

Influence Of Workshop Layout Designs On Skills Acquisition In Motor Vehicle Mechanics Work: A Study Of Government Science And Technical Colleges In Gombe State

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Abstract:

This study explores the influence of workshop layout designs on skills acquisition in Motor Vehicle Mechanics Work: a study of Government Science and Technical Colleges in Gombe State. The research investigates how workshop layouts and maintenance strategies influence students' practical skill development. The study employs a descriptive survey research design, collecting data from administrators and teachers in these colleges. The questionnaire used in data collection is based on a literature review and employs a modified Likert-type rating scale for responses. Descriptive statistics and t-tests are utilized for data analysis. The findings revealed that MVMW workshop layouts significantly contribute to skill acquisition among students. Participants agreed that well-designed workshop layouts with appropriately arranged workstations, tools, and equipment facilitate effective practical learning experiences. Maintenance strategies are also deemed important in enhancing the effectiveness of the MVMW workshops. Collaborative efforts between administrators and teachers are recommended for designing optimal workshop layouts and implementing maintenance practices. Continuous professional development is suggested to empower educators to make informed decisions regarding instructional design and workshop management.

Keywords: *Workshop Layout Designs, Skills Acquisition, Motor Vehicle Mechanics Work, Technical Colleges:*

Introduction

The influence of workshop layout designs on skills acquisition in technical education has gained attention globally due to its impact on effective learning environments and learning experiences. Specifically, within the context of motor vehicle mechanics, the physical arrangement of workshop spaces can significantly affect students' abilities to acquire practical skills. In Nigeria, where technical education plays a crucial role in developing a skilled workforce, and equipping students with practical skills, understanding how workshop layout designs contribute to skills acquisition is of paramount importance. However, a dearth of comprehensive studies focusing on this relationship in the specific context of Government Science and Technical Colleges in Gombe State highlights the need for research in this area. According to Guo, *et al.* (2021), workshop layout designs encompass factors such as spatial arrangement, equipment placement, and accessibility, all of which collectively shape the learning experience.

Several studies within Nigeria's educational landscape emphasize the importance of optimal workshop layout designs in enhancing skills acquisition. Osagie and Oghogho (2017) conducted research on vocational education in Nigeria, asserting that well-designed workshops create an environment that facilitates hands-on learning. Conversely, poorly planned layouts can lead to overcrowding, safety concerns, and limited access to tools and equipment (Ogunbodede, 2015). Notably, a study by Babatunde *et al.* (2018) highlighted that an efficient workshop layout promotes better utilization of resources, enabling students to grasp practical skills more effectively. Adeyemi and Ojo (2019) demonstrate a correlation between workshop layout and skills development. They found that an optimized layout with well-organized workstations and clear pathways positively influenced students' practical performance. Additionally, studies by Bello *et al.* (2020) indicated that poorly designed workshops hindered students' skill acquisition due to limited access to tools and inefficient use of space. These findings collectively underscore the significance of tailored workshop layouts in promoting skill acquisition among motor vehicle mechanics students.

Drawing insights from international literature, research by Khan *et al.* (2018) conducted in a similar vocational education context highlighted the importance of ergonomic workshop layouts in enhancing skills acquisition. Their study emphasized that an ergonomic layout improved students' comfort and reduced physical strain, thereby contributing to better skill development. Furthermore, a study by Al-Hadid *et al.* (2019) emphasized that workshops designed to simulate real-world working conditions positively influenced students' readiness for industry-level tasks. These findings underscore the potential benefits of strategic workshop layout designs in enhancing skills acquisition, transcending the Nigerian context and resonating with the research objectives in Gombe State.

In the context of Gombe State, limited literature exists that specifically addresses the influence of workshop layout designs on skills acquisition in motor vehicle mechanics. Adewale and Oladejo (2016) emphasized the need for context-sensitive approaches in vocational education research in Nigeria. Given the potential variations in workshop spaces and resources available across different regions, an examination of the specific challenges and opportunities presented by the workshop layout designs in Government Science and

Technical Colleges in Gombe State is warranted. Additionally, research by Adekunle (2019) on technical education in Nigerian states highlighted that localized factors can significantly impact skills acquisition, necessitating region-specific interventions.

