EFFECT OF COGNITIVE APPRENTICESHIP INSTRUCTIONAL METHOD ON STUDENTS' INTEREST IN AUTO MECHANICS TECHNOLOGY IN TECHNICAL COLLEGES

Johnbull Oyonru Okotubu
Science Education Department, Faculty of Education, University of Delta, Delta State , **Email:** jbeloforlife@gmail.com , john.okotubu@unidel.edu.ng

Abstract

This study was prompted by the desire to increase male and female students' interest in auto mechanics technology. The study aimed to see how the cognitive apprenticeship instructional method affected the students' interest in auto mechanics technology in technical colleges in Delta State. Two research questions guided the study, and two null hypotheses were tested at a 0.05 level of significance. The pre-test, post-test non-equivalent control group quasi-experimental research design was used for the study. The study population was 237 vocational II auto mechanic students in the six technical colleges in Delta State. The study had a sample size of 114. The purposive sampling technique was employed to sample two colleges from the six technical colleges. Auto Mechanic Interest Inventory (AMII) was used to collect data. Three research experts validated the instrument. Cronbach Alpha was used to establish the reliability coefficient of the instrument, and a reliability coefficient of 0.81 was achieved. Data relating to research questions were analyzed using the arithmetic mean, whereas the null hypotheses were tested using analysis of covariance (ANCOVA). The finding revealed that students' interest in auto mechanics technology using the cognitive apprenticeship instructional method was higher than that of students taught using the demonstration method. The conclusion reached was that the cognitive apprenticeship instructional method is an effective method of training that has the potential to increase student interest. The study recommends that technical teachers adopt the cognitive apprenticeship instructional method in teaching auto mechanics courses to increase students' interest and subsequently improve their academic achievement.

Keywords: *Cognitive apprenticeship, instructional method, interest and auto mechanics.*

Introduction

A technical college is an important aspect of the overall educational system that helps people build strong citizenship skills by enhancing their physical, social, civic, cultural, and economic abilities. According to Amaechi and Thompson (2016), the technical college provides comprehensive vocational instruction that prepares students for admission into various jobs. Students are taught in technical colleges to gain relevant information and abilities in various occupations to find a job in the real world. According to the National Board for Technical Education (NBTE) (2013), technical college is a part of Technical and Vocational Education Training (TVET) aimed to develop the recipients to become craftsmen and master craftsmen. The content targeted skill development and employment to meet the technical college's goals and objectives. The curriculum was divided into different trades with matching modules to allow students to successfully pick and complete the profession of their choice. The automobile trade is one among the several trades.

Auto mechanics technology is a course of study in the automobile trade offered by motor vehicle mechanics work in the technical colleges of Nigeria (NBTE, 2013). It is a subject that prepares the students to acquire relevant skills required for the service, repair and maintenance of automobiles. Auto mechanics involves the application of specific knowledge in the design, selection of materials, construction, operation and maintenance of automobiles. It is a subject connected with scientific principles/knowledge applied in designing and constructing a motor vehicle (Ogundola, 2014)**.** Limbourg (2014) defined auto mechanics technology as a course of study that prepares the recipients for occupation in repairing and maintaining automobiles. Limbourg further stated that it is the subject that equips the recipient with relevant skills required to function in various automobiles or specific areas of the automobile. According to Abubakar (2012), Auto mechanics technology is a programme in vocational institutions that enables students to acquire specialized knowledge and skills required to construct, repair, and maintain four wheels powered by an internal engine. Students in the auto mechanics technology programme are expected to be equipped with the skills and knowledge required to efficiently carry out maintenance work and repair modern, highly automated and computerized electronics gadgets in modern vehicles. To achieve these objectives, auto mechanic teachers must adapt instructional methods that stimulate, secure and sustain the learner's attention and interest and improve their academic achievement.

The tendency to be absorbed and sustained in an experience is known as interest. It is the zeal or willingness to participate in an activity from which one derives some pleasure (Adeniran et al., 2019)**.** According to Onu et al. (2020), interest plays a major role in any undertaking as it influences devotion to duties, fairness, firmness, honesty, endurance, and discipline. According to Obimalume (2021), this fact indicates that interest is a factor that correlates positively and significantly with competence. Students achieve significantly in areas they were interested in and poorly in those they lack interest in. Therefore, it is pertinent to say that a student's interest in a particular trade or career plays a significant part in the academic achievement of such a student. From the above, interest is a mediator in academic achievement, especially between the instructional process and educational outcomes. A student's interest in any subject is borne out of motivation and attitude exhibited by the teacher during the teaching. Also, students' morale and interest, irrespective of gender, can be dampened if a teacher uses an ineffective instructional method.

