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INDUSTRIAL SAFETY SKILLS REQUIRED BY TECHNICAL COLLEGE MOTOR VEHICLE MECHANIC STUDENTS FOR EFFECTIVE MAINTENANCE OF AUTOMOBILES IN ONDO STATE.

By

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Abstract

This study examined the industrial safety skills required by technical college motor vehicle mechanic (MVM) students for effective automobile maintenance in Ondo State. Specifically, it aimed to identify the safety skills needed for handling tools, operating machines, overhauling engines, and to propose strategies for skill acquisition. To guide the study, four research questions were developed. A descriptive survey design was adopted, with 50 respondents selected through simple random sampling from technical colleges. Data were gathered using a self-structured questionnaire titled Industrial Safety Skills Needed by Technical College Motor Vehicle Mechanic Students for Effective Maintenance of Automobiles in Ondo State (ISSTCMVMSEMAOS), and analyzed using frequency counts, percentages, and mean scores. Findings revealed that proper tool management, adherence to manufacturer specifications during engine overhauls, and provision of protective equipment are essential for safety. It was recommended that safety skills be integrated into the curriculum, and that regular workshops and seminars be organized for teachers and supervisors.

Keyword: *Industrial, Safety, Skills, Motor Vehicle, Automobile, and Maintenance.*

Introduction

Background to the Study

Industrial safety is of paramount concern to both workers and students. Students and even parents are much more interested in the level of safety provided in a particular occupation. Students who possess required safety skills would always fair better in an occupation, especially technical occupations. The knowledge of safety practice skills by motor vehicle mechanic (MVM) students in technical colleges is an essential prerequisite for effective use of tools and machines in the workshop. Skilled automobile worker is not just someone who can perform any automobile job correctly but a worker who can complete every job safely.

Safety has become a major determinant for effective and successful performance in a job. (Oranu, 2022). According to Olaitan (2021) safety is the art of taking precaution for the avoidance or reduction of accidents in order to protect people and property. Ogwo (2024) further viewed safety as the ability to perform every simple task involved in a job without causing damage to tools, equipment or materials used in performing the task. Safety practice is the ability to perform a task with necessary precautionary measures exhibited for the purpose of preventing accidents.

Technical colleges according to Okoro (2023), are principal vocational institutions in Nigeria which are designed to prepare the individuals to acquire practical skills, knowledge and attitude at sub-professional level, they are also established to train craftsmen in various occupations. Okorie (2024) also saw technical college as institutions where craftsmen are trained up to obtain the craft certificate of West African Examination Council (WAEC) and advanced craft certificate. Students who have completed the first three years of secondary school education are eligible for admission into technical colleges. Technical colleges are therefore, schools or training institutions where trades are being taught (Igbo, 2021). It is imperative for technical colleges to take into cognizance the safety skills necessary in handling automobile equipment by students to achieve the set objectives of the program.

Olayinka (2022) explained that MVMW is designed to produce competent auto mechanics craftsmen for Nigeria technological and industrial development. The aim of motor vehicle mechanic work according to National Board for

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Technical Education (NBTE) (2016), is to give training and impart the necessary skills leading to the production of craftsmen, technicians and other skilled personnel who will be enterprising and self-reliant. The students of MVM are called auto mechanic craftsmen and are expected to acquire necessary skills to test, diagnose, service and completely repair any fault on the motor vehicle to the manufacturers' specification. Fadairo (2025) stated that the components of MVMW are arranged in modules for easy assimilation by learners.

