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Content Framework for Modern Vehicle Technology Integration into Motor Vehicle Mechanic Work Curriculum in Technical Colleges in Gombe State, Nigeria

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Abstract: ***The main purpose of this study was to develop a content framework for inclusion of Modern Vehicle Technology into Motor Vehicle Mechanics Work MVMW curriculum in Government Science and Technical Colleges (GSTC) in Gombe State in order to enhance knowledge, attitude and skills for self-employment in modern vehicle maintenance and repairs and employable skills among MVMW trade students in technical colleges. The study was guided by 4 research questions. The population consisted of all the 30 MVMW trade teachers in Gombe State. The study adopted developmental research which was aimed to improve the current MVMW trade curriculum. A structured questionnaire was developed by the researcher with four point rating scale. The questionnaire was validated by four (4) experts from different field of Automobile Technology and trial tested on MVMW trade teachers. Mean and standard deviation was used to answer the responses while factor analysis and Cronbach Alpha was used to determine the validity and reliability of the instrument. The findings revealed that MVT content has four (4) units: these include: Introduction to MVT, Safety Rules and Regulation on MVT, Instrument for MVT Engine Testing and Measurement, It was recommended that: National Board for Technical Education (NBTE) should integrate these elements into the MVMW trade curriculum. Curriculum planners should adopt these clusters in designing the MVMW trade curriculum among other.***

Keywords: Content Framework, Curriculum, Integration, Modern Vehicle Technology, Motor Vehicle Mechanic Work, Technical Colleges.

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1. INTRODUCTION

Technical education is a specialized type of education which is obtained from technical colleges and vocational institutions. It has been an integral part of development strategies in many countries because of its impact on economy. Technical education is the major tool that empower the citizenry and free them from social vices to the barest minimum through provision of jobs. Okoro (2016) defined Technical education as the form of education which prepares manpower such as craftsmen and technicians for technical occupation. The trade offered at technical colleges' level such as: Bricklaying and concreting, Computer Repairs, Electrical/electronics, Television maintenance, Electrical instillation, Metal Work, Wood Work, and Motor vehicle mechanics work (MVMW) trade, form the part of the major trades offered in most Nigerian technical colleges. The challenges confronting such an educational programme is the structural imbalance in the production of graduates based on the current needs in the society taking place in vocational education (Shefiu, et al., 2019)

The curriculum content of trade courses offered in technical colleges cover four major areas namely: trade theory, workshop practice, industrial training and science education, hence teaching and learning trade courses in technical education require a balanced coverage of cognitive, affective and psychomotor skills of each course taught. Recent policies in Nigeria and other parts of the world advocated for speed limits(Federal Road Safety Commission, 2016), increase in fuel economy, reduction in Carbon monoxide emission, decrease in local pollutants, adherence to traffic rules and upgrade in occupant's safety(Environmental Protection Agency, 2016). These policies may have forced auto makers to produce vehicles with new and modified features (Arora, 2016).The introduction of electronic controls has particularly brought even greater changes in designs and operations of many of their sub-systems (Abdullatif, Inti, & Ahmed, 2013).

Nigerian TVET graduates (including Automobile Technology Education Graduates) are not equipped with the skills needed to attain these expectations (Ismail & Muhammed, 2014). This is as a result of the gap between the curriculum and the new advancements in technology that are not integrated into the

This has clearly made it necessary to improve the MVMW curriculum content to make it relevant curriculum and to incorporate the curriculum needs and aspiration of the society. This study will develop content of modern vehicle technology for inclusion into Motor Vehicle Mechanics Work (MVMW) curriculum in Government Science and. Technical colleges in Gombe State

Statement of the Problem

Modern vehicles are equipped with sophisticated A.I systems which allow them to detect obstacles, faults, climatic change, illumination, human gestures, vibration etc. and take action that will suit the situation(Cuneo, 2015). Different research works have shown that in the near future modern vehicle will dominate the automobile industries and personal transportation (Mearian, 2016; Milford & Robert, 2016; Russell, Dewey, & Tegmark, 2016;Thierer & Hagemann, 2014). The current GSTC college curriculum is lagging behind in capturing these recent technological advancements (Serumu, 2020). This implies that potential MVMW graduates might not be able to cope with the upcoming challenges in world of work if not

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exposed to up-to-date technological developments. This could be a reason why Ismail & Muhammed (2014) lamented that the learning contents and skills that can be acquired through the curriculum are inadequate for Automobile Technology Education graduates to be able to service and repair modern vehicles.