Appropriately teaching and learning auto mechanics will stimulate and enhance students' interest. It could further improve their academic achievement and qualify them for higher educational levels, enabling them to become knowledgeable in technology. It is based on this backdrop that researchers such as Daluba (2013), Vincent and Akpan (2014), Dorgu (2015), as well as Osuyi and Ainetor (2018) recommend that the demonstration teaching method be used for training within the vocational education.

The demonstration teaching method teaches concepts and principles of real things by combining explanation with handling or manipulating real things, materials, or equipment (Dorgu, 2015). According to Osuyi and Ainetor (2018), demonstration involves showing, doing, or displaying the point of emphasis to students. It is frequently used within a teaching method

and sometimes as a method of teaching itself. The teacher's responsibility is to demonstrate how to do something or demonstrate a concept by orally discussing the nature of the act, then showing the action methodically, and then having the pupils repeat the action. Students are involved in activities that will impact their behaviour patterns. Students are introduced to tangible materials relevant to their cognitive framework through demonstration. Direct encounters like this add a lot to the learning process. Demonstrations are particularly beneficial for teaching psychomotor skills and classes that need practical knowledge. The benefits of employing the demonstration method in teaching include bridging the gap between theory and practice, allowing the instructor to teach manipulative and operational abilities, and allowing students to witness the teacher display operational skills.

Although the demonstration method is an excellent way to teach topics to students, it does not appear to be effective at technical colleges regarding the automobile trade. The reason is that poor academic achievement and low-interest rates are still persistent among male and female students in auto mechanics in technical schools, as reported by National Business and Technical Examinations Board (NABTEB,2019). It is a challenge that necessitates determining the use of other instructional methods like the cognitive apprenticeship instructional method (CAIM).

According to Eze et al. (2020), the cognitive apprenticeship instructional method is a teaching style that encourages people to learn from one another through observation, imitation, and modelling. According to Gerard and Eric (2011), in the cognitive apprenticeship instructional method, one relies on expert demonstration (modelling) and guidance (coaching) in the early stages of learning. After that, the learner is challenged with slightly more difficult tasks than they can complete independently. Hence, they must rely on assistance and collaboration with others to complete these tasks. In other words, trainees must collaborate with more experienced experts and eventually go from observation to active practice. According to Tompkins (2016), cognitive apprenticeship learning activities are holistic and expand in complexity and diversity over time as the student gains experience. Identifying the subtle, tacit features of the expert practice that may not be explicated in the demonstrative teaching method is a key benefit of cognitive apprenticeship learning over standard classroom-based methods (Abubakar, 2012).

According to Gerard and Eric, the first phase of CAIM (modelling, coaching, and scaffolding) is meant to assist students in acquiring an integrated set of abilities through observation and guided practice. The second phase (articulation and reflection) is intended to assist students in focusing on their observations of expert problem-solving procedures and gaining conscious access and control over their problem-solving strategies. The last stage (exploration) aims to promote learner autonomy in expert problem-solving procedures and to define or formulate issues to be addressed. The demonstrational teaching method does not explicitly include these stages of the learning process.

Studies have revealed that the demonstration teaching method, commonly used in teaching students in technical colleges, does not stimulate students' interest in auto mechanic technology. It results in a high attrition rate and poor academic achievement of auto mechanic

technology students in technical colleges. As a result, the research seeks to establish the effect of CAIM on student interest in auto mechanics technology in technical colleges.

Statement of the Problem

It is a worry that many students who enrolled in the automobile trade continue to drop out of school or change to other trades before graduation. More worrisome is that the few who eventually graduate from the trade persistently perform poorly in their National Business and Technical Examinations Board (NABTEB) examination, as reported by NABTEB (2013, 2017, 2018, 2019). Several studies have attributed students' constant failure rate and lack of interest to several factors such as inadequate instructional materials, a dearth of committed teachers, and inappropriate instructional techniques. However, studies have revealed that among the numerous factors, the instructional method used by the teacher plays a predominant role in the interest and academic achievement of students in technical colleges. Therefore, to address the lack of students' interest and their persistent poor academic achievement in auto mechanic subjects, a better instructional method to enhance students' interest and improve performance needs to be adopted. It may likely arouse the students' interest and enhance their academic achievement.

