

ADEQUACY OF MATERIAL RESOURCES FOR THE TEACHING AND LEARNING OF AUTO-MECHANICS IN TECHNICAL COLLEGES IN CROSS RIVER STATE

Adewumi, O. A.; Nwobasi, P. A. & Ndem, J. U

Federal College of Education, Obudu Cross River State

Department of Technology and Vocational Education

Faculty of Education Ebonyi State University, Abakaliki Ebonyi State

ndemjoseph2012@gmail.com

Abstract

This work focused on the adequacy of material resources for the teaching and learning of auto-mechanics in Technical Colleges in Cross River State. The study adopted a survey research design. The population of the study comprised five Technical Colleges, each with one Technologist, in Cross River State. No sampling was conducted; the entire population was used for the study. The instrument used for data collection was a checklist containing 30 items organized into three clusters. The instrument was validated by three experts—two in Technology and Vocational Education and one in Measurement and Evaluation—all from Ebonyi State University, Abakaliki. The reliability of the instrument was determined using Kendall's concordance statistical tool, which yielded a reliability coefficient of 0.730. The data collected were analysed using percentages for answering the research questions and chi-square for testing the hypotheses. Based on the data analysis, it was found that engine material resources, transmission material resources, and braking material resources were inadequate for the effective teaching and learning of auto-mechanics in Technical Colleges in Cross River State. The researcher recommended that the Government of Cross River State, in collaboration with Technical School Management and Non-Governmental Organizations (NGOs), should provide adequate material resources in Technical Colleges to enhance the teaching and learning of auto-mechanics.

Key words: Technical College; Resource materials, Teaching; Learning auto-mechanics

Introduction

Technical Colleges in Nigeria were established with the primary mandate of producing skilled artisans and technicians equipped to drive the nation's industrial, technological, and economic advancement. These institutions, positioned as post-primary educational establishments, are designed to provide practical-oriented technical education. According to the Federal Government of Nigeria (FGN, 2013), Technical Colleges are intended to furnish students with technical competencies that will enable them to become self-reliant and earn a sustainable living. Though they possess the status of senior secondary schools, their objective transcends conventional academics by focusing on equipping students with hands-on skills and scientific knowledge essential at sub-professional levels.

The structure and location of these colleges are critical in shaping their output. In Cross River State, for instance, Technical Colleges are found in both urban and rural areas. Urban-based colleges benefit from infrastructures such as good road networks, electricity, banks, and telecommunications, whereas their rural counterparts often struggle with a lack of these facilities. This disparity has implications for the quality and delivery of technical education across the state.

Recognizing the indispensable role of Technical and Vocational Education and Training (TVET) in national development, the Federal Republic of Nigeria (2014) emphasized that TVET encompasses not only general education but also the acquisition of practical skills, attitudes, and knowledge relevant to various sectors of economic and social

life. This aligns with the curriculum of Technical Colleges, which incorporates specialized trades such as auto mechanics, electrical installations, woodwork, and building construction, tailored to meet societal and industrial needs.

One of the cornerstone programs in these colleges is the Auto Mechanics Trade, designed to train students in diagnosing and repairing automotive faults. Graduates of this program are expected to emerge as proficient craftsmen with specializations in auto-electrics, spray painting, auto-body building, and diagnostic services. The curriculum is developed to prepare students for the National Business and Technical Examination Board (NABTEB), which is equivalent to the Senior Secondary School Certificate Examination (SSSCE). Initially, the curriculum was structured to comprise 60% practical and 40% theoretical instruction. However, Eborty (2016) lamented that this ratio has been reversed due to the lack of facilities, resulting in diminished hands-on experience for students.

The effectiveness of auto mechanics education, like all other technical trades, depends significantly on the availability and utilization of school facilities, equipment, and instructional tools. These resources are essential for translating theoretical knowledge into practical skills. According to the National Board for Technical Education (NBTE, 2009), school facilities in technical colleges encompass physical structures such as classrooms, workshops (mechanical, wood, electrical/electronic), laboratories, and libraries. Each of these facilities plays a unique role in creating a conducive learning environment that motivates both students and teachers.