Purpose of the Study

The main purpose of the study is to develop content for inclusion of modern vehicle technology into motor vehicle mechanics work curriculum in G S T C in Gombe State. Specifically the study sought to:

1. Identify general content of modern vehicle technology for inclusion into MVMW curriculum at GSTC level.
2. Identify general performance objectives content of modern vehicle technology for inclusion into MVMW curriculum at GSTC level.
3. Determine the validate opinion on the developed content framework of modern vehicle technology necessary for inclusion into MVMW curriculum in GSTC.
4. Determine the reliability of the developed content for inclusion into MVMW curriculum in GSTC.

Research Questions

1. What are the general content of modern vehicle technology for inclusion into MVMW curriculum at GSTC level?
2. What are the general performance objectives of modern vehicle technology content for inclusion into MVMW trade curriculum at GSTC level?
3. What are the validate opinion on the developed content framework of modern vehicle technology necessary for inclusion into MVMW curriculum in GSTC?
4. What are reliability of the developed content for inclusion into MVMW curriculum in GSTC?

2. RELATED WORD

Modern Vehicle Technology Integration and Curriculum Development

Integrating modern vehicle technology into vocational education curricula is crucial to prepare students for the evolving demands of the automotive industry. As technology continues to advance rapidly, automotive technicians must possess not only traditional mechanical skills but also proficiency in electronic systems, computer diagnostics, and emerging technologies such as electric and hybrid vehicles (Adair & Sahin, 2019; Wong & Steffen, 2018). This shift towards a more technology-driven automotive landscape necessitates a corresponding update in curriculum content to ensure that graduates are equipped with the knowledge and skills required for success in their careers (Gupta & Sharma, 2020). Without incorporating modern vehicle technology into the curriculum, vocational education programs risk producing graduates who lack the competencies needed to perform effectively in today's automotive repair and maintenance sector.

Moreover, the integration of modern vehicle technology into curriculum development aligns with broader goals of enhancing the quality and relevance of vocational education. By

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incorporating cutting-edge technologies and industry-relevant practices, educational institutions can better prepare students for the realities of the workplace and increase their employability (UNESCO, 2015).

Importance of Curriculum Adaptation to Technological Advancements

Adapting vocational education curricula to reflect technological advancements is paramount to ensuring that graduates are equipped with the relevant skills needed to thrive in today's dynamic job market. As technology continues to revolutionize industries, including the automotive sector, traditional mechanical skills alone are no longer sufficient for aspiring automotive technicians. According to Wong and Steffen (2018), failing to update curricula in vocational education to incorporate modern technological competencies can lead to a significant skills gap among graduates, rendering them ill-prepared for the demands of the workforce. This underscores the critical importance of curriculum adaptation to bridge the divide between educational offerings and industry requirements.

Moreover, the rapid pace of technological innovation necessitates a proactive approach to curriculum development in vocational education. Gupta and Sharma (2020) and Adair and Sahin (2019) argued that an outdated curriculum not only undermines the quality of education but also limits the employability of graduates in a competitive job market.

Specific Approaches to Modern Vehicle Technology Integration

In integrating modern vehicle technology into vocational education curricula, institutions often employ a variety of strategies to ensure graduates are equipped with the necessary skills for the evolving automotive industry. One effective approach involves updating course content to encompass both traditional mechanical skills and modern technological competencies. Gupta and Sharma (2020) emphasize the importance of integrating electric vehicle technology into vocational education curricula, suggesting that programs should cover topics such as battery technology, electric drivetrains, and charging infrastructure. By incorporating these subjects, students gain a comprehensive understanding of emerging technologies, enhancing their employability in a rapidly changing automotive landscape. Additionally, Wong and Steffen (2018) advocate for a competency-based approach to curriculum development, which allows educators to tailor learning experiences to students' individual needs and industry requirements. Through hands-on training and practical application, students develop the skills and knowledge necessary to diagnose, repair, and maintain modern vehicles effectively.

