

Effects of jigsaw-iv on students' attitude towards maintenance/repairs of electrical equipment at colleges of education in Kano-Nigeria

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Abstract

The study examined the effects of Jigsaw-IV on students' attitude towards maintenance and repairs of electrical equipment at colleges of education in Kano-Nigeria. One research question and hypothesis guided the study. The population for the study was sixty-two (62) students, consisting all NCE III Electrical/Electronic Technology Education students at colleges of education in Kano-Nigeria. Simple random sampling technique was used to sample the two (2) colleges of education for the study. Quasi experimental design involving the pre-test, post-test of non-equivalent group was used for the study. Jigsaw-IV strategy was used in teaching the experimental group and demonstration teaching method was used in teaching the control group, 40 items questionnaire was used to seek the opinions of students on their attitude towards Maintenance and Repairs of Electrical Equipment, the instrument was subjected to parallel forms reliability analysis where the scores from both parallel tests was correlated using Cronbach's Alpha, it yielded reliability coefficient of 0.73. Mean and standard deviation was used to answer the research question while Analysis of Covariance was used to test the null hypotheses at 0.05 level of significant. The findings of the study revealed that Jigsaw-IV strategy improved student's attitude toward maintenance and repairs of electrical equipment and there is significant difference in students attitude mean scores taught maintenance and repairs of electrical equipment using Jigsaw-IV strategy compared to those taught using demonstration method. Keywords: Attitude, Electrical Equipment, Jigsaw-IV, Maintenance and Repairs.

1. Introduction

Technical education program as one of the major programs provide students with the opportunity to specialize in metalwork technology, woodwork technology, automobile technology, building technology and Electrical/Electronic technology education (National Commission for Colleges of Education [NCCE], 2020). Electrical/Electronic technology education, as offered in the Colleges of Education (Technical), is designed to equip and produce qualified NCE Electrical/Electronic technology education graduates with the right skills to engage in a life work in the industry as well as for self-employment among others (NCCE, 2020). In the attainment of these objectives, several courses were designed and implemented; one of such is maintenance and repairs of electrical equipment.

Maintenance and Repairs of Electrical Equipment aims at preparing students in understanding the maintenance and repair of many forms of domestic and industrial electrical appliances especially with the 21st century rapidly advancing technological world that is characterized by the dynamic evolution of new machines, gadgets and equipment, the needs for individuals skilled in the maintenance and repair of such electrical equipment cannot be overemphasized. These skills are not only crucial in the industrial sector but are also in high demand in daily life, ranging from household appliances and installations to advanced technological devices (Ibidapo, 2021).

To realize the objectives of the NCCE Technical program and indeed maintenance and repairs of electrical equipment, the teachers are expected to manifest high level of teaching strategy to improve the attitude toward the course. A report by Josiah (2020) revealed that various teaching methods such as lecture, demonstration and discussion are usually used because of its advantages of covering large content in a single lesson and also teach a large number of students at the same time with the aim of bringing meaningful learning. The method entails a one way flow of communication with the students trained to observe and blindly memorize the content without actually exposing them to challenges that will make them more actively engaged in the learning process which will facilitate the development of positive attitude (Teachmint, 2022 & Negi, 2023).

In order to address the inadequacies of the traditional methods which is teacher-centered, scholars have suggested the use of active strategies which are student-centered such as discussion methods, inquiry-based approach and cooperative learning (John, Agbowuro, & Chollom, 2023). There are various versions of cooperative learning which includes; think-pair share, Jigsaw strategy among others. The Jigsaw learning model, as expressed by Ansheila (2019), "is a cooperative learning model using students learning in small groups in a heterogeneous manner and students working together interdependently. The strategy, (Jigsaw-IV) developed by Holliday (2002) is the instructional strategy which involves the formation of Home Groups to resolve the task. The Home Groups allocate one member to each Expert or Research Group to gather data to bring back to the Home Group. Jigsaw-IV teaching strategy is beneficial for the students by encouraging active learning and engagement with the content, fostering social skills and positive interdependence, developing higher-order thinking skills, (Akudo & Olaoye, 2021).