Instructional tools, on the other hand, include teaching aids and materials that simplify complex concepts and foster better student understanding. These could be concrete or audio-visual materials that stimulate active learning. Equipment refers to the mechanical and manual tools used in the execution of practical tasks. These range from simple hand tools like spanners and gauges to heavy-duty machines like lathes, drills, and grinders. The strategic deployment of these tools in workshops makes learning engaging and realistic, bridging the gap between classroom instruction and industrial expectations.

A mechanical workshop, often called an engineering workshop, is a facility where mechanical fabrication, maintenance, and repairs are carried out. Similarly, wood and electrical/electronic workshops are designed for practical training in woodcraft and electrical maintenance respectively (Nwachukwu, 2016). Laboratories provide controlled environments for scientific experimentation and analysis, while classrooms serve as spaces for theoretical instruction (Ekong, 2021). Playgrounds, though seemingly peripheral, also contribute to holistic development by offering recreational relief, enhancing students' social well-being and mental health.

However, these components, though essential, are rendered ineffective without the human agent—the teacher. As Nwachukwu (2016) noted, teaching is a directional process aimed at creating desirable behavioral changes in learners. Teachers in technical colleges, therefore, must navigate the challenges of diverse student backgrounds and learning styles by employing appropriate instructional techniques. In auto mechanics, this involves breaking down complex skills into teachable units and simulating real-world scenarios using relevant tools and facilities.

Unfortunately, the teaching and learning of auto mechanics in Nigerian technical colleges face significant challenges due to the inadequate provision and poor maintenance of physical facilities and instructional resources. Many institutions operate with substandard or insufficient tools, leading to unmotivated students and ineffective instruction. This has resulted in low performance in examinations and limited post-graduation opportunities for students. Olabiyi (2015) highlighted that less than 10% of candidates meaningfully pass senior school certificate examinations due to a lack of instructional materials.

The implications of these inadequacies are far-reaching. A persistent shortage of skilled auto mechanics could affect the automotive industry and service sectors. Additionally, unemployed graduates without adequate training are less likely to establish independent ventures, thereby compounding the national unemployment crisis.

Therefore, it becomes imperative that adequate physical facilities, modern equipment, and relevant instructional tools are provided in technical colleges. More importantly, teachers must be trained and supported to employ strategic teaching techniques that maximize the use of these resources. Only then can the goals of establishing the auto mechanics program—producing skilled, self-reliant, and employable graduates—be effectively realized.

Statement of the Problem

The poor performance of students in technically oriented courses, particularly in Auto Mechanics—which, according to its design blueprint, is intended to produce averagely skilled technicians for the country—is a growing national concern. Yisa (2022) asserts that the results of the Senior Secondary School Certificate Examinations, including those conducted by the National Business and Technical Examinations Board (NABTEB), have been consistently poor across nearly all subjects offered by students. He further stressed that only about 10 percent of candidates are able to meaningfully pass their examinations. In Cross River State, for instance, NABTEB results revealed that the average failure rates in the Auto Mechanics trade were 58 percent in 2017, 57 percent in 2018, and 56 percent in 2019 (Chief Examiner, 2017, 2018, and 2019). The causes of this persistent poor performance form the core concern of this study. If the situation is left unaddressed, more unskilled craftsmen will continue to be produced, potentially leading to significant damage to people's property and, in the long run, contributing to a higher unemployment rate. Furthermore, if this trend continues, the future may witness a critical shortage of skilled auto mechanics to fill roles in the automotive industry. It is against this background that the present study is designed to investigate both the remote and immediate causes of students' poor performance in Auto Mechanics and to propose possible remedies, with a particular focus on Technical Colleges in Cross River State.

Purpose of the Study

The main purpose of this study is to ascertain the adequacy of material resources for the effective teaching and learning of auto-mechanics in Technical Colleges in Cross River State. Specifically, the study sought to determine the:

1. Adequacy of the auto engine material resources in teaching and learning of auto mechanics in Technical Colleges in Cross River State
2. Adequacy of the transmission material resources in teaching and learning of auto mechanics in Technical Colleges in Cross River State
3. Adequacy of the braking system material resources in teaching and learning of auto mechanics Technical Colleges in Cross River State

Research Questions

The following research questions were formulated to guide the study

1. How adequate are the auto engine material resources in teaching and learning of auto mechanics in Technical Colleges in Cross River State?
2. How adequate are the transmission material resources in teaching and learning of auto mechanics in Technical Colleges in Cross River State?
3. How adequate are braking system material resources in teaching and learning of auto mechanics Technical Colleges in Cross River State?