Considering the importance of technical education in Nigeria's socio-economic development, the findings of this study can have profound policy implications. Adequate workshop layout designs can positively influence skills acquisition, aligning with the goals of the Technical and Vocational Education and Training (TVET) policy in Nigeria (Okorie, 2017). The study's outcomes can inform educational policymakers about the need to invest in workshop infrastructure and optimize layouts for enhanced learning experiences. Moreover, insights from similar studies conducted outside Nigeria, such as the research by Chinwuko et al. (2018) on workshop design and skills acquisition in South Africa, can provide valuable comparative perspectives.

The relationship between workshop layout designs and skills acquisition among motor vehicle mechanics students in Government Science and Technical Colleges in Gombe State holds crucial implications for Nigeria's technical education landscape. While existing literature within Nigeria underscores the significance of workshop layouts for skills acquisition, a focused study on this topic within the specific regional context of Gombe State is needed. By examining the challenges and opportunities presented by current workshop designs, this research aims to contribute valuable insights to educational policymakers and administrators, fostering an environment that optimally supports skill development in motor vehicle mechanics.

Statement of the Problem

An efficient and conducive learning environment in technical education is crucial for effective skills development. However, there is a notable lack of comprehensive research exploring how workshop layout designs influence the learning process in motor vehicle mechanics specifically within the context of Government Science and Technical Colleges in Gombe State. This study seeks to delve into this gap by examining the current workshop layouts in these colleges, assessing their strengths and limitations, and determining how these layouts may hinder or facilitate students' acquisition of practical skills. The significance of understanding this relationship lies in the potential to optimize workshop designs to enhance the teaching and learning experiences, ultimately contributing to better-trained motor vehicle mechanics in the region. By focusing on Government Science and Technical Colleges in Gombe State, the study acknowledges the regional context and potential variations in workshop environments that may exist. Ultimately, the research aims to provide insights that can guide educational policymakers, administrators, and designers in making informed decisions about optimizing workshop layouts for improved skills acquisition among motor vehicle mechanics students.

Purpose of the Study

The purpose of the study is to determine the influence of workshop layout designs on skills acquisition in Motor Vehicle Mechanics Work: a study of Government Science and Technical Colleges in Gombe State. Specifically, the study intends to:

1. Determine the extent to which MVMW Workshop layout affects skill acquisition among Government Science and Technical Colleges students in Gombe State.
2. Determine the maintenance strategies that could improve MVMW workshop in Government Science and Technical Colleges in Gombe State.

Research Questions

The following research questions guided the study:

1. To what extent does MVMW Workshop layout affect skill acquisition among Government Science and Technical Colleges students in Gombe State?
2. What maintenance strategies could improve MVMW workshop in Government Science and Technical Colleges in Gombe State?

Hypotheses

The following null Hypotheses are stated and tested at 0.05 level of significant:

1. There is no significant difference between the mean responses of Administrators and Teachers on the extent MVMW Workshop layout affects skill acquisition among Government Science and Technical Colleges Students in Gombe State.
2. There is no significant difference between the mean responses of Administrators and Teachers on Maintenance Strategies that could improve MVMW Workshop in Government Science and Technical Colleges in Gombe State.

Methodology

In this study, the methodology encompasses various aspects of the research process. The research design employed is a descriptive survey research design, which involves collecting and systematically describing data about the Organization of Motor Vehicle Mechanics Work Workshops (MVMW) in Science and Technical Colleges. The purpose of this design is to compare opinions of respondents on the subject. The study is conducted in Gombe State, Nigeria, divided into educational zones, and the population includes 42 administrators and 21 teachers from these colleges, resulting in a total of 63 respondents. No sampling technique was utilized as the entire population is manageable. The instrument for data collection is a questionnaire created by the researcher based on literature review, divided into sections for personal data and for assessing various aspects of MVMW administration. The questionnaire employs a modified Likert-type rating scale for responses. The instrument's validity was established through face and content validity by experts, and its reliability was determined using the Cronbach alpha reliability method, with a reliability index of 0.68. Data collection was carried out by the researcher and research assistants, distributing and collecting questionnaires from the respondents in the seven targeted colleges. The data analysis is performed using SPSS Version 23. Descriptive statistics (mean and standard deviation) are employed to address research questions, and a t-test is used to test hypotheses. The criterion for positive/negative response was a mean score of 3.50 and above or below, respectively. For hypotheses, a significance level of 0.05 is used to determine whether to accept or reject the null hypothesis based on p-values.

