



## Assessment of Maintenance Strategies Adopted by Teachers and Technologists for Maintenance of Workshop Equipment in Technical Colleges of Taraba State, Nigeria

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### Abstract

*The study was designed to assess the maintenance strategies adopted by the teachers for the maintenance of workshop equipment in Technical Colleges in Taraba state, Nigeria. A descriptive survey research design was used for the study. The study was carried out in all the 9 technical colleges in Taraba State. The study's population included the teachers and workshop technologists from Taraba State's nine technical colleges. 35 teachers and 35 school workshop technologists were sampled for the study making total of 70 respondents. The instrument for data collection was Assessment of Maintenance Strategies Adopted by the Teachers and Technologists for the Maintenance of Workshop Equipment in Technical Colleges questionnaire. The questionnaire was validated and pilot tested. Cronbach Alpha method was used to test the reliability, and a 0.87 reliability coefficient was found. Two research questions and one hypothesis were raised to guide the study. The research questions were analysed using mean and standard deviation, while the hypothesis was tested using z-test statistics. The findings of the study revealed that most of the standard maintenance strategies were not adopted for maintenance of technical colleges workshop equipment in Taraba State. It was therefore recommended that the schools should be encouraged to adopt the appropriate maintenance strategies to safeguard and prolong the lives of the workshop equipment and its users.*

**Keywords:** Maintenance, school workshop, Equipment, Technical Colleges.

### Introduction

School facilities play a vital role in the actualization of the educational goals and objectives by satisfying the physical and emotional needs of the staff and students of the school. These objectives can only be achieved when the facilities are properly managed in order to create a good and safe learning environment for both the teacher and the learner. It is evidently clear that some science and technical-oriented subjects in which one of the major objectives is the acquisition of applied and practical skills can only be successfully taught in well-equipped workshops and laboratories.

Uduak (2018) described school workshop equipment as that which include tools in automobile, mechanical, metal, wood, building, electrical, and electronics units that are set up for professionally qualified technical teachers and other technical personnel to exhibit their technical know-how and for the learners to acquaint themselves with the equipment available as well as imbibe the required skills, like the theatre for medical professionals, the practicing farm for agriculturists, and the

laboratories for scientists. Workshop equipment in technical colleges may be described as the material things that facilitate teaching and learning process. (Baribor & Gimah, 2020). According to Ayonmike, Okwelle and Okeke (2015), quality technical and vocational tools and equipment enhance learners' competency in practical knowledge, skill, and mastery of their chosen careers, which will finally translate into technological development. Amadike and Vincent (2015) defined educational facilities as the infrastructural facilities like workshops, laboratories, studios, equipment, machines, tools, consumable materials, instructional materials, etc. that enable a skilled teacher to achieve a level of instructional effectiveness. Despite the emphasis by some authors on the roles of educational facilities in enhancing students' learning of skills and positive attitudes, the tools and equipment have to be properly maintained. A workshop with available and qualitative equipment can pose a serious danger to the learner, the instructor, and the equipment itself if it is not properly maintained. McGregor's theory Y stated that



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an average human being learns under proper conditions

(<https://www.managementstudyguide.com> theory-x-y).

According to Amadike and Vincent (2015) best practices require that a comprehensive equipment maintenance program be established and monitored. Therefore, for vocational technical education programme to achieve its objectives of serving the needs of individual's trainee the school workshop equipment, which are the necessary tools to equip the learner with the necessary skills, knowledge, and attitudes, must be effectively maintained. Oduak (2018) stressed that a properly equipped and maintained school workshop plays a vital role in the development of cognitive, psychomotor, and affective domains of learning objectives.

Technical colleges have been defined as educational institutions established with the aims of training and producing technicians for industry (UNESCO, 2022). According to UNESCO the fundamental objectives of technical college among others shall be:

1. Providing training in selected occupation.
2. Helping trainees to develop the requisite skills and ability necessary for securing and retaining a job.
3. Providing training and skills to individuals who will be economically self-sufficient.