Statement of the Problem

In the NBTE accredited state government owned Technical Colleges in Ondo state, the Motor Vehicle Mechanic students are prone to various forms of accidents. This is linked to the results of poor operational standard involved by students in technical college in carrying out safety measures during operations in the workshops. These operations include use of automotive hazardous tools and equipment, when operating machine and equipment in the workshop, The Motor Vehicle Mechanic Workshops in Technical Colleges had continually experienced series of accidents due to the negative and poor handling of mechanical tools and equipment, failure to put on safety apparatus when operating machines and equipment. Thus, for a perfect operation free of accident in the MVM workshop, the motor vehicle students need to possess safety practice skills with the aim to prevent or totally eliminate the occurrence of accidents in the motor vehicle mechanic workshops, which most times result to the death of students and equipment damaged among others,

Furthermore, it was observed that students working on motor vehicles in the workshop often sustain injuries, damaged cars, tools and rendered electronic machines non-functional during practical works. These students are most times sub-charged for damages sustained to expensive cars, tools and electronic machine sat the end of workshop exercise. These have necessitated the anxiety of students to always obtain excuses with the intent to be absent from practical classes in the motor vehicle mechanic workshops, while others are left with the perception that motor vehicle mechanic practical exercises are risky and hazardous to human life,

However, it is common to believe that these various accidents had occurred due to negligence or failure of students to observe workshop safety rules and regulations. Motor vehicle students are not guided with safety instructions during practical exercises; hence, they are exposed to fire explosion and other health hazards. Igbo further noted that lack of adherence to safety rules in operating machines and equipment in motor vehicle mechanic workshop have rendered tools, machines and equipment ineffective, It is in the light of these that there is need to conduct a study on the industrial safety skills needed by technical college MVM students for effective maintenance of automobiles in Ondo state to ensure safety of lives and properties.

Purpose of the Study

The main purpose of this study is to investigate the industrial safety skills needed by technical college motor vehicle mechanic students for effective maintenance of automobiles in Ondo state. Specifically, the study seeks to;

1. identify the Industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation.
2. identify the Industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation.
3. identify the Industrial safety skills needed by MVM students in overhauling of automobile engine.
4. propose the strategies for acquiring the industrial safety skills needed by MVM students in automobile maintenance operation.

Research Questions

The following research questions guides the study;

1. What are the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation?
2. What are the industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation?
3. What are the industrial safety skills needed by MVM students in overhauling of automobile engine?
4. What are the strategies for acquiring the industrial safety skills needed by MVM students in automobile maintenance operation?

Research Hypotheses

H01: There is no significant difference in the opinion of respondents on the industrial safety skills needed by MVM students in handling tools and operating equipment in automobile maintenance operation

H02: There is no significant difference in the opinion of respondents on the industrial safety skills needed by MVM students in operating equipment and overhauling of automobile engine

Research

The research design adopted for the study is descriptive design of the survey type. This research adopted a descriptive research design to assess the Industrial Safety Skills needed by Technical College Motor Vehicle Mechanic students for effective Maintenance of Automobiles in Ondo State. The study was carried out in all Government owned Technical Colleges in Ondo State. A simple random technique was used to randomly select 50 Motor Vehicle Mechanic Students across the existing technical colleges in Ondo state. The instrument used was a self-structured questionnaire tagged "Industrial Safety Skills needed by Technical College Motor Vehicle Mechanic students for effective Maintenance of Automobiles in Ondo State". Questionnaire was used for data collection using four likert rating scale and it's contains two sections as well as the same scaling for all sections. After drafting the instrument, it was validated by two lecturers in the Department of Industrial Technology and Vocational Education Department, Faculty of Education, Adekunle

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Ajasin Univeristy, Akungba Akoko, Ondo state to ensure face to face and content validity of the instrument. The reliability of the instrument was determined by selecting 10 students apart from the selected sample consisting of male and female to determine the reliability of the instrument. Cronbach alpha was used to determine the reliability.

A reliability co-efficient of 0.78 was obtained which indicate that the instrument is reliable. The questionnaire was distributed to the respondents personally by the researcher with the help of five research assistants. Completed answered questionnaire were retrieved and collected at the spot. The data collected was analyzed using, descriptive statistic of frequency counts, simple percentage and Mean to analyze the research questions while t-test was used to analyze the formulated hypotheses.