Establishing partnerships with industry stakeholders is another key strategy for integrating modern vehicle technology into vocational education curricula. By collaborating with automotive manufacturers, dealerships, and repair shops, institutions can ensure their programs remain relevant and up-to-date with industry standards and practices. Adair and Sahin (2019) and Gupta and Sharma (2020) highlight the importance of industry partnerships in facilitating work-based learning opportunities, such as internships and apprenticeships, which provide students with valuable hands-on experience and exposure to cutting-edge technologies.

Framework Development for Modern Vehicle Technology Curriculum

Developing a framework for modern vehicle technology curriculum involves a multifaceted approach that addresses the evolving needs of the automotive industry while catering to the

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educational context of technical colleges in Gombe State, Nigeria. According to Gupta and Sharma (2020), a successful curriculum framework should encompass a blend of theoretical knowledge and practical skills relevant to modern automotive repair and maintenance. This includes competencies in areas such as electrical systems, computer diagnostics, and hybrid vehicle technology, reflecting the increasing complexity of today's vehicles. Moreover, UNESCO (2015) emphasizes the importance of aligning curriculum development with industry standards and practices to ensure graduates are equipped with the skills and knowledge demanded by employers in the automotive sector.

To effectively implement the framework, collaboration between technical colleges, industry stakeholders, and relevant government agencies is essential. Wong and Steffen (2018) and Okebukola (2017) suggests that partnerships with automotive manufacturers, dealerships, and repair shops can provide valuable insights into industry trends and technological advancements, helping to inform curriculum content and instructional strategies.

3. METHODOLOGY

The study adopted developmental research design. According to Ali (2006), any research whose aim is to develop new curriculum component intended for use to better the curricula for improving the society as well as teaching and learning should be called a developmental research design. This design was used to developed content for modern vehicle technology as a curriculum component for inclusion in the existing MVMW curriculum to improve the competence of MVMW technical college graduates in handling repair and maintenance of modern vehicles. The study was conducted in Gombe State, Gombe state is located in the North Eastern region of Nigeria and lies between latitude 10.3638^0 N and longitude 11.1928^0 E and 11.45^0 El. The population of the study comprised 30 Motor Vehicle Mechanic Work teachers in Government Science and Technical colleges in Gombe State. Due to the manageable size of the population, whole-population sampling technique was adopted. The instrument for data collection was a structured questionnaire titled: Modern Vehicle Technology Content Questionnaire (MVTCQ). MVTCQ was subjected to both face and content validation by three experts from the Faculty of Education, Modibbo Adama University Yola. The questionnaire was administered to the respondents and 100% return was recorded. The data collected were analyzed using the Statistical Package for Social Sciences (SPSS) version 26.0. Research question 1 and 2 were answered using the mean and standard deviation while question 3 and 4 were also answered using factor analysis at 10% overlapping variance and Cronbach Alpha respectively. A decision rule was taken using class interval of 4.00 to 3.50 were considered very relevant, 3.49 to 2.50 were considered relevant, 2.49 to 1.50 were considered irrelevant and 1.49 to 0.50 were considered very irrelevant

4. RESULTS AND DISCUSSION

Research question 1: What is the general content of modern vehicle technology for inclusion into MVMW curriculum at GSTC level?

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Table 1: Mean and Standard Deviation of Teachers on the General Content of Modern Vehicle Technology for Inclusion into MVMW Curriculum

		N= 3		
S/N	**Items**	**$\bar{x}$**	**δ**	**Rmk**
1.	Introduction to Modern Vehicle Technology.	3.30	0.24	Relevant
2.	Safety Rules and Regulations on MVT	3.53	0.18	Relevant
3.	Instruments for MVT Engine Testing and Measurement.	3.37	0.22	Relevant
4.	Basic Modern Vehicle Technology computer system.	2.80	0.10	Relevant
	Grand Mean	**3.25**		**Relevant**

Key: $\bar{x}$ = Mean Response, δ = Standard Deviation, Rmk = Remark
Source: fieldwork (2023)
Table 1 shows that the general content of modern vehicle technology listed are all relevant with mean scores ranging from 2.80 to 3.53, with corresponding standard deviations between 0.10 and 0.24.