The demonstration method mostly used for teaching in technical colleges, according to Osuyi and Ainetor (2018), seems not to be yielding the desired result in auto mechanics technology in technical colleges. This is because poor academic achievement and high attrition rate among auto mechanics students in technical colleges still persistent. Therefore, could this problem of constant poor academic achievement and lack of interest among technical college auto mechanics students be enhanced using the Cognitive Apprenticeship Instructional Method (CAIM)?

Purpose of the Study

The study aims to determine the effect of cognitive apprenticeship instructional methods on students' interest in auto mechanics technology. Specifically, the study determined:

1. The effect on mean interest scores of auto mechanic students in technical colleges taught with cognitive apprenticeship instructional method and those taught with demonstration method.

2. The effect on mean interest scores of male and female students taught auto mechanics with cognitive apprenticeship instructional method.

Research Questions

The following research questions guided the study.

1. What is the difference between the mean interest scores of students taught auto mechanics technology using cognitive apprenticeship and demonstration instructional methods?
2. What is the difference between the mean interest scores of male and female students taught auto mechanics technology using the cognitive apprenticeship method?

Hypotheses

The following null hypotheses were tested at a 0.05 level of significance.

Ho_1: Mean interest scores of students taught auto mechanics technology using the cognitive apprenticeship instructional method and those taught using the demonstration method are not significantly different.

Ho_2: Mean interest scores of male and female students taught auto mechanics technology using the cognitive apprenticeship instructional method do not differ significantly.

Method

The research was conducted using a quasi-experimental research design. The study was carried out at Delta State's six technical colleges. The study population was 237 vocational II auto mechanic students in the six technical colleges in Delta State. The study used a sample size of 114. The purposive sampling technique was employed to sample two colleges from the six technical colleges. The Auto Mechanics Interest Inventory (AMII) was used to collect data. Three experts validated the research instrument. Cronbach Alpha was used to test the instrument for dependability, yielding a reliability index of 0.81.

Experimental Procedures:

The researcher demanded and received approval from the principals of the colleges to use their facilities, instructors and students in the study. The research lasted seven weeks (one week for pre-test and briefing of instructors involved, six weeks for treatment and post-test). Before the experiment began, the researcher used the first week to brief the instructors on the method engaged in the exercise. After training, the auto mechanics instructors in the participating colleges conducted a pre-test on both groups (experimental and control groups) to determine the students' initial ability and interest before the experiment. Classes began on the second week and finished on the sixth week. At the same time, a post-test was carried out on the seventh week. The instruction took place during the regular school programme. The auto mechanics instructors followed the normal school schedules in teaching their lessons.

The experimental group received teaching using the cognitive apprenticeship technique, while the control group received instruction using the demonstration method. The training process's key emphasis was identifying, functioning, and connecting the various components of the vehicle engine and transmission system. The experimental group's instruction was created with the CAIM elements in mind. Modelling, mentoring, and scaffolding was used to sequence the teaching sessions carefully. During each teaching and learning experience, students in the experimental groups were systematically encouraged to engage in articulation, reflection, and exploration by sharing ideas on areas of difficulty and defining problems to be solved, consistent with the CAIM methods. The auto mechanics instructors and their helpers used AMII test items to deliver a post-test to both groups after the therapy. For each of the dependent variables, the exercise generated post-test data. The researcher marked the students' test responses and statistically analysed the data. Mean scores and analysis of covariance were used to examine the data (ANCOVA). The mean was used to answer the study questions, while the null hypotheses were tested using Analysis of Covariance (ANCOVA) at a 0.05 level of significance. The null hypothesis was rejected if the p-value was less than or equal to the significance level (0.05). The

null hypothesis was not rejected even though the p-value was larger than the significance level (0.05).

