

Effect of Interactive Engagement Strategy on Secondary School Students' Performance in Metalwork in Ekiti State, Nigeria

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ABSTRACT

This study was designed to investigate the effect of interactive engagement strategy on the performance of secondary school students in metal work in Ekiti State, Nigeria. The study adopted a quasi-experimental pre-test and post-test non-equivalent experimental and control group design which involved groups of students in their intact classes was adopted. The population for the study was all 11 SSS II students offering metal work in all Senior Secondary Schools in Ekiti State. One research questions and one null hypothesis tested at 0.05 level of significance guided the study. The instrument used for data collection was the interactive engagement Strategy (IES) questionnaire, The IES instrument was subjected to face and content validation by three experts. The trial test for determining the coefficient of internal consistency and stability of the instrument was carried out using Pearson Product Moment correlation statistics, Kuder –Richardson-20. (K-R.20), the value was found to be 0.75. Mean was used to answer the research question, while ANCOVA was employed to test the hypothesis. The result of the study indicated that there was no significant difference between the effect of interactive engagement strategy and the conventional technique on students' achievement in metalwork. A slight improvement was however observed in the achievement scores of students exposed to interactive engagement strategy. Recommendation was given on the usage of the teaching strategy at the secondary school level.

Keywords: Interaction Engagement, Metal work, Students performance, Secondary Schools, Nigeria

INTRODUCTION

Metalwork is the process of working with metals to create individual parts. It is indeed the process of forming and shaping metals to create useful tools, objects, equipment parts, and structures. Metalwork subject is designed to help the student to use hand and machine tools in the workshop to produce simple work pieces, demonstrate knowledge and understanding of materials used in the workshop, apply the principles of logical planning in the manufacture of items in the workshop and also observe safety precautions. Metalwork generally fall under three categories of forming, cutting, and joining. It may also involve techniques such as cutting, welding, casting, and molding. Materials used by metalwork worker may include ferrous and non-ferrous metals such as steel, aluminum, gold, silver, bronze, iron, and more. Accordingly, WAEC (2022) identify the objective of Metalwork to include observation of safe working practices in the workshop, demonstration of knowledge and understanding of tools, materials and equipment, apply basic processes for the care and maintenance of hand and machine tools, have the ability in identifying, analysing and evaluating a problem, apply their knowledge of processes and materials to the solution of problems, Demonstrate basic skills of good craftsmanship, apply knowledge of career opportunities in metalwork, have the ability to translate an idea into a project design. Thus the main purpose of the program is to prepare students for postsecondary education and or employment in the Metalwork industry. The importance of metalworking cannot be over emphasized, this is because it provides machinery and inputs to most economic activities for their reproduction. These include the manufacturing industry, construction, automotive, mining, agriculture, as well as many others (Kristin, 2022) While at the same time providing individual practitioners with a source of livelihood just like all other vocational trades Metalwork is presently not a compulsory subject at the SSS level.

It is essentially chosen by students who intend to study science, engineering and technology related courses at the tertiary level or students wishing to practice after secondary level education. The realization of the objectives of metal work can only be achieved only when the trade is appropriately and effectively taught to learners. This can be possible by making teaching/learning process to be student-centered as against being teacher-centered and by also viewing students as problem solvers rather than direction followers. Thus for a nation to develop technologically the study of metalwork must be encouraged as it is a very important foundation for all mechanical engineering related courses.