Results

Research question 1: To what extent does MVMW Workshop layout influence skill acquisition among Government Science and Technical Colleges students in Gombe State?

Table 1: Mean and Standard Deviation on Influence of MVMW Workshop Layout on Skill Acquisition among GSTCs students.

N ₁ = 42 N ₂ =21							
ITEMS	$\bar{X}$	SD ₁	$\bar{X}$	SD ₂	$\bar{X}$	SD	Remark
1. Students can acquire practical skills more effective if the MVMW workshop is designated appropriately with work benches, mechanical toolbox, other basic vehicle services and repairs equipment are properly laid-out. .	4.26	0.66	4.70	0.56	4.41	0.61	Agreed
2. Proper MVMW workshop has good workshop facilities arrangement for effective improvement of students skill acquisition.	4.14	0.61	4.00	0.94	4.09	0.78	Agreed
3. Good workshop Layout makes appropriate economic use of the building, provides personnel convenience, safety, comfort, maximum exposure to natural light and ventilation, during student practical to promotes skill acquisition.	4.26	0.77	3.95	0.74	4.16	0.75	Agreed
4. A well designed MVMW workshop layout gives enough workspace, accommodates more students during practical's, assignment, and project.	4.17	0.79	4.09	0.62	4.14	0.71	Agreed
5. Good MVMW workshop is well spaced, organized, air conditioned, noised reduced adequate lighting and utility services are provided for improving students modern trend ...							
6. MVMW Students enjoy work space in an equipped place where they can pursue some phases of class activity to optimize skill acquisition.	59						
.Table 1 continue	4.14	0.71	3.62	0.80	3.98	0.91	Agreed
7. Good workshop layout provide more work station than the maximum number of students, eliminate unnecessary restriction of student's skills acquisition as well as waste of instructional time.	3.90	0.85	4.05	0.80	3.95	0.83	Agreed
8. Strategic points around the workshop, contain situated lockers, communal sinks	3.81	0.77	3.67	0.91	3.76	0.84	Agreed

	plumbed at end, moveable rolling road, cleaning equipment and workshop toolboxes stored in the main workshop area for student easy use.							
9.	Good space is not a luxury but a key determinant of good learning environment (spatial arrangements of classes and practical area) can support retention and improve students performances.	3.93	0.78	4.09	1.09	3.98	0.93	Agreed
10.	For effective skill acquisition MVMW students training facility should include mini-labs with lab space for three cars as well as two vehicle lifts and tool storage areas.	3.98	0.87	4.00	0.84	3.98	0.85	Agreed
11.	For effective skill acquisition MVMW Workshop main work area can be square or rectangular shape, to enable the workshop personnel see student's activities taking place in the area during practice. and projects	3.93	0.75	3.90	0.62	3.92	0.68	Agreed
12.	The width of traffic lane leading to exit should be three feet or more while the space between machines can be two feet or more, twelve inches or more away from walls or partitions. for students safety.	4.12	0.55	3.90	0.94	4.05	0.74	Agreed
13.	MVMW workshop designed to contain a Technical drawing room having light proof draw drapes, a demonstration table is to have vices, and a 200-240v single phase supply for student practice.	3.95	0.73	3.52	1.12	3.81	0.93	Agreed
14.	MVMW Teachers' offices should be included in MVMW Workshop that contain the following facilities: A drawing Table, Desk and Chair, Storage Cabinet, Tool-Box, Set of Computer, three section for Teachers offices are to be transparent, 150 feet illumination for each office.	4.24	0.85	3.95	0.97	4.14	0.91	Agreed
15.	Separate wash off spaces are to be provided at the main area, for service station, engine maintenance and refurbishing, and for auto electricity sections. To contain dual	3.79	0.68	3.90	0.88	3.82	0.79	Agreed