An aspect of school management that is generally overlooked is equipment maintenance, especially school workshops and laboratories. Since the supply of Hungarian tools and equipment to schools to teach technical and vocational subjects in 1977, practically little or no attention has been paid to the maintenance of such equipment (Amadike & Vincent 2015). Most of the equipment were rusted and the buildings were blown off by winds storm; they never undergone renovation or any form of modernization, in spite of the changes in the educational system (Audu, Aede, Yusri, & Muhammad, 2013). Tools/equipment maintenance is an issue that concerns all levels of the education, ranging from prekindergarten to tertiary levels. Some of those equipment are obsolete and therefore cannot contribute to the learning of modern skills. Maintaining

workshop tools and equipment, as well as renovating and modernizing old ones, necessitates significant expertise and commitment of human and material resources. Changes in weather conditions and poor culture are responsible for the deterioration and aging of school equipment. School managers and teachers who constantly use the school equipment lack knowledge of equipment maintenance strategies (Abubakar & Adamu, 2019). Consequently, they fail to integrate equipment maintenance into the management of the school. According to Asiabaka (2008), the issue of equipment maintenance is haphazardly addressed at all levels of the educational system, as no funds are usually allocated for equipment maintenance and procurement of consumable materials such as fuel/lubricant, coolants, reagents, etc. Repairs take place only when problems arise due to the breakdown of the existing facility. According to Abubakar and Adamu (2019), equipment maintenance entails providing a clean and safe environment for teaching and learning. It also involves the provision of adequate equipment for teaching and learning

Szuba and Young (2003) classified maintenance into four types as: preventive, routine, emergency, and predictive.

**Preventive Maintenance:** This is a type of maintenance carried out on school workshop equipment to avoid breakdowns and ensure the optimal performance of the equipment. Up-to-date information about the tools/equipment is required to serve as a guide for this maintenance team. Preventive maintenance according to Asiyai (2012) saves time and money. It is usually an integral part of management practice in societies where maintenance culture is well established. Decisions on preventive maintenance are collectively made and implemented.

**Routine Maintenance:** This is also part of preventive maintenance, but it is carried out periodically as scheduled by the school managers. Facilities may be serviced monthly, quarterly, or even annually, depending on the agreed schedule. The nature and maintenance intervals are described in the manufacturer's guide. To avoid equipment breakdown, school



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administrators follow these guidelines Carter and Carter (2001).

an effective school workshop maintenance plan can:

Emergency Repairs: This is very common in the management of school facilities in societies where maintenance culture is not well established. It takes place when a facility breaks down and urgent measures or steps have to be taken to remedy the situation. In this regard, collective decision-making may not be possible because there may be limited time to bring together all the necessary individuals to make decisions. It is also expensive because, due to a lack of maintenance, the extent of damage may require total replacement of the facility or a high cost of repair (Abraham, 2013). In some cases, the breakdown may cause injury or even death to school staff and students. The resultant effect may be a high insurance premium or the inability to use the facility for teaching and learning until repairs have been made. School managers should proactively develop and implement a facilities management plan to address facility needs.

1. Contribute to an organization's instructional effectiveness and financial wellbeing.
2. Improve the cleanliness, orderliness, and safety of an educational organization's facilities.
3. Reduce a building's operational and life-cycle costs.
4. Help staff deal with limited resources by identifying facility priorities proactively rather than reactively.
5. Extend the useful life of equipment.

Equipment maintenance requires expert input from a wide range of stakeholders. Collaborative efforts bring new ideas and perspectives to equipment maintenance. Over the years, school managers have emphasized that the physical facilities such as tools and equipment available for academic and non-academic activities are grossly inadequate, and where they are available, most of them are absolute and not properly maintained (Audu et al., 2016).

Predictive Maintenance: This involves the use of computer software to predict equipment failure based on age, user demand, and permanence measures.