In order to achieve the objective of effective training of prospective competent engineers and technologists, government at both the federal and state levels expended huge amount of money on the procurement of equipment for use as technical education equipment in the secondary schools. In the same vein, such effort like curriculum review, policy shift, re-training, and production of technical education teachers by the government to ensure qualitative education at the Senior Secondary School (SSS) level and bring about high quality products both in academics and for employment have not yielded much dividend (Federal Government of Nigeria (FGN), 2001). There have been persistent reports of high rate of failure in metalwork subject in the West African Senior School Certificate Examination (WASSCE). The analysis of West African Examination Council (WAEC) result compiled by the planning, Research and Statistics Department, Ekiti State Ministry of Education, Science and Technology revealed that of the entire twenty two candidates that sat for metalwork in 2018, no single candidate passed at credit level. In 2019, only 02 of the 13 students that sat for metalwork passed at credit level. In 2020, only a disturbing 06(15.5%) of the 20 candidates that sat for the examination passed at credit level. One probable cause of the steady fall in the performance level in metalwork subject according to WAEC Chief Examiner's report (2011) is indicative of a serious variance between the expectations of National Policy on Education (NPE) and reality, and calls for an assessment of the available infrastructure as well as the teaching strategy adopted in imparting knowledge to the students. Thus, the poor performance of students in metalwork may be attributed to the use of conventional methods such as demonstration method adopted for teaching the trade subject. Obviously, the adoption of only lecturer-centered methods of teaching by the trade teachers may result into ineffective use of varieties of instructional materials and facility and inability of trade teachers to effectively implement the curriculum to naturally increase students' involvement and commitment in learning. To this therefore the learning environment should be transformed from one that is predominantly memory-based and teacher-based learning environment, to one that promotes learner-centered learning (Agboghroma, 2015) Such as interactive engagement strategy

Interactive engagement teaching strategy according to Starting Point (2023) are strategy designed to promote conceptual understanding through interactive engagement of students in heads-on (always) and hands-on (usually) activities which yield immediate feedback through discussion with peers and/or instructors.

Accordingly, Gergis (2011) describe IE as a means of instruction whereby the teachers actively involve the students in their learning process by way of regular teacher-student interaction, student-student interaction, use of audio-visuals, and hands-on demonstrations. To this therefore, the students are constantly encouraged to be active participants in their quest to acquire knowledge. Participating students are engaged in learning activities that lead to a higher level of understanding and result in the participants' (students) ability to apply what they learned on the job. Interactive teaching is a two-way process of active participant engagement with each other, the facilitator, and the content.

The principles of interactive engagement assume that students receive knowledge not only from the teacher, but also interacting with each other using additional materials and tools. (Briolight, 2022). The main feature of interactive engagement teaching strategy is that new knowledge is not given ready-made, the student must obtain it on his own. In this case, not only the result becomes significant, but also the course of reasoning, which forms critical thinking. Briolight (2022) further identified brainstorming, projects with presentation, business games (role-playing and imitation), use of information and communication technologies, playback of audio and

video materials (online tests, use of training sites, special programs or interactive equipment designed for training) as main methods and techniques for implementing interactive learning

Zamira Gashi Shatri (2016) in the study titled Implementation of Interactive Teaching Techniques in School Practice. The study involved a total respondents of 60 secondary school students and teachers in six different places in Kosovo. The results of the study indicates that a significant number of teachers practice interactive teaching techniques in schools. The study also revealed that Learning is more attractive to students. Students can evaluate each – other. With these methods encourage critical thinking and understanding, students collaborate with each other among other findings.

Furthermore in the study of Eiman and Matthew (2017) titled; Students' perceptions of lecturing approaches: traditional versus interactive teaching. 60 first year dental students at the School of Medicine, Dentistry and Biomedical Sciences, Queen's University Belfast (QUB), UK, were used for the study. The result indicated that interactive engagement promote interactivity, focused attention, and provide feedback on comprehension. A total of 95% of the respondents reported that it increased their participation and found that it clarified their thinking and helped to focus on key points. Another 81.7% mentioned that it increased their motivation to learn. Students regarded it as a useful method for giving real-time feedback, which stimulated their performance and participation and that the strategy was helpful in focusing students' attention and in clarifying information among other findings.

In a related vein, the study conducted by Rimma, Aleksandr? and Marina (2016) titled; The Use of Interactive Methods in the Educational Process of the Higher Education Institution, The study was conducted to ascertain the influence of interactive methods on undergraduate students studying Psychological-pedagogical education at the Institute of Psychology and Pedagogy at the Sakhalin State University, Russia. The study indicated that interactive training is the most effective in the preparation of future psychologists. This because they observed that students exposed to the interactive methods, form professional competences, develop analytical thinking, mobilize their cognitive powers, and develop strong interest in new knowledge among other findings.