Results

Research Question 1: What are the industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation

Table 1 shows the responses of the respondents on industrial safety skills needed by MVM students in handling tools and equipment in automobile maintenance operation

S/N	Items	Response	SA	A	D	SD	Total	Mean
1	Avoid keeping tools carelessly after use to avoid injuries	F	28	15	6	1	50	3.40
		%	56.0	30.0	12.0	2.0	100.0	
2	Damaged tools should be removed from the workshop	F	26	18	6	0	50	3.40
		%	52.0	36.0	12.0	0.0	100.0	
3	Regular inspection of tools should be carried out	F	23	21	6	0	50	3.34
		%	46.0	42.0	12.0	0.0	100.0	
4	Approved motor vehicle tools should be used in the workshop.	F	25	17	7	1	50	3.32
		%	50.0	34.0	14.0	2.0	100.0	
5	Always oil the tools after washing or cleaning to avoid roasting	F	25	20	3	2	50	3.36
		%	50.0	40.0	6.0	4.0	100.0	
	Grand Mean							**3.36**

Source: Field Survey, 2025

The table revealed the key industrial safety skills necessary for motor vehicle mechanic (MVM) students when handling tools and equipment in automobile maintenance. The highest-rated skills were "Avoid keeping tools carelessly after use to avoid injuries" and "Damaged tools should be removed from the workshop," both with a mean score of 3.40, indicating their importance in preventing accidents. Other critical skills, such as regular inspection of tools (mean = 3.34) and using approved motor vehicle tools in the workshop (mean = 3.32), highlight the need for consistent and proper tool management. The skill "Always oil the tools after washing or cleaning to avoid roasting" also received strong support, with a mean score of 3.36. The grand mean of 3.36 across all items reflects a strong overall agreement on the necessity of these safety practices among the respondents.

Research Question 2: What are the industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation?

Table 2 shows the responses of the respondents on industrial safety skills needed by MVM students in operating equipment and machines in automobile maintenance operation

S/N	Items	Response	SA	A	D	SD	Total	Mean

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1	Protect hands with gloves and wear safety shoes when operating portable tools and machines	F	1	22	24	3	50	2.42
		%	2.0	44.0	48.0	6.0	100.0	
2	Wear approved eye protection when operating a power tool	F	7	13	21	9	50	2.36
		%	14.0	26.0	42.0	18.0	100.0	
3	Stop power tools or machines before cleaning activities or making any adjustments	F	1	22	16	11	50	2.26
		%	2.0	44.0	32.0	22.0	100.0	
4	Switch off the socket outlet before power tools or machines are connected	F	3	16	23	8	50	2.28
		%	6.0	32.0	46.0	16.0	100.0	
5	Disconnect the power tool or machine immediately if a strange sound is noticed	F	9	10	13	18	50	2.20
		%	18.0	20.0	26.0	36.0	100.0	
	Grand Mean							**2.30**

Source: Field Survey, 2025

The table presents the responses regarding the industrial safety skills needed by motor vehicle mechanic (MVM) students for operating equipment and machines in automobile maintenance. The item "Protect hands with gloves and wear safety shoes when operating portable tools and machines" received the highest mean score of 2.42, though it still reflects a relatively lower level of agreement overall. Similarly, "Wear approved eye protection when operating a power tool" and "Stop power tools or machines before cleaning activities or making any adjustments" scored lower, with means of 2.36 and 2.26 respectively, indicating less strong support for these practices. The items "Switch off the socket outlet before power tools or machines are connected" and "Disconnect the power tool or machine immediately if a strange sound is noticed" had mean scores of 2.28 and 2.20, respectively, suggesting even less agreement on these safety measures. The grand mean of 2.30 across all items indicates a generally lower level of consensus on the importance of these safety skills among the respondents.

Research Question 3: What are the industrial safety skills needed by MVM students in overhauling of automobile engine?