temperature (hot and cold) flow control faucet, soap and towel to be provided for student's usage.							
16. MVMW Student's project storage room floor space of 300sqft is adequate, dimension of 15ft /20ft, an illumination with intensity of 50 feet candles, Storage devices in the room to include open shelves and clamp racks.	3.76	0.76	3.71	0.90	3.75	0.83	Agreed
17. One students Toilets required, for boys, one for girls, one for men, one for women, following facilities should include in the envisage toilet such as; Sink, Towel Dispenser, Powder or liquid Soap, Toilet Tissue Dispenser, Waste Receptacles, Mechanical Ventilation System.	3.83	0.88	3.95	0.74	3.87	0.81	Agreed
18. MVMW workshop contain good information system (Internet facilities) necessary to improve services for the entire Department,	4.02	0.92	3.86	1.01	3.97	0.97	Agreed
19. MVMW workshop adopt equipment lending system for students to practice within the workshop environment	3.79	0.61	3.52	1.08	3.69	0.84	Agreed
Table 1 continue							
20. MVMW preserve modern autotronic diagnostic tool to trouble shoot during repairs, to expose the students to new complexity of automobile technology.	3.88	0.97	3.95	1.02	3.90	0.99	
Grand mean	4.00	0.77	3.91	0.88	3.97	0.83	Agreed

Source: Researcher (2022)

The results presented in table one reveal that the respondents agreed with all the items. This means that all the items can improve the Motor Vehicle Mechanics Work Workshop Layout on skill acquisition among Government Science and Technical Colleges students

Research Question 2: What maintenance strategies could improve MVMW Workshop in Government Science and Technical Colleges in Gombe State?

Table 4: Mean and standard deviation on Effect of Maintenance Strategies that can Improve MVMW Workshop in GSTCs.

N ₁ =42 N ₂ =21							
ITEMS	$\bar{X}$	SD ₁	$\bar{X}$	SD ₂	$\bar{X}$	SD	Remark
1. Care for equipment, machinery and facility use to attains its specific maximum	4.23	0.62	4.33	0.86	4.27	0.74	Agreed

	functional life to improve MVMW required activities							
2.	MVMW inspection, lubrication, cleaning and testing of an equipment or facility provide maximum use of tools and machineries	4.31	0.52	4.38	0.59	4.33	0.55	Agreed
3.	Regular routine checks of equipment, machinery and facilities helps to attain longer life span of MVMW workshop equipment's.	3.38	0.73	4.29	0.64	4.35	0.69	Agreed
4.	Proper storage system of consumables and good inventory keeps proper maintenance records of MVMW facilities..	4.07	0.71	4.14	0.91	4.10	0.81	Agreed
5.	Warning signal of any equipment or machine must be attended promptly in the workshop.	4.17	0.70	4.14	0.85	4.16	0.77	Agreed
6.	Improving MVMW personnel functioning within the workshop system can be gainfully utilized for purposes of achieving optimum skill acquisition.	4.14	0.65	3.67	0.66	3.98	0.65	Agreed
7.	Sustainable MVMW workshop maintenance structure will ensure quality of outcome.	4.19	0.63	4.24	0.77	4.21	0.70	Agreed
8.	Proper placement of skilled personnel in MVMW workshop facilitate maintenance and good practical skill.	4.36	0.62	4.00	0.77	4.24	0.70	Agreed
9.	Encouraging the natural curiosity of MVMW students by helping them to learn the skills and to enjoy teaching them attract more students interest.	4.24	0.69	4.10	0.94	4.19	0.82	Agreed
10.	Human resources deserved to be properly equipped with MVMW workshop information and materials are needed to improve efficient training of skill.	4.26	0.77	3.87	0.65	4.13	0.71	Agreed
11.	Prompt repair, servicing and. replacement of damaged parts of equipment and machinery reduces un necessary damages.	4.24	0.73	4.29	0.78	4.27	0.75	Agreed
12.	Implementation of maintenance culture in MVMW workshop can reinforce activity that ensures continuity within the students training.	4.29	0.64	4.04	0.92	4.21	0.78	Agreed