On the same vein Nataliia, Yuliia, Olha, Olena & Nelia (2021) also conducted a study titled the Ways of Developing Basic Competences in the Study of Foreign Languages through Interactive Methods. The effectiveness of the interactive engagement strategy was investigated in learning of the following foreign languages: English, German, French, Spanish, and Polish. It was found that the strategies have positive effect on improving the correctness of language, its purity, clarity, accuracy, logic, expressiveness, and conciseness. The need to inculcate in students' the workplace basic and thinking skills that will enable them to fit properly in the world of work and improve their performance which is a source of concern in the senior secondary school certificate examination (SSSCE) called for effective instructional techniques such as the interactive engagement strategy. Based on the foregoing therefore, the study investigated the effect of interactive engagement strategy on secondary school students' performance in metalwork in Ekiti State, Nigeria.

Purposes of the Study

The purpose of this study was to determine the effect of interactive engagement strategy on secondary school students' performance in metal work in Ekiti state, Nigeria

Research Question

The below research question was posed to guide this study

What is the effect of interactive engagement strategy on secondary school students' performance in metalwork?

Research Hypothesis

HO: There is no significant difference in academic achievement of students taught metalwork with interactive engagement strategy and those taught using conventional method.

METHODS

Design of the Study

This study adopted a quasi-experimental pre-test and post-test non-equivalent control group design. This design was considered suitable for the study because intact classes (non-randomized groups) were assigned to the two different groups in this studies (Interactive engagement strategy and control group)

EG, O1 x O1 CG, O1 – O1

Where

EG stands for experimental group CG stands for control group

O1 stands for pre-test/post-test observation

X stands for the Interactive engagement strategy treatments

– stand for the use of the Conventional method

Research Subjects

The population for the study comprises of all the 11 senior secondary school two students in all the three senior secondary schools offering metalwork in Ekiti State. Six (6) of the students were in a school, four (4) are in another school while one (01) is in the third school. The reason for choosing SSS two is that the students have undergone the curriculum of the subject in their year one and they could respond to the test items. The sample for the study comprised of ten students purposively sampled. Thus 6 of the students were treated with Interactive engagement strategy in one school while 4 students were used as control group in another school.

Research Instrument

The instrument for data collection for this study was the Metalwork Interactive engagement test (MIET) developed by the researcher. The MIET instrument contained 25 multiple choice items with five options. The MIET items therein were adapted from the West African Examination Council (WAEC) syllabus paper 1 past question papers. The instrument was administered on the respondents during the pretest stage, it was thereafter reshuffled to be used for the posttest administration. This rearrangement was to curtail over familiarization of students with an arrangement pattern. The test items covered all the contents of the lesson plans developed to cover the major topics used for the study.

The Metalwork Interactive engagement lesson plans was used by the respective metalwork teachers who are also the research assistance in the experimental schools to teach the experimental groups while the control groups were taught with conventional lesson plans. The instrument was validated by one test and measurement expert and Two Mechanical Technology Education experts. The pilot tryout of the MEIT was conducted in a secondary school outside the state that did not take part in the study. The trial test for determining the coefficient of stability of the MIET was carried out using test re-test reliability technique.

This is by administering the test on same students twice within the interval of two weeks. The reliability coefficient of the instrument was found to be .75 using Kuder Richardson formula 20 (K – R 20), since the test

items are of multiple choice types

Experimental Procedure

The conduct of the study took place during the normal school lesson periods. The research was conducted in three stages. During the first stage ; intensive training programme was organized for the teachers involved in the study. The training exercise was based on the purpose of the study, the topic to be taught, the use of the lesson plans, the use of instrument and general conduct of the study. The MIET was thereafter administered as pretest on all the students (experimental and control).

The second stage lasted for four weeks. It witness the commencement of the experimental study. The prepared Metalwork Interactive engagement lesson plans was used to teach the experimental groups. The instructional procedures for the experimental groups includes;

Step 1: Introduction of the topic by giving pre-class assignment to the students. I.e. students to visit the laboratory to perform test on the metals

1. identify colours of traditional wooden/metal hoes, spears and daggers,
2. explain what they perceived is the cause of the colours of the metal
3. identify reasons why bolts and gears are not easily cut with hack saw or dented by hammers just like some other ferrous metals i.e. mild or medium carbon steel of same size

Step 2: Introduction of the topic on the bases of the pre-class assignment given to the students i.e. Heat Treatment of Metals.