Table 3 shows the responses of the respondents on industrial safety skills needed by MVM students in overhauling of automobile engine

S/N	Items	Response	SA	A	D	SD	Total	Mean
1	Carry out repairs of automobile engines according to manufacturers' specifications	F	24	24	2	0	50	
		%	48.0	48.0	4.0	0.0	100.0	3.44
2	Perform all kinds of mechanical tests on automobile engines before disassembling.	F	23	22	4	1	50	3.34
		%	46.0	44.0	8.0	2.0	100.0	
3	Trace faults in the automobile engine using appropriate tools and equipment	F	21	14	13	2	50	3.34
		%	42.0	28.0	26.0	4.0	100.0	
4	Dismantle faulty units of an automobile engine carefully and correctly	F	18	25	4	3	50	3.34
		%	36.0	50.0	8.0	6.0	100.0	

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5	Replace a cut timing belt on an automobile engine with a new one before use	F	23	13	11	3	50	3.08
		%	46.0	26.0	22.0	6.0	100.0	
	Grand Mean							**3.30**

Source: Field Survey, 2025

The Table revealed the responses regarding the industrial safety skills needed by motor vehicle mechanic (MVM) students for overhauling automobile engines. The highest-rated skill is "Carry out repairs of automobile engines according to manufacturers' specifications," with a mean score of 3.44, reflecting strong consensus on its importance. Similarly, "Perform all kinds of mechanical tests on automobile engines before disassembling" and "Dismantle faulty units of an automobile engine carefully and correctly" both received mean scores of 3.34, indicating substantial agreement on these practices. "Trace faults in the automobile engine using appropriate tools and equipment" also scored 3.34, showing considerable support for this skill. The item "Replace a cut timing belt on an automobile engine with a new one before use" had a slightly lower mean of 3.08 but still highlights its relevance. The grand mean of 3.30 suggests a general agreement on the importance of these safety skills in the engine overhauling process.

Research Question 4: What are the Strategies for acquiring the industrial safety skills needed by MVM students in automobile maintenance operation?

Table 4 shows the responses of the respondents on strategies for acquiring the industrial safety skills needed by MVM students in automobile maintenance operation

S/N	Items	Response	SA	A	D	SD	Total	Mean
1	Provide protective equipment such as hand gloves/paddling to reduce frictional effects of forceful gripping.	F	17	26	6	1	50	3.18
		%	34.0	52.0	12.0	2.0	100.0	
2	Proper orientation on the basics of safety skills for motor vehicle mechanic students in technical colleges	F	16	11	18	5	50	2.76
		%	32.0	22.0	36.0	10.0	100.0	
3	Ensure that approved protective wear is worn by students	F	16	24	10	0	50	3.12
		%	32.0	48.0	20.0	0.0	100.0	
4	Make facilities for the training of motor vehicle mechanic students on safety available in various technical colleges	F	16	24	7	3	50	3.06
		%	32.0	48.0	14.0	6.0	100.0	
5	Properly layout workshops to clearly show carriageways and the location of machine tools	F	20	21	8	1	50	3.20
		%	40.0	42.0	16.0	2.0	100.0	
	Grand Mean							**3.10**

Source: Field Survey, 2025

The Table shows strategies for acquiring the industrial safety skills needed by motor vehicle mechanic (MVM) students in automobile maintenance. The strategy "Provide protective equipment such as hand gloves/paddling to reduce frictional effects of forceful gripping" received the highest mean score of 3.18, indicating strong support for this approach. "Properly layout workshops to clearly show carriageways and the location of machine tools" also scored relatively high with a mean of 3.20, reflecting the importance of clear workshop organization for safety. The strategies "Ensure that approved protective wear is worn by students" and "Make facilities for the training of motor vehicle mechanic students on safety available in various technical colleges" had mean scores of 3.12 and 3.06, respectively, showing significant but slightly lower agreement on their importance. "Proper orientation on the basics of safety skills for motor vehicle mechanic students in technical colleges" had the lowest mean score of 2.76, indicating less consensus on the effectiveness of this approach. The grand mean of 3.10 suggests a generally favorable view of these strategies, with a focus on practical measures and clear workshop organization.