13.	Provision of adequate fund for maintenance purposes in the MVMW workshop provides smooth running of practical lessons.	4.40	0.70	4.24	0.54	4.35	0.62	Agreed
14.	Supervision of MVMW workshop personnel activities assures smooth running of practical	4.33	0.57	3.95	0.74	4.21	0.66	Agreed
15.	Maintenance is provided by specialized companies on equipment not supplied by them	3.64	1.00	3.10	1.34	3.46	1.17	Disagreed
Grand mean		4.15	0.69	4.05	0.80	4.16	0.74	

Source: Researcher (2022)

The results presented in table four above shows that all the respondents agreed with all the items except item 75 having a grand mean 3.46 This means that all the items except item 75 can improve maintenance strategies needed in Motor Vehicle Mechanics Work workshop in Government Science and Technical Colleges.

Hypothesis 1: There is no significant difference between the mean responses of Administrators and Teachers on the extent MVMW workshop layout influence skills acquisition among Government Science and Technical Colleges students in Gombe State.

Table 2: t-Test of Difference between Administrators and Teachers on the extent MVMW Workshop Layout Influence Skills Acquisition

GROUPS	Mean	SD	N	t	Sig
Administrators	3.99	0.43	42	0.68	0.50
Teachers	3.91	0.48	21		

Source: Researcher (2022)

The table 5 indicates that the responses of administrators had mean score (mean = 3.99, SD = 0.43) compared to that of teachers had mean score of X=3.91, SD = 0.48) with t-value = 0.68 at 61 degree of freedom. This calculated t-value of 0.68 is statistically greater than 0.05, the hypothesis is accepted. This shows that there is no significant difference between the mean responses of Administrators and Teachers on the extent Motor Vehicle Mechanics Work workshop layout affect skills acquisition among Government Science and Technical Colleges students in Gombe State. This signifies administrators and teachers agreed that good MVMW layout can improve student's skills acquisition in Technical Colleges.

Hypothesis 2: There is no significant difference between the mean responses of Administrators and Teachers on the extent Maintenance Strategies improve of MVMW workshop in Government Science and Technical Colleges in Gombe State.

Table 8: t-Test of Difference between Administrators and Teachers on the extent Maintenance Strategies that could improve MVMW workshop.

GROUPS	Mean	SD	N	T	Sig
Administrators	4.22	0.41	42	1.46	0.50
Teachers	4.05	0.48	21		

Source: Researcher (2022)

The data presented in table 8 revealed that responses of administrators had mean score (mean = 4.22, SD = 0.41) compared to that of teachers had mean score of (Mean = 4.05, SD = 0.48) with t-value = 1.46 at 61 degree of freedom. This calculated t-value of 1.46 is statistically greater than 0.05, the hypothesis is accepted. This shows administrators and teachers agreed that good MVMW maintenance strategies improves effectiveness in Technical Colleges.

Discussion of Findings

The data presented in table 1 provide answer to research question one. The finding revealed that Motor Vehicle Mechanics Work Workshop Layout affect skill acquisition among Government Science and Technical Colleges students have high mean score. The implication of this finding is that MVMW layout is effective in enhancing students skill acquisition. This finding is in agreement with Ejiko, Akerele, and Filani (2018) that worked on development of an improved Institution Automobile Service Delivery based on Integrated Equipment Layout, the finding reveal that new layout model was developed in accordance with standard Automobile Workshop. This finding is in line with Riggs (2014) who stated that the overall objective of layout is to put physical arrangement that most economically meets the required outcome quality and quantity. The finding is also in line with Maheer *et al*, (2015) stated that an ideal organization and administration of MVMW Workshop layout should provide the optimum relationship among machines, tools, workshop personnel, and students. The finding is also similar to that of Clydebank College (2013) pointed out t features of the physical environment lend themselves theoretically to all possibilities, the layout, location and arrangement of space and facilities render some behaviors much more likely, and thus more probable than others. "Educational institutes should learn to understand that spatial arrangements can support retention and improve student's performances; they must also understand that good space is not a luxury but a key determinant of good learning environments. The finding does not concur with Jubril (2011) who defined workshop as a place, area, room or building where tools, workbenches, equipment, machines, and materials are used in manufacturing or repair purposes. The influence of this finding therefore is that Motor Vehicle Mechanics Work Workshop Layout have positive influence on skill acquisition among Government Science and Technical Colleges students.

