. This finding is in consonance with Okoro (1999) cited by [17] who stated that many technical teachers abandoned the conventional method of executing lessons, partly through demonstration or laboratory work-experience on account of non-existence and non-availability of teaching resources (laboratories tools, materials or equipment).

The finding with regard to research question three also indicates that the academic performance of students in the experimental group and control group showed that when paired the experimental group were better with a 33% method. Which implies that the activity-based teaching method is better than traditional teaching (lecture) method. This finding is in agreement with [13] who concluded that the cooperative learning methods (peer tutoring and reciprocal peer tutoring) which are activity-based

teaching method are better than conventional teaching method. She recommended among others that teachers should be encouraged to employ peer tutoring and reciprocal peer tutoring more in their teaching method in order to increase the level of students' academic performance.

The findings with regard to the hypotheses revealed that there was a significance difference in the pre-test and post-test mean scores of the both the activity-based teaching method and traditional (lecture) method but however, there was a greater and more excellent significant difference in the mean scores of performances of the students taught metalwork trade using activity-based teaching method, this imply that activity-based teaching method has a better advantage in the improvement of the students' academic performances. The findings are in agreement with Ludwig, and Macarty (1982), and Sowande (2002) that one of the characteristics of the skilled metalwork teachers is the ability to select sheet metal for practical instruction based on its properties and classification.

The finding from the hypothesis were also in consonance with [16] [18] who pointed out that effective implementation of any curriculum to achieve the desired outcome depends in part on the teachers' ability to effectively manipulate, operate, use, equipment, tools, and materials to help the learners learn the content of the curriculum. Activity creates formal linkages between school and metalwork industries that help students to acquire work-based skills that will enable the students to have smooth transition from school to gainful employment in industries. These findings were in agreement by recommendation made by Beck (1994) who posits that integration of theory and practices will bring about experiences that are required to narrow the existing gap between theories and practical skills in a way to self-employment. The views of the above authors help to validate that activity-based teaching competencies are required by the metalwork trade teachers for their students to academically perform optimally.

4. CONCLUSION

Based on the findings of this study, it was shown that there is a significant effect of using activity-based teaching method on students' academic performance in metalwork trade (MWT) in science and technical colleges in Gombe State. It was recommended, among others, that an activity-based teaching method is better than traditional (lecture) teaching method in metalwork trade for better academic performance of metalwork trade students.

The Ministry of Education should be organizing workshops and seminars in collaboration with industries and technical colleges from time to time to train metalwork teachers on how to use new metalwork tools, equipment, and machines. In a similar way, the use of lecture method should be discouraged in teaching metalwork trade in science and technical colleges.

The Ministry of education should also ensure adequate supply of metalwork tools, equipment, machines and consumable materials to promote activity-based lessons in science and technical colleges.

Furthermore, stakeholders in education like Teachers Registration Council (TRC), the Joint Consultative Committee on Education (JCCE), National Board for Technical Education (NBTE), National Education Resource and Development Center (NERDC), National Teachers Institute (NTI), Colleges of Education, Degree awarding Institution in Education and Universities should ensure that activity-based teaching method is inculcated in the curriculum of metalwork trade teachers' training program.

4.1 Recommendations

The following recommendations should be considered for implementation:

1. Metalwork trade teachers should adopt activity-based teaching method in their teaching methods to increase interest, motivate the learning styles of the students in their classrooms, and enhance their academic performance.
2. The Federal Government of Nigeria, the Ministry of Education and Administrators should ensure that the science and technical colleges have adequate and suitable materials and teaching resources for the (MWT) teachers to demonstrate and perform the basic concept in metalwork trade to the students in science and technical colleges to perform better in their academics and their employable skills.
3. Metalwork trade teachers should be sent for training on the latest activity-based teaching method using innovative technology to enable them to be able to impact the knowledge and thereby by motivating and sustaining the interest of the students in metalwork trade. Teaching method using innovative technology to enable them to be able to impact the knowledge and thereby by motivating and sustaining the interest of the students in metalwork trade.
4. Science and Technical colleges through the department of technical colleges should obtain material, tools and equipment that are not available in the school workshop from metalwork technology industries for classroom use to enable the students acquire practical skills for high academically performance.

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