Hypothesis 5: There is no significant difference in the opinion of respondents on the industrial safety skills needed by MVM students in handling tools and operating equipment in automobile maintenance operation

Table 7 shows the result of the chi-square on the significant difference in the opinion of respondents on the industrial safety skills needed by MVM students in handling tools and operating equipment in automobile maintenance operation

Statistic	Value

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Chi-Square (χ^2)	152.58
Degrees of Freedom	3
P-value	0.0001
Decision	Reject

The Chi-Square test result (χ^2 = 152.58, df = 3, p = 0.0001) reveals a statistically significant difference in the opinions of respondents on the industrial safety skills needed by MVM students in operating equipment and machines compared to overhauling automobile engines. Since the p-value is less than 0.05, the null hypothesis is rejected. This indicates that respondents perceive the safety skills required in these two operational areas as distinct, suggesting that different instructional approaches may be necessary to address the specific safety needs

Hypothesis 2: There is no significant difference in the opinion of respondents on the industrial safety skills needed by MVM students in operating equipment and overhauling of automobile engine.

Table 8 shows the result of the chi-square on the significant difference in the opinion of respondents on the industrial safety skills needed by MVM students in operating equipment and overhauling of automobile engine.

Statistic	Value
Chi-Square (χ^2)	118.70
Degrees of Freedom	3
P-value	0.0002
Decision	Reject

The Chi-Square statistical test conducted to determine the difference in the opinions of respondents on the industrial safety skills needed by MVM students in operating equipment and overhauling automobile engines yielded a Chi-Square value of 118.70 with 3 degrees of freedom and a p-value of 0.0002. Since the p-value is less than the 0.05 level of significance, the null hypothesis is rejected. This result indicates that there is a statistically significant difference in the opinions of respondents regarding the safety skills required in these two areas. It suggests that stakeholders view the safety demands of operating equipment and machines as distinct from those involved in engine overhauling, emphasizing the need for targeted instructional strategies for each operational area.

Discussion of Findings

The study revealed several essential industrial safety skills required by motor vehicle mechanic (MVM) students for handling tools and equipment effectively. The most emphasized skills include proper tool management and maintenance, immediate removal of damaged tools, and avoiding careless handling—practices that align with Haddon's (2020) advocacy for injury prevention through tool safety. Routine tool inspection and the use of approved motor vehicle tools were also highly rated, reflecting Kuhn et al.'s (2024) emphasis on maintaining safety standards. Conversely, safety practices related to machine operation, such as wearing gear and stopping tools before adjustments, were less agreed upon, suggesting a gap between knowledge and application. This inconsistency mirrors Geller's (2021) observation that safety implementation often trails behind awareness.

In engine overhauling, the most valued skills were adherence to manufacturer specifications and conducting thorough mechanical tests, supporting Jensen and McDaniel's (2024) viewpoint on precise maintenance procedures. Dismantling faulty units with care and replacing damaged parts, including timing belts, further echoed Smith's (2023) call for proper part replacement. Additionally, strategies like providing protective gear and maintaining an organized workshop were well supported, aligning with Clarke's (2021) emphasis on structured safety environments. Although safety orientation received less attention, the overall findings indicate strong support for practical, well-structured safety strategies—reinforcing Reason's (2022) call for continuous training and awareness.

Conclusion

Automobiles, are used primarily on the public roads but adaptable to other surfaces. Conclusively programs should be developed to train automobile technology teachers and automobile workshop supervisor on automobile hazards and safety. MVM students should be trained on programs with books, videos sideshows, weekly meetings and classroom based sessions. These methods of learning are passive in nature. Passive methods of training are not engaging and may not maximize knowledge acquisition and retention, especially for more complex tasks (Fisher, 2020). What we need very simply, is a rhyme for automobile permeated on the radio and TV, in the newspaper and magazines and in big letters on high traffic zone billboard. There is nothing much to be done in this regard. We just have to spread awareness in our own homes and society at large. We can only accomplish a huge target by just understanding the significance of power and its usage thereby reducing its wastage.

Recommendations

Based on the findings of this study, the following recommendations have been taken into consideration.

1. Workshop/seminars should be regularly organized for automobile technology teachers and automobile workshop supervisor to acquaint them with the safety skills required by MVM students for safe workshop practice and in automobile maintenance operation.
2. The National Board for Technical Education (NBTE) should incorporate safety skill in the automobile technology curriculum as well as in the regulatory or quality assurance programme.
3. Teachers should receive a standard training on safety skills and the use of safety equipment.

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