Since Jigsaw-IV strategy has the potentials to effectively increase the involvement of each student in the learning activity, it may have the potential to enhance students' attitude toward maintenance and repairs of electrical equipment. Attitudes can be defined as evaluative statements, either positive or negative, that are associated with an individual's outward disposition (Olaoye, 2021). He further suggested that attitudes are learned predispositions that dictate an individual's positive or negative response to various situations, concepts, or individuals. This encompasses affective components such as feelings, emotions, behavioral components like past and anticipated actions, and cognitive components including thoughts and beliefs. Consequently, when these three components are positive, students are more likely to develop a positive attitude towards a learning process which will reflect the determined outlook on how to react and behave in specific circumstances such as teaching and learning of maintenance and repairs of electrical equipment. Akudo (2021) assert that attitudes are somewhat dynamic and can evolve over time into different forms. For instance, students' responses to different learning strategies can vary based on their attitudes. While a student may engage cheerfully in discussions in a collaborative setting, the absence of such interaction may dampen their enthusiasm in a conventional classroom setting. This doesn't necessarily indicate a lack of cheerfulness in the latter scenario, but rather a less conducive learning environment. In many instances, students tend to form their attitudes based on a combination of factors such as knowledge, experiences, assumptions, beliefs, habitual actions, and emotions. Learner's attitudes towards school were a determinant factor that predicts their academic performance (Anshina, 2023). The implication is that a positive attitude gives rise to positive result while a negative attitude turns out a negative result. This suggests that student's poor attitude has a negative effect on their performance in maintenance and repairs of electrical equipment (Bio-Anu, 2018) hence the need for an improved

instructional strategy (Jigsaw-IV) that will enhance students' critical thinking, attitudes and practical skills performance.

The teaching of maintenance and repairs in colleges of education Kano state has so many flaws. There is a problem in helping the individual learner in gaining competent cognitive skills necessary to add value to learning. Emphasis on the teaching of maintenance and repairs is on the content and not on the process. Teachers present facts as they get them from the textbooks without giving students the opportunity to analyze, synthesis and evaluate these facts. Thus students memorized theoretical facts through rote memorization for the purpose of using them during assessment. As a result of this, students attitude toward the module becomes problematic especially when attempting to process technological facts. Philip, Einstein, Nsagha, & Nana (2023) asserts that, some of the values of teaching maintenance and repairs are skills, powers of enriching reflective and imaginative minds; this is because electrical/electronic education collects and organizes facts, providing them with a framework which requires positive attitude and analytical mind to work on them. With this values missing in the teaching of maintenance and repairs in colleges of education Kano state, learner's will as well fail to develop the necessary positive attitude and analytical mind, hence the need for investigations. Cooperative learning has been proven through research as an instructional strategy in developing students positive attitude skills considering the rich nature of social interaction. However, most of these studies use different instructional methods alongside cooperative learning strategy in relation to attitude. There are limited studies which examines the different cooperative learning strategies and their influence on attitude in maintenance and repairs. The different cooperative learning strategies have different structures and organizations; this may affect the outcome for thinking in different ways. It therefore becomes imperative to evaluate the effects of Jigsaw-IV strategy on students' attitude in maintenance and repairs of electrical equipment at colleges of education, Kano state-Nigeria. The aim of this study is to determine the effects of Jigsaw-IV on students' attitude toward maintenance and repairs of electrical equipment at colleges of education in Kano-Nigeria. Specifically, this study seeks to examine the mean attitude differences of students taught maintenance and repairs of electrical equipment at colleges of education in Kano-Nigeria using Jigsaw-IV strategy and demonstration method.