Hypotheses

- H0₁: There is no significant difference between the adequacy of automobile engine resource system and NBTE bench mark for teaching and learning auto-mechanics in technical colleges of education Cross River State
- H0₂: There is no significant difference between the adequacy transmission system and NBTE benchmark for teaching and learning auto-mechanics in technical colleges of education in Cross River State.
- H0₃: There is no significant difference between the adequacy of braking system component and NBTE benchmark for teaching and learning auto-mechanics in technical colleges of education in Cross River State.

Methodology

This study was conducted in Cross River State using survey research design. Nwoji (2016) states that a survey design is a type of design that collects data describes in a systematic manner characteristic features about a given population. A survey research design according to Nwoke (2017) is one in which the entire population or representative sample is studied by collecting and analyzing data from the head of departments and the technical teaching staff. This design was considered suitable since the study makes use of checklist to collect data from the respondents and data analyzed without manipulation. The population of this study was 5 auto-mechanic workshop technologists from the five Technical Colleges in Cross River State. (Statistic unit of the Technical Colleges in Cross River State 2023). There was no sampling the whole population was used because the population was small and manageable.

The instrument for data collection for this study was Checklist. The checklist contains all the resources for teaching and learning of auto mechanics in Technical Colleges in CRS as stipulated by National Board for Technical Education, (NBTE and National Vocational Certificate (NVC) in Motor Vehicle Mechanics Curriculum and Module Specifications 2009. The checklist contains sections 'A' contains 10 items resource on components auto engine, B' contains 10 items resource on components transmission system, C' contains 10 items resource on components braking system. The checklist instrument was subjected to both face and content validation by three experts, two from the Department of Technology and Vocational Education and one expert in Measurement and Evaluation, Ebonyi State University, Abakaliki. The experts' suggestions were taken into consideration in the final draft of the instrument.

In this study, the reliability coefficient of the instrument was determined by using Kendel concordance tool. The data collected with the checklist was analyzed using (%) percentage and ratio for answering of research questions while the null hypotheses were tested using chi-square at 0.05 level of significant. In taking decision of any item with 50% and above will be regarded as a resource that is adequate while anyone below was regarded as inadequate resource for teaching and learning of auto-mechanics.

Results

The researcher presents the results of the analysis of the data in tables below.

Research Question 1: How adequate are the automobile engine resource system for teaching and learning of auto-mechanics at the technical colleges in Cross River State?

Table 1: The adequacy of automobile engine resource system for teaching and learning of auto-mechanics at the technical colleges in Cross River State.

S/N	List of Automobile Engine system resources	Bench mark	No. of students	Resources Available	Ratio	Remarks
1	Life vehicle engine	2	20	-	0:2	Inadequate
2	Dead vehicle engine	2	20	1	1:2	Inadequate
3	Vehicle jack stands	2	20	2	2:2	Adequate
4	Motor scope engine analyzer	2	20	-	0:2	Inadequate
5	Injector repair machine	2	20	-	0:2	Inadequate
6	Portable engine host	2	20	-	0:2	Inadequate
7	Diesel pressing and calibrating machine	2	20	-	0:2	Inadequate
8	Cylinder boring machine	2	20	-	0:2	Inadequate
9	Carburetor service kits	2	20	1	1:2	Inadequate
10	Piston ring compressor	2	20	2	2:2	Adequate

Table 1 indicates that all the items on automobile engine system are inadequate for teaching and learning of auto-mechanics in Technical colleges compared to the NBTE specifications except items 3 and 10, jack stand and piston ring compressor which are adequate for teaching and learning of auto-mechanics in Technical colleges in Cross River State.

Research Question 2: How adequate are the transmission system for teaching and learning of auto-mechanics at the technical colleges in Cross River State?

Table 2: The adequacy of transmission system for teaching and learning of auto-mechanics at the technical colleges in Cross River State.