Results

Table1. ***Mean and Standard Deviation for Interest Scores of Students***

Groups		Mean Interest Scores				
	No	Pre-test Mean	Stand dev	Post-test Mean	Stand dev	Mean Gain
Experimental	58	45.24	6.31	75.24	9.21	30.00
Control	56	45.12	6.36	47 .71	9.25	2.59

Table 1 displays the mean and standard deviation of interest scores of students in experimental and control groups. The mean scores indicate that the experimental group had higher mean scores in both the pre-test and post-test. The mean gain for the experimental group is 30.00, while the control group is 2.59. It shows that the experimental group gained more interest than the control group.

Table 2: ***Mean and Standard Deviation for Interest Scores of Male and Female Students in Experimental Group***

	Groups		Pre-test interest	Post-test interest	Mean gain
Experimental	Male	Mean	44.84	76.22	
		N	45	45	31.38
		Std. Deviation	6.32	9.14	
	Female	Mean	46.62	71.85	
		N	13	13	25.23
		Std. Deviation	6.35	8.99	

Table 2 shows that males had higher post-test mean interest than female students. The mean gain of male students is 31.38, while that of female students is 25.23.

Table 3

ANCOVA for Differences in mean interest scores of Students

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1194.277[a]	2	597.139	2.214	.114
Intercept	3372.553	1	3372.553	12.503	.001
Pretest interest	1040.565	1	1040.565	3.858	.052
Cogn. Interest	355.994	1	355.994	4.565	.037
Error	29940.740	111	26940.736		
Total	465392.000	114			
Corrected Total	31135.018	113			

a. R Squared = .038 (Adjusted R Squared = .021)

Table 3 shows a significant effect of treatment in the post-test mean interest score of students in the experimental group and control groups $F(1, 113) = 4.568$, $p< 0.05$. This means a significant difference in the mean interest scores of students in experimental and control groups. Therefore, the hypothesis that there is no significant mean difference in the mean interest scores of students in the experimental and control group is rejected.

Table 4: ***ANCOVA for Differences in Male and Female Mean Interest Scores in Experimental Group***

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	549.145[a]	2	274.573	3.521	.036
Intercept	3247.418	1	3247.418	41.639	.000
Gender pretest	76.279	1	76.279	.283	.596
Gender exper	256.887	1	256.887	3.294	.075
Error	4289.476	55	77.9		
Total	333192.000	58	90		
Corrected Total	4838.621	57			

a. R Squared = .113 (Adjusted R Squared = .081)

Table 4 shows no significant effect of treatment in the post-test mean interest score of male and female students in the experimental group, $F(1, 113) = 3.294$, $p> 0.05$. In the experimental group, there was no significant difference in interest mean scores between male and female students. As a result, the hypothesis that there is no significant mean difference in male and female students' mean interest scores in the experimental group is not rejected.

Discussion of Results

The analysis of research question 3 and hypothesis 3 revealed that students who were taught auto mechanics technology using the demonstration teaching method had an average mean interest score. In contrast, those taught with CAIM had a higher mean interest score than those taught using the demonstration method. It means that students in auto mechanics had an interest in the trade, but for using CAIM in teaching, the students' interest increased significantly. This could be due to activities and experiences involved in CAIM, which increased the students' interest significantly. This finding is in line with Obimalume (2021), Ogundola (2014), Oyenuga (2010) and Musa (2007), who found that students' interest could be enhanced when the instructional method that increases students' participation is used for instruction. However, the results of this study differ from the findings of Olaf and Jurgen (2001), which showed that students' interest had no significant effect on the teacher's instructional method but the students' academic choice.

Lastly, the analysis of hypothesis 6 revealed that the mean interest of male and female students taught auto mechanics using CAIM did not differ significantly in post-test mean scores. This indicates that the cognitive apprenticeship instructional method was effective and could potentially improve the interest of both male and female students in auto mechanics technology.

This result is in line with the findings of Obimalume (2021), Ogundola (2014), Oyenuga (2010) and Musa (2007), which reported that if the instructional method that promotes gender active involvement is used for instruction, the interest of both male and female students could be enhanced.

Conclusion

The study's findings revealed that students' interest in auto mechanics technology significantly increased in the trade, which could be due to activities and experiences involved in CAIM. Therefore, it was concluded that the cognitive apprenticeship instructional method effectively improves students' interest in auto mechanics technology irrespective of gender.