Step 3: Conceptual questions were posed to the students based on pre-class assignment and the sub topic being taught. i.e.

Step 4: The students were given ample time to respond to the pre-class assignment after which they are allowed to keep their responses to a later time when they will be called upon to criticise the answers themselves

Step 5: Use teaching aids that press for answers, and capture/hold the student's attention for explaining concepts. These may include charts, drawings, various tools, worked project and samples. I.e. charts depicting heat treatment processes and samples of heat treated metals

Step 6: The students were asked to group themselves into groups of three (3) Students per group for interaction purposes especially with respect to the pre-class assignment and the topic at hand.

Step 7: The students carry out investigation on the concept explained by teacher by involving in practical activities (hands-on-activity) using all tools, machines and online materials provided under the guidance of the teacher and workshop attendance. I.e. carry out heat treatment of some metals.

Step 7: more probing questions are thereafter asked as regard the practical class. I.e. explain characteristics exhibited by metals subjected to different heat treatment process.

Step 8: Based on the class activities, students are there after encourage to criticise their responses to the pre-class assignment earlier kept with them within the group. They are expected to seek clarification from the teacher where need be.

The third stage involved the administration of the rearranged MIET instrument on both the experimental and control groups. The process also lasted for one week.

Data Analysis

The data collected from the administration of pre- test, post-test was analyzed using Mean to answer the research questions. The hypotheses formulated for the study was tested at .05 level of significance using Analysis of Covariance (ANCOVA). This is because ANCOVA as a statistical technique removed the initial differences between groups, so that the selected or pre-tested groups can be correctly considered as equated or equivalent by removing score difference in the pre-test performance across groups and reducing the between-group source variation (Statistics Solutions, 2023).

What is the effect of interactive engagement strategy on secondary school students’ performance in metalwork?

RESULTS AND DISCUSSION

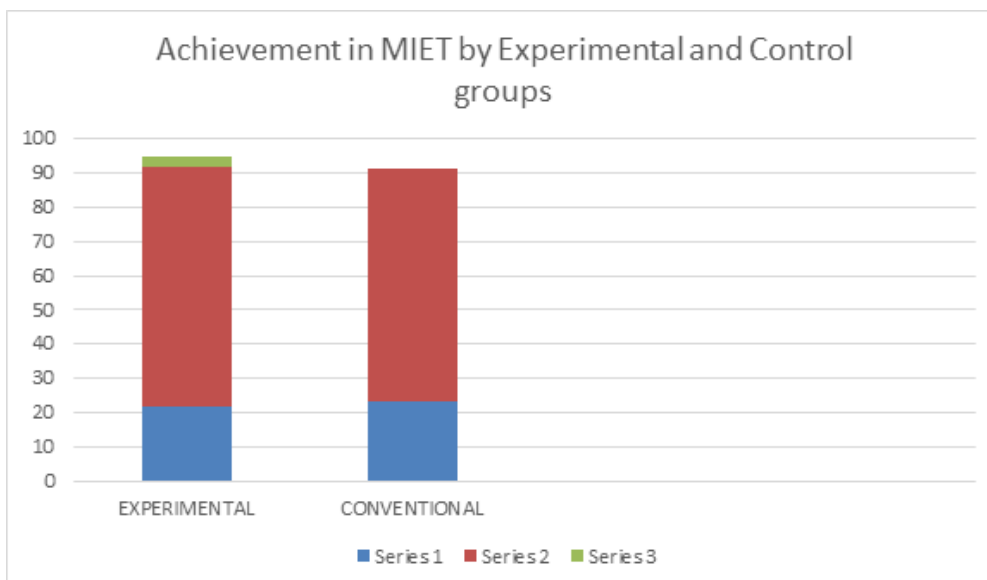
Research Question: What is the effect of interactive engagement strategy on secondary school students’ performance in metalwork?