2. Literature Review

Amosa, and Mudasiru (2017), investigated the effect of computer-supported Jigsaw cooperative learning strategies on performance, attitudes, and retention of secondary school students in physics. Study aimed at examine Students' Team Achievement Division and Team-Assisted Individualization on performance, attitudes, and retention of secondary school students in physics using computer-supported Jigsaw cooperative learning strategies. Purposive sampling technique was used to select four senior secondary schools from Minna, Nigeria. The students were allocated to one of four groups: Students Team Achievement Division (STAD), Jigsaw II, Team-Assisted Individualization (TAI), and Individualized Computer Instruction (ICI). Computer-Assisted Learning Package (CALP) on physics was used as the treatment instrument, Physics Achievement Test (PAT) and Physics Attitude Scale (PAS) were used as outcome measures. Analysis of Covariance and the post-hoc test were used for data analysis. Significant differences were found in the performance and attitudes of the groups, though Jigsaw cooperative learning strategies did not improve retention compared to ICI. These findings support the integration of computer-supported cooperative instructional strategies in secondary school classrooms. All three

computer-supported cooperative learning strategies had a positive effect on student attitudes towards physics compared to individualized computer instruction (ICI). However, Jigsaw II was the only computer-supported cooperative learning strategy to have a positive effect on student performance compared to ICI. Furthermore, cooperative learning strategies did not increase retention compared to ICI. The reviewed study is related to the present study in term of design, and strategy. The reviewed study deals with Effectiveness of Computer-Supported Jigsaw II, and TAI Cooperative Learning Strategies on Performance, Attitude, and Retention of Secondary School Students in Physics while the present study deals with effect of Jigsaw-IV strategy on students' critical thinking, attitude and Practical Skills Performance in Maintenance and Repairs of Electrical Equipment. The studies also differed in term of population, geographical location and study area, the reviewed study was conducted in Minna Niger, while the presence study was conducted in College of Education in Kano state, north-western, Nigeria.

Isaiah, and Comfort, (2017) carried out a study on attitude of students towards cooperative learning strategy in some selected secondary schools in Nasarawa State. The study was aimed at investigating the attitude of students toward the cooperative learning approach. A quasi experimental design was used for the study. The sample was made of 179 SS 1 students from three public secondary schools in Nasarawa state. The Jigsaw Attitude Questionnaire (JAQ) was used to collect the data. Regular teachers served as research assistants. The experimental groups was exposed to the Jigsaw cooperative learning approach. Treatment lasted for 12 weeks. Students taught with the Jigsaw cooperative method responded to the 10-item JAQ, and were analyzed using percentages and the chi square, at 0.05 level of significance. Results showed that, students taught using the Jigsaw cooperative method developed positive attitudes to the teaching strategy significantly. It is recommended that the use of the Jigsaw cooperative method be encouraged in science teaching.

The reviewed study is related to the present study in term of design, instrument for data collection for Jigsaw attitude questions and the method of teaching. The reviewed study deals with attitude of students towards cooperative learning in some selected secondary schools while the present study deals with the effect of Jigsaw-IV strategy on students' critical thinking, attitude and Practical Skills Performance in Maintenance and Repairs of Electrical Equipment at colleges' of education Kano-Nigeria. The studies also differ in term of population, geographical location, objectives and study area, the reviewed study was conducted in Nasarawa State while the presence study was conducted in Kano state, north-western, Nigeria and its objective is to investigate the effects of Jigsaw-IV strategy on students' attitude compared to the demonstration method.

3. Methodology

The research design used in this study is quasi experimental involving pre-test and post-test of non-randomized groups. The study involve two (2) sampled college of education in Kano State, Nigeria. NCE III Electrical technology education students were used for the study. The population for this study is Sixty-two (62) electrical/electronic technology education students which consisted all NCE III electrical / electronic technology education students.

Simple random sampling technique was used to sample the two institutions for the study. Furthermore, balloting method was used to assign one intact NCE III class for the controlled group (demonstration teaching method) and one intact NCE III class in the other school for the experiment group (Jigsaw-IV

strategy)

The sample size for the study was 48, 22 NCE III Electrical/Electronic Technology Education students in school A (Experimental Group) and 26 NCE III Electrical/Electronic Technology Education students in school B (Control Group) in their various intact classes for Experimental group and Control group respectively.