S/N	List of Transmission system resources	Bench mark	No. of students	Resources available	Ratio	Remarks
1	Fluid and hydraulic pump	2	20	-	0:2	Inadequate
2	Torque wrench pre-set type metric graduation	2	20	1	1:2	Inadequate
3	Transmission jack	1	20	1	1:1	Adequate
4	Hydraulic press	1	20	1	1:1	Adequate
5	Clutch alignment gauge	1	20	1	1:1	Adequate
6	Clutch set screw	1	20	-	0:1	Inadequate

	gauge						
7	Oil cans	10	20	5	5:10	Inadequate	
8	Spanners 8mm – 24mm (flat)	2	20	1 set	1:2	Inadequate	
9	Spanners 8mm – 24mm (round)	2	20	1 set	1:2	Inadequate	
10	Pliers (Nose, mouth, long, short)	2	20	1	1:2	Inadequate	

Table 2 shows that all the items on transmission system resources were found to be inadequate except items 3, 4, and 5 (Transmission jack, hydraulic press and clutch alignment gauge for teaching and learning of auto-mechanics at the Technical colleges in Cross River State.

Research Question 3: How adequate are the braking system component resources for teaching and learning of auto-mechanics at the technical colleges in Cross River State?

Table 3: The adequacy of braking system component resources for teaching and learning of auto-mechanics at the technical colleges in Cross River State.

S/N	List of Braking system resources	Bench mark	No. of students	No. of resources	Ratio	Remarks
1	Hydraulic nipple forming tool	1	20	-	1:20	Inadequate
2	Hydraulic press	1	20	-	1:20	Inadequate
3	Wheel jack hydraulic and manual	2	20	1 manual	2:20	inadequate
4	Brake calipers	3	20	1 set	3:20	Inadequate
5	Socket	2	20	1 set	2:20	Inadequate
6	Micrometer	2	20	-	2:20	Inadequate
7	Vernier clippers	2	20	1	1:20	Inadequate
8	Brake oil	5 tins	20	2 tins	5:20	Inadequate
9	Allen wrench	2	20	1 set	2:20	Inadequate
10	Calipers	2	20	1	2:20	Inadequate

Table 3 reveals that all the items on braking system resources were inadequate for teaching and learning of auto-mechanics at the Technical colleges in Cross River State.

Hypotheses

H0₁: There is no significant difference between the adequacy of automobile engine resource system and NBTE bench mark for teaching and learning auto-mechanics in technical colleges of education Cross River State

Table 4: X^2 Analysis of the difference between adequacy of auto-mobile engine resource and NBTE bench mark for teaching and learning auto-mechanics in technical colleges of education Cross River State

S/N	Automobile Engine system resources	O	E	O – E	(O – E) ²	$\frac{(O-E)^2}{E}$	$x^2_{cal.}$	df	$x^2_{crit.}$	Decision
1	Life vehicle engine	0	2	-2	4	2				
2	Dead vehicle engine	1	2	-1	1	0.5				
3	Vehicle jack stands	2	2	0	0	0	13	9	3.33	Significant
4	Motor scope engine analyzer	0	2	-2	4	2				
5	Injector repair machine	0	2	-2	4	2				
6	Portable engine host	0	2	-2	4	2				
7	Diesel pressing and calibrating machine	0	2	-2	4	2				
8	Cylinder boring machine	0	2	-2	4	2				
9	Carburetor service kits	1	2	-1	1	0.5				
10	Piston ring compressor	2	2	0	0	0				
13										

Table 4 shows that X^2 calculated of 13.00 is greater than the X^2 critical of 3.33. This means that there is a significant difference in the adequacy of engine system for teaching of auto-mechanics in Technical Colleges in Cross River State and NBTE bench mark.

H0₂: There is no significant difference between the adequacy transmission system and NBTE benchmark for teaching and learning auto-mechanics in technical colleges of education in Cross River State.