### Statement of the Problem

The need for school workshop equipment/tools maintenance cannot be overemphasized. Equipment maintenance is necessary to provide a satisfactory teaching and learning environment in order to achieve educational goals (Gaither, 2003). Audu *et al.* (2013) observed that proper school workshop equipment maintenance reduces the cost of capital expenditures made in vocational institutions as it reduces the rate of repair and breakdown of school equipment. School workshop equipment imply a substantial cost to the school system for their establishment, and if not properly maintained, they dilapidate and wear out faster than their normal life span, and such schools will not derive optimum benefits from their use (Samuel & Okaforcha, 2016). This suggests that where school workshop equipment are not properly maintained, there will be a need for replacement. This can result in higher costs for capital expenditures. If not replaced, it can also disrupt effective teaching and learning operations. Elghaffar (2007) emphasized that

Equipment maintenance is an integral part of the overall management of the school. The actualization of the goals and objectives of technical education require the provision, maximum utilization, and appropriate maintenance of the equipment. Furthermore, advancement in science and technology necessitate that the school management adopt modern methods of equipment maintenance. This will improve the quality of teaching and learning. The quality of the school workshop equipment and the quality of its products are inextricably linked. The school equipment is a major determining factor in the attainment of its objectives. Unfortunately, in the words of Amadike and Vincent (2015), Abubakar and Adamu (2019) most of the school equipment are not properly maintained, especially at the technical college level. It was discovered that most technical college workshops are not properly equipped, and even those that are equipped are not properly maintained. It is against this backdrop that this study is design to assess the maintenance strategies adopted by the teachers and technologists for the maintenance of workshop equipment in technical colleges in Taraba State, Nigeria.



### Purpose of the Study

The purpose of the study was to assess the maintenance strategies adopted by the teachers and technologists for the maintenance of workshop equipment in technical colleges in Taraba State; Specifically, the study sought to achieve the following objectives:

1. Determine the maintenance strategies adopted by the teachers for the maintenance of workshop equipment in technical colleges in Taraba State, Nigeria.
2. Identify the maintenance strategies adopted by the technologists for the maintenance of workshop equipment in technical colleges in Taraba State, Nigeria.

### Research Questions

The following research questions guided the study

1. What are the maintenance strategies adopted by the teachers in technical colleges in maintaining their school workshop equipment and tools?
2. What are the maintenance strategies adopted by workshop technologists in technical colleges to maintain their school workshop equipment and tools?

### Hypothesis

The following hypothesis guided the and was tested at .05 level of significant

There is no significance difference between the mean responses of technical college teachers and workshop technologists as regards the maintenance strategies adopted for the maintenance of workshop equipment in technical colleges in Taraba State, Nigeria

### Methodology

The study adopted a descriptive survey research design. The study was conducted in all the 9 technical colleges in Taraba State. A total of 70 respondents comprising of 35

technical teachers and 35 workshop technologists from all the technical colleges was used as population for the study. An Assessment of Maintenance Strategies Adopted by the Teachers and technologists for the Maintenance of Workshop Equipment in Technical Colleges questionnaire was designed by the researcher. The questionnaire was validated by two experts in vocational and technical education and pilot-tested. Cronbach Alpha was used to test the reliability and 0.87 reliability coefficient was found. The questionnaire items were structured on 4-point likert type scale option of Highly Adopted (HA) = 4, Adopted (A) = 3, Moderately Adopted (MA) = 2 and Not Adopted (NA) = 1.

The researcher sought the permission of the school principals to administer the questionnaire to the respondents, and the permission was granted. Two (2) research assistants were used in addition to the researcher. The questionnaires were distributed to the respondents and were collected immediately after filling them. The questionnaires were 100% returned.

The questionnaires were analysed using mean and standard deviation, while hypotheses were tested using Z-test statistics. A mean score of 2.50 was used as a decision point. Therefore, any item with a mean score of 2.50 and above were considered agreed and those items of mean score of 2.49 and below were considered disagreed. In the case of hypothesis testing, any z-test with a P value greater than 0.05 ( $P > 0.05$ ) is considered not significant, hence the null hypothesis was accepted.

### Results

#### Research Question 1

What are the maintenance strategies adopted by the teachers in technical colleges in maintaining their school workshop equipment and tools?