40 question items that elicit students' attitude in maintenance and repairs of electrical equipment. The instrument was used for both pre-test and post-test to find the effect of Jigsaw-IV strategy on students' attitude toward in maintenance and repairs of electrical equipment. The instrument, lesson plans, lecture notes, lab manual and the marking schemes was subjected to content and face validation validated by 3 experts. The instrument was subjected to parallel forms reliability analysis where the scores from both parallel tests was correlated using Cronbach's Alpha, it yielded reliability coefficient of 0.73. Mean and standard deviation was used to answer the research question while Analysis of Covariance was used to test the null hypotheses at 0.05 level of significant. Both descriptive and inferential statistics was analyzed using Statistical Packages for Social Sciences (SPSS) version 23.

4. Results and Discussion

Table 1: Pre-test and Post-test Mean Scores for Students' Attitude of Experimental and Control Groups.

Groups	N	Pre-test		Post-test		Mean gain
		\bar{x}	SD	\bar{x}	SD	
Experimental Group	22	60.81	4.62	112.72	14.08	51.91
Control Group	26	63.39	4.99	93.12	9.03	29.73
Mean gain difference						22.18

The result in Table 1 indicates that the experiment group that were taught maintenance and repairs of electrical equipment using Jigsaw-IV strategy has a pretest mean score of 60.81 and standard deviation (SD) of 4.62 with a post-test mean score of 112.72 and standard deviation(SD) of 14.08, This yielded 51.91 on pre-test, post-test mean gain in the experiment group. On the other hand, the control group that were taught maintenance and repairs of electrical equipment using demonstration method has a pretest mean score of 63.39 and standard deviation(SD) of 4.99 with a post-test mean score of 93.12 and standard deviation(SD) of 9.03. This yielded 29.73 pre-test, post-test mean gains in the control group. This results indicated that both teaching approach (Jigsaw-IV strategy and Demonstration Teaching Method) are useful in improving students' attitude toward maintenance and repairs of electrical equipment, but the effect of Jigsaw-IV strategy on improving students 'attitude toward maintenance and repairs of electrical equipment is higher than the effect of Demonstration Method.

Null Hypothesis

Table 2. Analysis of Covariance (ANCOVA) for the test of significance difference of Students' Attitude of Experimental and Control Groups.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	4625.099 ^a	2	2312.550	16.890	.000
Intercept	3303.682	1	3303.682	24.129	.000
Pretest	41.638	1	41.638	.304	.584
Group	4006.379	1	4006.379	29.261	.000
Error	6161.380	45	136.920		
Total	511199.000	48			
Corrected Total	10786.479	47			

1. R Squared = .420 (Adjusted R Squared = .403)

The data presented in Table 2 shows that the F value is 29.261 when the P-value is 0.0001. Since the p-value is less than the level of significance (P-value<0.05), the F-value is significant. That is, the null hypothesis which stated that , “there is no significant difference between the attitude mean scores of students taught maintenance and repairs of electrical equipment using Jigsaw-IV strategy and those taught using demonstration method is rejected. Therefore, there is a statistically significant difference between the attitude mean scores of students taught maintenance and repairs of electrical equipment using Jigsaw-IV strategy and those taught using demonstration method.

Discussions

The result of the findings on research question and the hypothesis presented in table 1 and 2 revealed that, the NCE III electrical/electronic technology education students taught maintenance and repairs of electrical equipment using Jigsaw-IV strategy have higher attitude mean score than the those taught using demonstration method, and the effect was statistically significant(P-value is 0.0001< 0.05). This indicated that, Jigsaw-IV strategy is more effective in improving students' attitude towards maintenance and repairs of electrical equipment. The result of this study may not be far from the fact that the strategy exposed the students into multiple home groups' discussions. Each home group receives a slightly differentiated but well-defined task from the teacher with firm instructions on how each member can cooperates to achieve a common goal as a team. Thus, promote cooperation by making individuals dependent on each other. This technique has a strong effect on attitude towards learning and some social relationship among students in the group because each student has a chance to contribute meaningfully to a discussion, engages in inter and intrapersonal activities that allow them to process information and interact with a variety of class members to gain greater understanding and skills which develops positive attitude toward the module. This could also be as a result of the fact that Jigsaw-IV strategy enhances and stimulates learners' attitude and make learners entertain lively, attractive, and active which increased the students' attitudes toward learning the module compared with demonstration teaching method. The approach also promotes mutual relationship within the team because every participant needs each other to attain the set goals. This result is in line with the finding of Amosa, and Mudasiru (2017); Isaiah, and