Table 1 – Mean of MIE test scores of students taught with interactive engagement strategy and conventional techniques

Test	Teaching Techniques			
	interaction engagement		Conventional Method	
	N	Mean	N	Mean
Pre-test	06	22.00	05	23.40
Post-test	06	70.00	05	67.80
Mean gain score		48.00		44.40

Table 1 shows that the students taught metalwork with interactive engagement strategy had a mean interest score of 22.00 in the pretest and a mean interest score of 70.00 in the posttest making a posttest mean gain in the treatment group to be 48.00. The group taught metalwork with conventional technique had a mean interest score of 23.40 in the pretest and a posttest mean of 67.80 with a posttest mean gain of 44.40. This result indicates that both the interactive engagement strategy and the conventional technique are effective in increasing students’ achievement in metalwork but the effect of interactive engagement strategy on students’ achievement in metalwork is higher than the effect of the conventional technique.

Figure 1



Research Hypothesis

HO: There is no significant difference in academic achievement of students taught metalwork with interactive engagement strategy and those taught using conventional method

Table 2 – Summary of Analysis of Covariance (ANCOVA) for Test of Significance of Treatments on Students’ Achievement in Metalwork

Source of Variation	Sum of Squares	DF	Mean Square	F	Sig of F
Corrected Model	37.763 ^a	2	18.881	.680	.534
Intercept	363.541	1	363.541	13.087	.007
Pretest	24.563	1	24.563	.884	.375
Treatment	23.743	1	23.743	.855	.382
Error	222.37	8	27.780		
Total	52631.000	11			
Corrected Total	260.000	10			

***Significant at sig of F < .05**

The data presented in Table 2 shows F-calculated values for effects of treatment on students’ achievement in metalwork. The F-calculated value for treatment is .855 with a significance of F at .382 which is more than .05. The null-hypothesis is hereby accepted at .05 level of significance. With this result, there is no significant difference between the effect of interactive engagement strategy and the conventional technique on students’ achievement in metalwork.

Discussion of findings

The data on table 1 shows that students taught metalwork with interactive engagement strategy and those taught with conventional laboratory method both had improvement in their achievement in the metalwork achievement test but the effect of interactive engagement strategy was slightly higher than the effect of the conventional technique by just a mean of 3.60. At the same time, Analysis of covariance was employed to test the hypothesis as indicated in Table 2, at an calculated F- value (.855) with a significance of F (.382) and confidence level of .05. This result, clearly indicated that there was no significant difference between the effect of interactive engagement strategy and the conventional technique on students’ achievement in metalwork. This thus implies that the interactive engagement strategy is not more effective than the conventional technique in improving students’ achievement in metalwork.

This finding corroborated the study conducted by Ali & Ömer (2018) who investigated the possible effects of blended learning on high school students’ physics achievements, science process skills, and attitudes towards physics. They observed that the effect of blended instruction is not dependent upon the teaching methods implemented with and as such there study indicated that expository teaching method is as effective as inquiry teaching method.

The findings of this study is at variance with those of Nataliia, Yuliia, Olha, Olena & Nelia (2021) who observed a significant increase in students’ achievement in language proficiency. This differences may be attributed to the fact that the present study is a practical oriented trade that is generally taught with the use of the laboratory method which can be said to be student centered to some extent. The findings is not also notin agreement with that of Eiman and Matthew (2017) and Rimma, Aleksandr? and Marina (2016) who all also observe a positive increase in achievement over the conventional method. Perhaps, this differences observed in this study and others being reviewed might be as a result of the fewness of the population of the respondent in this study. While the population all the reviewed study are mostly above a hundred that of this study stood at just eleven (11) with just ten (10) of them being used for the study, there is does every

probability that students in the control group might unconsciously be collaborating together either during on-school or off-school hours. Though, the students are made not to stay together during classes because of the competitive nature of the group, they might indirectly be gaining collectively from one another and from the teacher's responses to questions and answers.

CONCLUSION

The study revealed that there was no significant difference in the achievement of senior Secondary students in metalwork when taught using interactive engagement strategy as compared to the conventional teaching method. The slightly higher mean gain observed in the achievement test was therefore not significant.

RECOMMENDATIONS

The following recommendations are made Based on the findings.

Workshops and Seminars should be organized to educate Metalwork and other practical oriented vocational Education subject teachers on the use of interactive engagement strategy and other contemporary student centered teaching strategies.

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