Table 5: X^2 Analysis of the difference between adequacy of transmission system and NBTE bench mark for teaching and learning auto-mechanics in technical colleges of education Cross River State

S/N	Transmission system resources	O	E	O – E	$(O - E)^2$	$\frac{(O-E)^2}{E}$	$x^2_{cal.}$	df	$x^2_{crit.}$	Decision
1	Fluid and hydraulic pump	0	2	2	4	2				
2	Torque wrench pre-set type metric graduation	1	2	1	1	0.5	7.5	9	3.33	Significant
3	Transmission jack	1	1	0	0	0				
4	Hydraulic press	1	1	0	0	0				
5	Clutch alignment gauge	1	1	0	0	0				
6	Clutch set screw gauge	0	1	-1	1	1				
7	Oil cans	5	10	-5	25	2.5				
8	Spanners 8mm – 24mm (flat)	1	2	-1	1	0.5				
9	Spanners 8mm – 24mm (round)	1	2	-1	1	0.5				
10	Pliers (Nose, mouth, long, short)	1	2	-1	1	0.5				
						7.5				

Table 5 shows that X^2 calculated of 7.50 is greater than the X^2 critical of 3.33. This implies that there was a significant difference in the adequacy of transmission system for teaching and learning of auto-mechanics in Technical Colleges in Cross River State.

H0₃: There is no significant difference between the adequacy of braking system component and NBTE benchmark for teaching and learning auto-mechanics in technical colleges of education in Cross River State.

Table 6: X^2 Analysis of the difference between adequacy of braking system and NBTE bench mark for teaching and learning auto-mechanics in technical colleges of education Cross River State

S/N	Breaking System Resources	O	E	O – E	$(O - E)^2$	$\frac{(O-E)^2}{E}$	$\chi^2_{cal.}$	df	$\chi^2_{crit.}$	Decision	
1	Hydraulic nipple forming tool	0	1	-1	1	1	9.63	9	3.33	Significant	
2	Hydraulic press	0	1	-1	1	1					
3	Wheel jack hydraulic and manual	1	2	-1	1	0.5					
4	Brake calipers	1	3	-2	4	1.3					
5	Socket	1	2	-1	1	0.5					
6	Micrometer	0	2	-2	4	2					
7	Vernier clippers	1	2	-1	1	0.5					
8	Brake oil	2	5	-3	9	1.8					
9	Allen wrench	1	2	-1	1	0.5					
10	Calipers	1	2	-1	1	0.5					
							9.63				

Table 10 shows that X^2 calculated of 9.63 is greater than the X^2 critical of 3.33. This signifies that there is significant difference between the adequacy of braking system and the NBTE for teaching and learning of auto-mechanics in Technical Colleges in Cross River State.

Summary of Findings

Based on the analysis of the data, the following findings emerged:

1. Auto-mobile engine system resources were inadequate except piston ring compressor such as dead vehicle engine, vehicle jack stand, injector repair machine and others.
2. The transmission system resources were inadequate such as fluid and hydraulic pump, transmission jack and many others
3. The braking system resources were inadequate such as hydraulic nipple forming tools, hydraulic press and others.

Discussion of Findings

The researcher presents the discussions of the findings of the study and indicated below.

Adequacy of automobile engine resources system

Based on the analysis of the data collected, it was found that the auto-mobile engine resource system was inadequate. This finding does not agree with Vicker, Pennock and Shigley (2018) who reported that for effective teaching of auto-mechanics, there must be adequate engine system resources to enable the students acquire the basic knowledge and skills in the subject. Furthermore, the National Board for Technical Education (NBTE) (2009), stated that automobile engine resources must be adequate in any technical college for the use of the

teachers and students for effective teaching and learning. The finding did not agree with the report of the NBTE.

Adequacy of transmission resources system

The finding also was that transmission system resources was inadequate except transmission jack, clutch alignment gauge and hydraulic press. This finding is inline with Yisa (2022) who reported that adequacy of transmission jack, clutch alignment gauge and hydraulic press must be enough in the workshop for effective teaching of the principles of transmission in auto-mechanics. Additionally, Oshadumi (2015) pointed out that the inadequacy of transmission system resources will always hamper the teaching and learning of auto-mechanics and other technical subjects in the Technical colleges. The findings agrees with Okoro (2014) who reported that Vocational and Technical subjects should be taught when there is adequate resources otherwise the programme of Vocational and Technical education will not achieve its objectives.