Comfort, (2017); Sa'adu, and Julius (2018); Gerald, (2018); Tsegaye, and, Nellie, (2020) and Akudo and Olaoye (2021). Their findings revealed that there is significant effects on students' attitude through cooperative learning strategies. This finding is not in line with the findings of Sarikaya and Eǧmir (2020) and Gretchenn, (2020), who revealed that students attitude decreased significantly in the experimental group (Jigsaw strategy) and increased insignificantly in the control group (traditional teaching method).

Conclusions

Electrical/electronic technology education students taught maintenance and repairs of electrical equipment using Jigsaw-IV strategy had higher attitude score than the students taught using demonstration method and the effect was statistically significant ($P\text{-value is } 0.0001 < 0.05$). Based on the findings of this study it was concluded that Jigsaw-IV strategy improved student's attitude toward maintenance and repairs of electrical equipment. The following recommendations were made based on the findings.

Electrical technology education teachers should be encouraged to adopt student-centered instructional strategy such as Jigsaw-IV strategy and other modern strategies that will improved student's attitude toward maintenance and repairs of Electrical equipment.

TVET teachers should adopt the Jigsaw-IV strategy in the teaching of maintenance and repairs of equipment as it has a higher effect in improving student's attitude toward maintenance and repairs of Electrical equipment at colleges of Education in Kano-Nigeria.

National Commission for colleges of Education (NCCE) should insist that TVET lecturers uses Jigsaw-IV strategy as it improved student's attitude toward in maintenance and repairs of Electrical equipment at colleges of Education in Kano-Nigeria.

References

- Abike, J.R., Agbowuro, C. & Chollom, G. (2023). Effectiveness of teaching: Jigsaw IV strategy in biology achievement and retention of senior secondary two students. *International Journal of Advancement in Educational Research*, 10(1), 107–114. ISSN: 3208 2715. <https://bwjournal.org/index.php/bsjournal/article/view/1143>.
- Ainur, D.R., Retno, H.W. & Permatasari, A. (2023). The effectiveness of STAD cooperative learning models on critical thinking ability and student learning outcomes on chemical equilibrium. *UNESA Journal of Chemical Education*, 12, 132–140. Doi:10.26740/ujced.v12n2.p132-140.
- Akudo, O.K. & Olaoye, A.A. (2021). Effects of jigsaw-iv instructional strategy on students' attitude towards coordinate geometry. *Nigerian Online Journal of Educational Sciences and Technology (NOJEST)*, 3, 2, 109–119.
- Amosa, G.I. & Mudasiru, Y.O. (2017). Effect of computer-supported jigsaw II, cooperative learning strategies on performance, attitude, and retention of secondary school students in physics. *Journal of Peer Learning*, 10, 76–94.
- Ansheila, R.S. & Supari, M. (2019). The Effectiveness of the Cooperative Learning Model of Jigsaw type on the Results of Students Learned from Skill Critical Thinking of Vocational Schools. *Advances in Social Science, Education & Humanities Research*. 1st Vocational Education International Conference (VEIC), 10. 379-392 DOI: [10.3758/s13428-017-0999-y](https://doi.org/10.3758/s13428-017-0999-y).