Research Question 2: What are the general performance objectives of modern vehicle technology content for inclusion into MVMW trade curriculum at GSTC level?

Table 2: Mean and Standard Deviation of Teachers on the General Performance Objective of Modern Vehicle Technology for Inclusion into MVMW Curriculum

		N= 30		
S/N	**Items**	**$\bar{x}$**	**δ**	**Rmk**
Cluster I: Introduction to Modern Vehicle Technology.				
1.	Define modern vehicle technology.	2.77	0.14	Relevant
2.	Describe Modern Vehicle Technology.	2.93	0.08	Relevant
3.	List four major systems in Modern Vehicle Technology operations.	2.67	0.13	Relevant
4.	Explain electronic control on Modern Vehicle Technology.	2.57	0.14	Relevant
5.	Explain communication system in Modern Vehicle Technology.	2.53	0.16	Relevant
6.	Discuss how electronic communication in Modern Vehicle Technology System provides feedback.	2.57	0.15	Relevant
7.	Identify Modern Vehicle Technology display units.	2.63	0.13	Relevant
8.	Describe Modern Vehicle Technology display indicators on different conditions.	2.63	0.13	Relevant
9.	Differentiate between warning signal of Modern Vehicle Technology and normal operating condition of vehicle system.	3.20	0.07	Relevant
	Cluster Mean	**2.82**		**Relevant**
Cluster II: Safety Rules and Regulations on Modern Vehicle Technology				

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10.	Apply workshop safety rules and regulations on the use of Modern Vehicle	2.67	0.12	Relevant
11.	Outline the process of identifying hazards in Modern Vehicle Technology	2.57	0.15	Relevant
12.	Demonstrate circuit safe handling technique	2.77	0.08	Relevant
13.	Observe safety in the use of electronic connectors to Modern Vehicle Technology	2.87	0.13	Relevant
14.	Identify safety measure thatare to be taking in testing electric circuit on Modern Vehicle Technology	2.87	0.18	Relevant
15.	Identify safety components in Modern Vehicle circuits	2.80	0.20	Relevant
16.	Demonstrate safety rules in designing of electrical diagram on MVT	3.23	0.19	Relevant
	Cluster Mean	**2.83**		**Relevant**
Cluster III: Instruments for Modern Vehicle Technology Engine testing and Measurement				
17.	Define the concept of instrument and measurement.	3.27	0.17	Relevant
18.	List various laboratory materials for measurement and instrumentation.	3.40	0.17	Relevant
19.	State the functions of millimeters on Modern Vehicle Technology.	3.47	0.09	Relevant
20.	Identify different wire connectors used in Modern Vehicle Technology wiring	2.80	0.15	Relevant
21.	Differentiate the number of pins for different connectors.	2.83	0.19	Relevant
22.	Identify wire connectors and measure of continuity.	3.03	0.13	Relevant
23.	List the type of vehicle electronic diagnostic tools OBD, OBD I, OBD II.	3.13	0.16	Relevant
24.	Identify cord wires and vehicle type	2.73	0.17	Relevant
	Cluster Mean	**3.08**		**Relevant**
Cluster IV: Basic Modern Vehicle Technology computer system				
25.	Describe Modern Vehicle computer and its classification.	3.37	0.09	Relevant
26.	Outline the role of computer in new generation vehicle.	3.23	0.08	Relevant
27.	Identify parts of computer.	3.30	0.09	Relevant
28.	State the function of the major part of computer	3.37	0.17	Relevant
29.	List the type of computers used on Modern Vehicle.	3.53	0.16	Relevant
30.	Operate key board on Numeric, Alphabets, and Alphanumeric.	3.53	0.14	Relevant
31.	Explain the operation and application of computer in auto shop.	2.77	0.16	Relevant
32.	Identify how computer connect to new generation vehicle.	3.20	0.07	Relevant
33.	Identify how vehicle model is considered in the selection of computer connectors.	2.67	0.12	Relevant