**Table 1: Responses of teachers on the maintenance practices adopted in their school workshops**

SN	Practices	X	SD	Remark
1	We sweep our workshops on a daily basis.	1.46	8.51	Not adopted
2	We sweep our workshop on a regular basis.	2.69	15.69	Adopted
3	We always have sufficient lubricants, such as engine oil or grease, in our workshops.	1.8	10.52	Not adopted
4	We always have sufficient coolant in our workshops.	1.63	9.37	Not adopted
5	We always have sufficient fuel in our school generator.	1.77	10.52	Not adopted
6	We lubricate our equipment and tools at regular intervals.	2.14	12.48	Not Adopted
7	Our tools are always kept sharp for students to use.	1.86	10.85	Not adopted
8	Most of the equipment and tools in our workshops are kept in good condition and are functional.	1.69	9.85	Not adopted
9	Most of the equipment and tools in our school workshops are relevant to the current curriculum of vocational education.	1.54	8.99	Not adopted
10	We maintain our school workshop equipment and tools just to avoid their breakdown.	2.74	15.98	Adopted
11	We have a schedule for maintenance of our school workshops.	1.49	8.69	Not adopted
12	We lubricate our machines and tools whenever students want to conduct practical	2.0	11.49	Not Adopted
13	We have sufficient firefighting equipment in our school workshops.	1.51	8.80	Not adopted
14	We usually carry out tests on some equipment and tools to determine their condition.	1.29	7.52	Not adopted
15	We regularly carry out repairs on some equipment and tools that breakdown as a result of wear and tear.	2.6	15.16	Adopted
16	We usually replace some part we find weak before it breaks.	1.37	7.99	Not adopted
17	We usually only replace equipment or tool parts when they break.	2.4	13.99	Not Adopted
18	Maintenance of school workshop equipment and tools is the responsibility of workshop attendance only.	2.6	15.16	Adopted
19	Funds are always allocated for the maintenance of school workshops.	1.17	6.38	Not adopted
<b>Grand Mean</b>		1.83	7.85	Not adopted

The result in Table 1 revealed that out of the 19 maintenance practices listed on the table, only 4 items were adopted by teachers in maintaining their school workshop tools and equipment. Item number 2 which is sweeping of the school workshop on regular bases has means response of 2.69 and standard deviation of 15.69, item number 10 which is maintenance of the workshop equipment to avoid their breakdown has a mean response of 2.74 and standard deviation of 15.98, item number 15 has mean response of 2.6 and standard deviation of 15.16 which showed that they regularly carry out some repairs of some equipment

that were broken as a result of tears and wears and item number 18 had mean response of 2.6 and standard deviation of 15.16. The total grand mean is 1.83 and standard deviation of 7.85. This revealed that majority of the maintenance strategies were not adopted by the teachers to maintain their school workshop equipment.

#### Research Question

What are the maintenance strategies adopted by workshop technologists in technical colleges to maintain their school workshop equipment and tools?





**Table 2: Responses of school workshop technologists on the maintenance practices adopted in their school workshops**

SN	Practices	X	SD	Remark
1	We sweep our workshops on a daily basis.	1.69	9.85	Not adopted
2	We sweep our workshop on a regular basis.	2.51	14.64	Adopted
3	We always have sufficient lubricants, such as engine oil or grease, in our workshops.	1.89	11.02	Not adopted
4	We always have sufficient coolant in our workshops.	1.91	11.14	Not adopted
5	We always have sufficient fuel in our school generator.	1.94	11.31	Not adopted
6	We lubricate our equipment and tools at regular intervals.	2.1	12.24	Not adopted
7	Our tools are always kept sharp for students to use.	1.86	10.86	Not adopted
8	Most of the equipment and tools in our workshops are kept in good condition and are functional.	1.83	10.67	Not adopted
9	Most of the equipment and tools in our school workshops are relevant to the current curriculum of vocational education.	1.66	9.68	Not adopted
10	We maintain our school workshop equipment and tools just to avoid their breakdown.	2.54	14.81	Adopted
11	We have a schedule for maintenance of our school workshops.	1.77	10.32	Not adopted
12	We lubricate our machines and tools whenever students want to conduct practical	2.06	12.01	Not adopted
13	We have sufficient firefighting equipment in our school workshops.	1.63	9.50	Not adopted
14	We usually carry out tests on some equipment and tools to determine their condition.	1.51	8.80	Not adopted
15	We regularly carry out repairs on some equipment and tools that breakdown as a result of wear and tear.	2.51	14.64	Adopted
16	We usually replace some part we find weak before it breaks.	1.34	7.81	Not adopted
17	We usually only replace equipment or tool parts when they break.	1.94	11.31	Not adopted
18	Maintenance of school workshop equipment and tools is the responsibility of workshop attendance only.	2.46	14.34	Not adopted
19	Funds are always allocated for the maintenance of school workshops.	1.34	7.81	Not Adopted
<b>Grand Mean</b>		<b>1.92</b>	<b>8.15</b>	<b>Not adopted</b>