- Bio-Anu, D. (2018). Students and teachers attitudes responsible for poor academic performance of junior high school students. *Asian Journal of Education and Social Studies*, 2, 1–8. AJESS.40174. DOI: [10.9734/AJESS/2018/40174](https://doi.org/10.9734/AJESS/2018/40174)
- FRN, 2014. National Policy on Education. Abuja: National Educational Research Development Centre (NERDC).
- Gretchenn, D.A. (2020). Effects of hands-on experiences on student achievement, interest, and attitude in chemistry. *Electronic Theses and Dissertations*, 343. <https://scholarworks.sfasu.edu/etds/343>.
- Hassan, Y.J. Raymond, E., & Bukar, B. (2020). *Introduction to Electronic Maintenance and Repairs*. University Press LTD. Usmanu Danfodiyo University Press: Sokoto, Nigeria. ISBN: 978-978-980-496-5.
- Holliday, D.C. (2000). *The Development of Jigsaw-IV in a Secondary Social Studies Classroom*. University Press of America: Lanham, MD, USA, 23–25.
- Ibidapo, A.B. (2021). The strategies for improving skill acquisition of building technology students in Colleges of Education in Nigeria. *International Journal of Educational Research (IJO)*, 4(7). ISSN: 2805-413X. www.ijojournals.com.
- Isaiah, O.A. & Comfort, K.G. (2017). Attitude of students towards cooperative learning in some selected secondary schools in Nasarawa State. *Journal of Education and Practice*, 8, 29–34.
- John, R.A., Agbowuro, C. & Chollom, G. (2023). Effectiveness of Teaching: Jigsaw-IV Strategy in Biology Achievement and Retention of Senior Secondary two Students. *International Journal of Advancement in Educational Research (IJAER)*. ISSN, 3208–2715, 10, <https://www.academia.edu/10115175>.
- Josiah, M.M. (2020). Effects of Jigsaw Cooperative Learning Strategy on Students' Motivation and Achievement in Senior Secondary School Physics in Jos [PhD Thesis]. Metropolis: Nigeria. University of Jos: Jos.
- Negi, S. (2023). Lecture as a method of teaching. <https://www.scribd.com/document/685082825/lecture-as-a-method-of-teaching>.
- Philip, I.A., Einstein, M.E.A., Nsagha, S.M. & Nana, C. (2023). “The Impact of Cooperative Learning Strategies on the Development of Students' Attitude in History: The Case of Secondary and High Schools in the Buea Municipality” published in *International Journal of Trend in Scientific Research and Development (IJTSRD)*, 7, 303–323. ISSN: 2456-6470. URL: www.ijtsrd.com/papers/ijtsrd53982.pdf.
- Sarikaya, A. & Eđmir, E. (2020). The effect of cooperative learning method on academic achievement, attitude and critical thinking disposition in the 7th Grade Mathematics Lesson. *International Journal of Educational Research Review*, 8, 740–757. DOI: [10.24331/ijere.1309484](https://doi.org/10.24331/ijere.1309484).
- Silva, H., Lopes, J., Dominguez, C. & Morais, E. (2022). [Lecture] Lecture, Cooperative learning and concept mapping: Any differences on critical and creative thinking development? *International Journal of Instruction*, 15, 765–780. DOI: [10.29333/iji.2022.15144a](https://doi.org/10.29333/iji.2022.15144a).
- Silva, H., Lopes, J., Morais, E. & Dominguez, C. (2023). Fostering critical and creative thinking through the cooperative learning Jigsaw and group Investigation. *International Journal of Instruction*, 16, 261–282. DOI: [10.29333/iji.2023.16315a](https://doi.org/10.29333/iji.2023.16315a).
- Teachmint, (2022). Lecture method of teaching. <https://blog.teachmint.com/lecture-method-of-teaching>.
- Tsegaye, S.Y. & Nosisi, F. (2019). Learners' conceptual knowledge development and attitudinal change towards calculus using Jigsaw cooperative learning strategy integrated with GeoGebra. *International Electronic Journal of Mathematics Education (IEJME)*, 15(1), 2–26. Doi:10.29333/iejme/5936.
- Zulhamdi, Z., Rahmatan, H., Artika, W., Pada, A.U.T. & Huda, I. (2022). The effect of applying blended learning strategies flipped classroom model on students' attitude. *Jurnal Penelitian Pendidikan IPA*, 8, 86–93. DOI: [10.29303/jppipa.v8i1.1186](https://doi.org/10.29303/jppipa.v8i1.1186).