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34.	Demonstrate the communication between computer and vehicle communication Area Network (CAN-BUS) System.	2.57	0.15	Relevant
	Cluster Mean	**3.15**		**Relevant**

Key: $\bar{x}$ = Mean Response, δ = Standard Deviation, Rmk = Remark
Source: fieldwork (2023)

Table 2 shows that the grand mean calculated as 2.97 implies that the general performance objectives of modern vehicle technology were found to have 4 clusters, all considered relevant for inclusion into the MVMW trade curriculum in GSTC.

Research Question 3: What is the validate opinion on the developed content framework of modern vehicle technology necessary for inclusion into MVMW curriculum in GSTC?

Table 3: Factor Analysis on the Validate Opinion on the Developed Content Framework of Modern Vehicle Technology for Inclusion into MVMW Curriculum

S/N	Items	Factor Loading	Rmk
	General Content		
1.	Introduction to Modern vehicle Technology.	1.000	Valid
2.	Safety Rules and Regulations on Modern vehicle Technology.	1.000	Valid
3.	Instruments for Modern vehicle Technology Engine testing and Measurement.	1.000	Valid
4.	Basic Modern vehicle Technology computer system.	0.998	Valid
5.	Electronic Sensors and Actuators on Modern vehicle Technology.	0.998	Valid
6.	Modern vehicle Technology Fault Diagnosis and Rectification using on Board diagnostic (OBD)	0.989	Valid
	General Performance Objective of Modern Vehicle Technology		
	Cluster I: Introduction to Modern Vehicle Technology.		
7.	Define modern vehicle technology.	0.988	Valid
8.	Describe Modern Vehicle Technology.	0.995	Valid
9.	List four major systems in Modern Vehicle Technology operations.	0.998	Valid
10.	Explain electronic control on Modern Vehicle Technology.	0.919	Valid
11.	Explain communication system in Modern Vehicle Technology.	1.000	Valid
12.	Discuss how electronic communication in Modern Vehicle Technology System provides feedback.	1.000	Valid
13.	Identify Modern Vehicle Technology display units.	1.000	Valid
14.	Describe Modern Vehicle Technology display indicators on different conditions.	1.000	Valid
15.	Differentiate between warning signal of Modern Vehicle Technology and normal operating condition of vehicle system.	0.999	Valid

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	Cluster II: Safety Rules and Regulations on Modern Vehicle Technology		
16.	Apply workshop safety rules and regulations on the use of Modern Vehicle	0.999	Valid
17.	Outline the process of identifying hazards in Modern Vehicle Technology	1.000	Valid
18.	Demonstrate circuit safe handling technique	1.000	Valid
19.	Observe safety in the use of electronic connectors to Modern Vehicle Technology	0.931	Valid
20.	Identify safety measure that are to be taking in testing electric circuit on Modern Vehicle Technology	0.955	Valid
21.	Identify safety components in Modern Vehicle circuits	0.952	Valid
22.	Demonstrate safety rules in designing of electrical diagram on MVT	0.933	Valid
	Cluster III: Instruments for Modern Vehicle Technology Engine testing and Measurement		
23.	Define the concept of instrument and measurement.	0.967	Valid
24.	List various laboratory materials for measurement and instrumentation.	0.964	Valid
25.	State the functions of millimeters on Modern Vehicle Technology.	0.787	Valid
26.	Identify different wire connectors used in Modern Vehicle Technology wiring	0.996	Valid
27.	Differentiate the number of pins for different connectors.	0.950	Valid
28.	Identify wire connectors and measure of continuity.	0.893	Valid
29.	List the type of vehicle electronic diagnostic tools OBD, OBD I, OBD II.	0.910	Valid
30.	Identify cord wires and vehicle type	0.994	Valid
	Cluster IV: Basic Modern Vehicle Technology computer system		
31.	Describe Modern Vehicle computer and its classification.	0.978	Valid
32.	Outline the role of computer in new generation vehicle.	1.000	Valid
33.	Identify parts of computer.	0.994	Valid
34.	State the function of the major part of computer	0.951	Valid
35.	List the type of computers used on Modern Vehicle.	0.919	Valid
36.	Operate key board on Numeric, Alphabets, and Alphanumeric.	0.922	Valid
37.	Explain the operation and application of computer in auto shop.	0.936	Valid
38.	Identify how computer connect to new generation vehicle.	0.999	Valid
39.	Identify how vehicle model is considered in the selection of computer connectors.	0.999	Valid
40.	Demonstrate the communication between computer and vehicle communication Area Network (CAN-BUS) SYSTEM.	1.000	Valid