Table 2 revealed that among the 19 practices shown, only items 2, 10 and 15 were adopted as they have mean responses of 2.51, 2.54 and 2.51 and standard deviation of 14.64, 14.81 respectively which are greater than the 2.49 decision rule. This showed that the remaining 16 equipment maintenance strategies were not adopted by the technologists in in the maintenance of their workshop equipment

### Hypothesis Testing

**Table 3: Paired Z-Test for Teachers—Technologists**

Mean	-0.0389
Std Error	0.0440
Lower 95% CI:	-0.1313
Upper 95% CI:	0.0534
Z	-0.89
DF	18
P	0.3875

The result of hypothesis testing on the mean response of teachers and workshop attendance on the maintenance practices



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adopted in maintaining their school workshop equipment and tools showed that there is no significance difference in their responses as the P value is 0.3875 ( $P > 0.05$ ). Hence, the null hypothesis is therefore accepted

### Discussion

The findings of the study revealed that most of the maintenance practices listed were not adopted by both the teachers and workshop technologists in the management of their school workshop equipment and tools. For instance, some parts that wear weak as a result of wears and tears were not replaced to avoid break down, there were no sufficient lubricants, coolants, firefighting equipment, etc. to keep the machines in good condition and free from rust, as observed by Audu, Aede, Yusri, and Muhammad (2013). According to Samuel and Okaforcha (2016), the teachers and school workshop attendees do not practice preventive maintenance, which is one of the maintenance strategies to avoid break downs and ensure optimal performance of the facilities, which usually saves cost and time.

It was also found that most of the equipment and tools were not relevant to the current school curriculum, there was no schedule for the maintenance of the school workshops, equipment and tools were only lubricated whenever they were going to be used, and the teachers and students only attended the school workshops to avoid a breakdown at the moment. This is in contrast to the routine maintenance strategy, which should be scheduled on a weekly, monthly, quarterly, or even annual basis, depending on the planned schedule, to avoid facility breakdown as suggested by Gaither (2003).

It was also discovered that equipment and tools break due to wear because they were not regularly checked to determine their condition and were only replaced when completely broken. This is contrary to the good maintenance culture, which requires a regular check of the equipment and tools to determine their condition before they break down. This may result in injury or even death to staff and students of the school as observed by szuba and Young, (2003).

A lax attitude toward maintenance culture may occasionally result in damage to the extent that requires total replacement of the

facility or a high cost of repairs. The resultant effect may also be a high insurance premium or the inability to use the facility for teaching and learning until it is repaired. This is in agreement with the findings of Castali (2013) that, despite the fact that school workshop equipment and tools enhance students' learning of skills and attitudes, if not properly maintained, they can pose serious dangers to the learner, the instructor, and the equipment.

It is against this backdrop that the researcher assessed maintenance strategies adopted by the teachers and technologists for maintenance of their school workshop equipment in technical colleges in Taraba State, Nigeria. This is to enhance learners' competency in practical knowledge, skills and mastery of their chosen career which may translate into technological development as found by Ayonmike, Okwelle and Okeke (2015). Onwurah (2004) also found that properly equipped and maintained school workshop play vital roles in the development of cognitive, psychomotor and affective domain of the learner.

### Conclusion

It was concluded that school workshop equipment maintenance is very vital in enhance learning as the equipment/tools develop the cognitive, psychomotor and affective domain of the learner which may result into acquisition of practical skills, knowledge, attitudes and mastery of their chosen career. Unfortunately, both the teachers and the technologists have not adopted the appropriate maintenance strategies that can keep the equipment in safe and good condition to bring out the expected competencies in the learner.

### Recommendations

The following recommendations were made:

1. The ministry of education should provide adequate equipment in technical colleges' workshops to enhance students' performance.
2. To safeguard and prolong the life span of equipment, tools, and users, school heads should ensure strict compliance with standard maintenance strategies.



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- Teachers and workshop attendees should be regularly trained on workshop maintenance skills.

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