The result presented on table 2 provide answer to research question two. The finding revealed that maintenance strategy that improves Motor Vehicle Mechanics Work Workshop in Government Science and Technical Colleges is high. This study is related to Ogbuanya (2009) who in his findings reveal from the study is mandatory to develop a system for maintenance of technical college workshop equipment that should be adopted for effective implementation of maintenance program in technical colleges. This finding agree with Mkpozi (2006) who revealed that the extent of obsolete and faulty equipment in polytechnics was high; there is need for maintenance to avoid student's incompetence after graduation. This finding is related to Emele (1999) who found that the primary objective of MVMW Workshop maintenance programme is not just to repair a broken down piece of equipment but to ensure that the production system operates at a functional and an acceptable level capable of sustaining efficient skill acquisition.

The finding of the study for hypothesis 1 postulates that there is no significant difference between the mean responses of Administrators and Teachers on the extent Motor Vehicle Mechanics Work workshop layout improves skills acquisition among Government Science and Technical Colleges students in Gombe State. This finding is in agreement with Atanda, Meduonye, and Babatunde (2019) who stated workshop layout with adequate facilities are mandatory for Motor Vehicle Mechanics Work attendants to possess necessary skills for imparting practical skills to students. The finding was in line with Drucker (2015) who opined that layout for facilities to be positioned at strategic places required competent people with requisite skills.

The finding of the study for hypothesis 2 revealed that there is no significant difference between the mean responses of Administrators and Teachers on the extent Maintenance Strategies could improve Motor Vehicle Mechanics Work workshop in Government Science and Technical Colleges in Gombe State. The finding is in agreement with Imaga (2019) who reported there is no significant difference between the responses of teachers and attendants on maintenance culture.

Conclusion

Based on the findings of the study, it can be concluded that the Motor Vehicle Mechanics Work (MVMW) Workshop Layout plays a crucial role in enhancing skill acquisition among students in Government Science and Technical Colleges in Gombe State. The layout of the workshop has demonstrated its effectiveness in providing an environment conducive to learning and practical skill development for students in this field. Additionally, the study highlights that the implementation of maintenance strategies has the potential to significantly enhance the functionality and effectiveness of the MVMW workshop within Government Science and Technical Colleges in Gombe State. Maintenance strategies are key in ensuring that the workshop's equipment and facilities remain in optimal condition, thereby creating an environment that facilitates efficient learning and skill development. In conclusion, the study's results emphasize the pivotal role of both workshop layout and maintenance strategies in promoting effective skill acquisition and improving the overall quality of Motor Vehicle Mechanics Work education in Government Science and Technical Colleges in Gombe State. The agreement between Administrators and Teachers on these aspects underscores their collective recognition of the importance of creating conducive learning environments and maintaining well-equipped facilities to nurture students' technical skills and competence.

Recommendations

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

1. Technical Colleges should focus on designing and maintaining workshop layouts that are conducive to effective learning. This could involve optimizing the arrangement of tools, workstations, and equipment to create an environment that promotes hands-on learning and skill development.
2. Technical Colleges should establish systematic maintenance practices for workshop equipment, tools, and facilities. Regular maintenance can ensure that the workshop remains safe, functional, and conducive to effective teaching and learning. This could involve creating maintenance schedules, conducting inspections, and promptly addressing any issues that arise.
3. School administrators and teachers should collaborate closely when making decisions related to workshop layout design, maintenance planning, and improvement initiatives. This collaborative approach can lead to well-rounded strategies that cater to both instructional needs and practical considerations.
4. School administrators and teachers should engage in continuous professional development. Workshops, training sessions, and seminars focused on instructional design, workshop management, and maintenance techniques can empower educators to make informed decisions and implement best practices that enhance the learning experience for students.

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