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	Cluster V: Electronic Sensor and Actuators on Artificial Intelligence Vehicle		
41.	Define sensor and actuators.	1.000	Valid
42.	Mention the types of sensors.	0.997	Valid
43.	Identify sensors.	0.998	Valid
44.	mention the types of actuators	1.000	Valid
45.	Identify actuators	1.000	Valid
46.	Identify Modern Vehicle electronic communication in a unit.	1.000	Valid
47.	Describe how sensor operates on Modern Vehicle Technology.	1.000	Valid
48.	Describe how actuator operates on Modern Vehicle.	0.999	Valid
49.	Explain how mechanical components operate with electronic sensor and actuators.	0.999	Valid
50.	Measure electric input in a sensor.	1.000	Valid
51.	Record output voltage in the operation of sensor.	1.000	Valid
52.	Describe the phenomena on how actuators operate.	0.997	Valid
53.	Identify through diagrams where sensors and actuators are located in a MV.	0.998	Valid
	Cluster VI: MVT Fault Diagnosis and Rectification using on Board diagnostic (OBD)		
54.	Identify reasons that may lead to vehicle diagnosis.	1.000	Valid
55.	Observe the displayed information on the computer unit on the dash board.	1.000	Valid
56.	Interpret displayed information, diagram or signals	1.000	Valid
57.	Carry out visible checks on the vehicle.	1.000	Valid
58.	Observe changes of sound in mechanical operation of a vehicle.	0.994	Valid
59.	Selection of correct type of cord and pins connector for particular vehicle model.	0.997	Valid
60.	Locate output connecting point for scanner on the vehicle.	0.977	Valid
61.	Conduct stage of OBD test on Modern Vehicle Technology	0.972	Valid
62.	Identify whether a fault is permanent fault or temporary faults.	0.934	Valid
63.	Explain the differences between permanent faults and temporary fault.	0.936	Valid
64.	Eliminate the temporary fault s	0.947	Valid
65.	Observed electronic safety as the components are very sensitive.	0.977	Valid

Table 3 shows the factors organized into two modules and further categorized into seven clusters had factor loadings ranging from 0.934 to 1.000, with all items considered valid. The validity implies that the opinions on the developed content are generally considered valid and appropriate for inclusion in the curriculum.

Research Question 4: What are reliability of the developed content for inclusion into MVMW curriculum in GSTC?

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Table 4: Reliability of the Developed Content for Inclusion into MVMW Curriculum

S/N	Items		No. of Items	Cronbach Alpha Index	Remark
1	**General Content**		**6**	0.86	Reliable
2	**General Performance Objective of Modern Vehicle Technology**				
	i.	Cluster I: Introduction to Modern Vehicle Technology.	9	0.87	Reliable
	ii.	Cluster II: Safety Rules and Regulations on Modern Vehicle Technology	7	0.95	Reliable
	iii.	Cluster III: Instruments for Modern Vehicle Technology Engine testing and Measurement	8	0.88	Reliable
	iv.	Cluster IV: Basic Modern Vehicle Technology computer system	10	0.74	Reliable
	v.	Cluster V: Electronic Sensor and Actuators on Artificial Intelligence Vehicle	13	0.97	Reliable
	vi.	Cluster VI: MVT Fault Diagnosis and Rectification using on Board diagnostic (OBD)	12	0.79	Reliable
		Reliability of the Instrument	**65**	**0.87**	**Reliable**

Table 4 indicated that the instrument was valid with a reliability index of 0.87 computed using Cronbach Alpha.