Recommendations

The study recommended that the cognitive apprenticeship instructional method should be explicitly accepted as a method of instruction in technical colleges. It was also suggested that school administrators should encourage auto mechanics teachers to use cognitive apprenticeship instructional methods. There should be provision for opportunities for in-service training, conferences, seminars, and workshops to equip them with competencies needed in the use of the cognitive apprenticeship instructional method.

References

Abubakar M. I. (2012). Effect of Cognitive Apprenticeship Instructional Method on Auto Mechanics Students. *Assumption University Journal of Technology 16 (2),* 89-98.

Adeniran S.A, Atsuwe B. A, Iortyom A. I. (2019). Effect of Multimedia Teaching Technology on SSS 1 Student's Interest and Achievement in Auto Mechanics in Gboko, Benue State, Nigeria. *International Journal of Advance Research and Innovation, 7(3),* 235-239.

Amaechi O.J & Thompson C. G (2016). Practical skills in technical and vocational training programmes in Nigeria. *International Journal of Scientific Research Engineering & Technology* 5 (12), 78 –82.

Daluba, N. E. (2013). Effect of Demonstration Method of Teaching on Students' Achievement in Agricultural Science. *World Journal of Education 3 (6*), 61- 67.

Dorgu, T.E. (2015). Different teaching methods: A panacea for effective curriculum implementation in the classroom. *International Journal of Secondary Education 3(6),* 77-87.

Eze T. I, Obidile J. I & Okotubu, J.O (2020). Effect of cognitive apprenticeship instructional method on academic achievement and retention of auto mechanics technology students in technical colleges. *European Journal of Education Studies, 6(11),* 180-190.

Federal Government of Nigeria (FGN) (2013). *National Policy on Education.* NERDC Press.

Gerard, P & Eric P. (2011). A cognitive apprenticeship approach to engineering education: the Role of learning styles. *Journal of the Higher Education Academy. 6 (1*), 21-29.

Limbourg, G (2014). *Understanding the principle of automobile technology*. Premium Publishing
Incops.

Musa, S. A. A. (2007). Effect of constructivist teaching method on students' achievement and interest in Mathematics in secondary schools in Kogi State. *Journal of Vocational and Technical Educators, 1 (1),* 12-17.

National Board for Technical Education (2013). *National Technical Certificate Examination (craft level) Syllabus for Engineering Trades based on the NBTE Modular Curricular.* NBTE

National Business and Technical Examination Board (2019). Chief Examiner's Report on the performance of students in NTC and NBC examination. Fiesta Printing Press Ltd.,

Obimalume V.N (2021). Effect of multiple intelligence-based instructional approaches on students' interest in secondary school Biology. *Sapientia Foundation Journal of Education, Sciences and Gender Studies (SFJESGS), 3(2),*234 – 242.

Ogundola I. P. (2014). Effect of Inquiry Techniques on the Interest of Technical College Students in Auto Mechanic in Nigeria. *IOSR Journal of Research & Method in Education, 4(2),* 53-60.

Olaf, K. & Jurgen B. (2001). The relationship between interest and achievement. *Journal for Research in Mathematics Education 32 (5),* 448-470.

Onu, W.O. Anyaegbunam, N.J. &Uzoigwe A. V (2020). Improving biology students' interest and Achievement through collaborative instructional strategy, *British Journal of Education Society and Behavioural Science,33 (2),*9-20.

Osuyi S.O &Ainetor U.A (2018). Effect of Demonstration Teaching Method on Students' Academic Performance in Basic Electricity in Technical Colleges in Edo State. *Journal of Education in Developing Areas (JEDA)26 (2),* 37 – 45.

Oyenuga, A. O. (2010). Effect of Models on Interest and Academic Achievement of Auto-mechanics students in Technical Colleges in Lagos State. *PhD Thesis* Presented to the Department of Vocational Teacher Education, University of Nigeria, Nsukka.

Tompkins, E. K. (2016). Application of cognitive apprenticeship model to library instruction. *City University of New York Academic Works.* http://academicworks.cuny.edu/kb_pubs/22.

Vincent E. O & Akpan U. T (2014) Instructional strategies and students' academic performance in electrical installation in technical colleges in Akwa Ibom State: Instructional skills for structuring appropriate learning experiences for students. *International Journal of Educational Administration and Policy Studies. 6 (5),* 80-86.