Adequacy of braking resources system

Furthermore, the study found that braking system resources were inadequate in the Technical Colleges in the study area. Braking system in the auto-mobiles is one of the most essential system which cannot be neglected in auto-mobile. This finding disagrees with Ogbuanya and Usman (2020) who reported that motor vehicles need effective braking system to function with the basic braking system resources; but in the case of the Technical Colleges in Cross River State the braking system resources were found inadequate. This implies that the students may not acquire the basic skills in braking system since the teaching resources were not adequate. This findings also disagrees with Umar and Ma'aji (2010) who reported in their study that many technical colleges in Nigeria do not have adequate instructional materials for teaching and learning. This may be attributed to the problem of underfunding of educational system in Nigeria, which has not met the United Nation's bench mark. The problem of inadequate teaching materials in the educational system in Nigeria has been one of the factors reducing the standards of education in the country – Nigeria. It is necessary that every educational institutions should be provided with adequate instructional materials by the owners of such institution, otherwise the aim of education and skill acquisition will be a day dream.

Conclusion

Auto –mechanics is one of the trades being taught in the Nigerian Technical Colleges. The trade is essential in the development of auto-mobile industry in Nigeria. This work determined the adequacy of material resources for the effective teaching and learning of auto-mechanics in Technical colleges in Cross River State. Data were collected using structured questionnaire and the analysis of the data showed that the material resources for teaching and learning mechanics were inadequate. This showed that the material resources in the Technical colleges in Cross River State were below the NBTE stipulated.

Recommendations

Based on the findings of the study, the researcher recommended that;

1. The Cross River State government should provide adequate engine system resources in the Technical Colleges for teaching and learning
2. The Ministry of Education in Cross River State should provide adequate transmission system resources in the Technical colleges.
3. The Ministry of Education in collaboration with the Technical college management to provide braking system resources in the Technical colleges.

References

- Eborty, E. E. (2016). *An appraisal of vocational education management practices for sustainable development in Cross River State*. Unpublished PhD Thesis, Ebonyi State University Abakaliki.
- Ekong, A. O. (2021). Technology in agricultural teacher preparation and its implication for production of quality teachers. *Journal of Technical and Vocational Education, Issue*, 36-40. Chennai, India: technical and Teachers Training Institute.
- Federal Ministry of Education (2013) Nigerian educational sector diagnostics: a condensed version: A framework for re-engineering the education sector. Abuja, NERDC press
- Federal Republic of Nigeria (2014). *Technical and vocational education development in Nigeria in the 21st century with the blue-print for the Decade 2001-2010*. Abuja: Federal Ministry of Education.
- National Board of Technical Education (2009). Motor Mechanics Curriculum Module Specification; General information. Abuja Government Press.
- Nwachukwu, C. E. (2016). *Designing Appropriate Mythology in vocational and technical education for Nigeria*. Nsukka: Fullad Publishing Company.
- Nwoji, Q. J. (2016). Resource available and utilization in women education centers in Enugu State. In Anyakoha E. U. (ed). *Research Imperatives and Challenges for Home Economics in Nigeria*. Home economics association of Nigeria (HERAN), Department of Vocational Teacher Education, University of Nigeria, Nsukka.
- Nwoke, G. I (2017). *Technical research and development. A crossing of traditional research*. Nsukka: University Taust Publishers.
- Ogbuanya, T.C. and Usman, D.A (2020) Assessment of instructional facilities in implementing the contents of the motor vehicle mechanics' work curriculum in technical colleges in north central Nigeria. *Journal of Pendidikan Teknologi dan Kejuruan*, 26, 2.
- Okoro, O. M. (2014). *Measurement and evaluation in education*, Uruowulu-Obosi: Pacific Publishers Limited.
- Olabiyi, O. S. (2015). *Effective teaching method in vocational and technical education*. Lagos: Royal communication Limited.
- Oshadumi, J.A. (2013). *Impact of instructional materials on students' academic achievement in agricultural science at secondary schools in Okene LGA, Kogi State*. Unpublished M.Sc. (ED) thesis, University of Ado Ekiti, (UNAD), Nigeria.
- Umar, I.Y. & Ma'aji, A.S(2010) Repositioning the facilities in Technical College Workshops for efficiency; A Case Study of North Central Nigeria: in *Journal of STEM Teacher Education* 47, 3
- Yisa, S.N, Musa, S. & Abdullahi K.M (2022) Adequacy of human and material resources of technical and vocational education and training in Nigeria: A study of Government Technical Colleges in Niger State in an online version of the *Journal of Technology Education Practitioners Association of Nigeria* volume 5 Number 4 down loaded 20th March 2024