Discussion of Findings

The findings of the study revealed that items related to Introduction, Safety Rules, Instruments, and Basic Computer Systems were considered relevant for inclusion into MVMW trade curriculum in GSTC. In exploring the integration of automotive diagnostics into the Motor Vehicle Mechanics and Works (MVMW) trade curriculum in the GSTC, a synthesis of Nigerian literature reveals a consensus on the relevance of specific thematic areas. Oyebisi and Adejoh (2018) emphasize the criticality of a comprehensive introduction to automotive systems to enhance students' foundational knowledge. This curriculum expansion aligns with the growing complexity of automotive technology, ensuring that students are equipped with essential skills for contemporary vehicle maintenance. Okonkwo (2017) who investigated the safety in automotive workshops underscores the importance of safety rules and protocols, advocating for their inclusion in MVMW trade.

The findings of the study revealed that 34 items categorize into 6 clusters under general performance objectives of modern vehicle technology were considered relevant for inclusion into MVMW trade curriculum in GSTC. The findings aligns with the report of Anusobi, Gambari, Alabi and Abdullahi (2017) and Mangesa and Dirawan (2016) who reported that 89 task items were identified and categorized into 3 clusters under the general performance objectives of modern vehicle technology in Nigeria. The study emphasizes the relevance of these findings for inclusion into the auto-mobile engineering courses in Nigerian polytechnics' curriculum.

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The study on the development of a curriculum with 65 items categorized into two main modules: General Content and General Performance Objective of Modern Vehicle Technology. The validation process ensured the appropriateness of these modules for inclusion in the curriculum. According to Akpan (2018), curriculum development in technical education is crucial for aligning educational content with industry demands, and the incorporation of modern vehicle technology in the curriculum reflects the need to stay current with advancements in the automotive sector. Similarly, the work of Okebukola (2017) emphasizes the importance of performance objectives in shaping curriculum outcomes. Okoli and Okeke (2019) stress the significance of considering cognitive, affective, and psychomotor domains in curriculum development, supporting the multi-dimensional approach taken in the study.
The findings of the study on the developed content for the MVMW curriculum, which demonstrates strong reliability across different clusters, align with the broader educational landscape in Nigeria. According to Okebukola (2017), the need for reliable and effective curriculum development in Nigeria is crucial for addressing the challenges in the education system that focuses on skill development. To further support the findings, Ajayi (2018) emphasizes the importance of a solid curriculum foundation to enhance effective and dynamic educational outcomes that will align with the industrial and classroom needs.

5. CONCLUSION

Based on the findings of the study it was concluded that the identified elements such as Introduction, Safety Rules, Instruments and Basic Computer Systems not only deemed relevant but are imperative for the enrichment of the Motor vehicle mechanics work (MVMW) trade curriculum at Government Science and Technical Colleges (GSTC). These specific components represent crucial facets of modern vehicle technology, offering students a foundational understanding that aligns with contemporary advancements in the field.

Recommendations

Based on the findings of the study, the following recommendations are made:

1. Curriculum planners like National Educational Research Development Council (NERDC), National Boards for Technical Educational (N.BTE) and other examination bodies' school adopt and include the developed MVT content for inclusion into MVMW trade curriculum at Government Science and Technical College (GSTC). This will ensure that crucial aspect of modern vehicle technology is adequately covered.
2. Curriculum planners should adopt these clusters in designing the MVMW trade curriculum in GSTC, facilitating a structured and comprehensive approach to modern vehicle technology education.
3. Educational stake holders should incorporate the specific performance objective with the MVMW trade curriculum, to ensure a balance and holistic development of students across different educational domains.
4. National Board for Technology Education (NBTE) should formally integrate these modules into the MVMW trade curriculum, as they provide a well-structured frame work for affective teaching and learning of modern vehicle technologies.

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