

Short Paper

# Technical Teachers' Rating of Workshop Facilities Maintenance Practices for Effective Training Programmes in Technical Colleges in Delta State

Musibau Giwa

Department of Building Technology  
Federal College of Education (Technical) Asaba, Delta State, Nigeria

[Musbaugiwa74@gmail.com](mailto:Musbaugiwa74@gmail.com)

(corresponding author)

Ogochukwu T. Ibeneme

Department of Technology and Vocational Education  
Nnamdi Azikiwe University, Awka, Anamabra State, Nigeria

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## Abstract

The insufficient exposure to workshop practice might be blamed for the incapacity of technical college graduates, particularly in Delta State, to fit into any field without additional training or start their businesses. This can be because the technical institutes lack workshop facilities or because they are in poor condition. The facility maintenance culture embraced by the technical colleges is called into question by this circumstance. The purpose of this study is to determine technical teachers' ratings of workshop facilities maintenance practices in technical colleges. The study adopted a descriptive survey design. The area of the study was Delta State. There was no sampling; therefore, the entire population was studied. The population for the study was 292 technical teachers from all six technical colleges in Delta State. Two research questions guided the study. A 16-item structured questionnaire validated by three experts was used for data collection, while the reliability was determined using Cronbach's alpha internal consistency method and a reliability coefficient value of 0.82 was obtained. Mean and Standard Deviation were used to answer the research questions, while the t-test was used to test the hypotheses at a 0.05 level of significance. Findings from the study indicated among



others that technical teachers rated predictive and preventive maintenance practices to a moderate extent, based on the findings. It was, therefore, recommended among others that Technical College Managers should ensure that only competent teachers preferably those with industrial experiences are recruited so that minor maintenance issues as it affects workshop facilities are handled by them.

**Keywords** – technical teachers, workshop facilities, maintenance practices, technical colleges

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## **INTRODUCTION**

The educational discipline known as vocational and technical education is thought to be the most effective means of bringing about rapid, desired changes or growth in a nation's economic, political, social, and human resources (Odu, 2011). This component of education is crucial for the advancement of a nation, particularly in the areas of employment and job creation, industrial development, entrepreneurial strategy, poverty alleviation, promotion of the Nigerian economy, and promotion of Nigerian culture and values. The apprenticeship system, as well as basic, post-basic, and higher education levels, are options for acquiring vocational and technical education. Vocational and technical education is frequently offered in specialized trades in technical colleges or community colleges at the post-basic level. Universities, Institutes of Technology/Polytechnics, and colleges of education offer them at the higher education level (Technical). The post-basic level available in technical colleges will be the subject of this study.

Consequently, technical colleges are institutions established to train students to obtain the practical skills, information, and attitude required for employment. The main objectives of technical college education, according to Abdulkadir (2011), are to generate skilled and knowledgeable craftspeople who will support industrial development in the fields of maintenance, commodities production, and general services. According to Odu (2010), technical colleges are institutions designed to train individuals to work as technicians and to reflect current trends and developments in the industry and the abilities required. The National Technical Certificate is typically awarded after three years of study in technical colleges (NTC). The Junior Secondary Certificate (JSC) or a comparable credential, such as a vocational training centre certificate, is the prerequisite for admission to technical colleges (NBTE, 2015).

However, holders of the Senior Secondary School (SSS) Certificate who would like to learn technical and vocational skills can participate in the programme. In light of this, among other technical and vocational skills taught in technical colleges are carpentry and joinery, plumbing and pipe fittings, painting and decoration, electrical installation and maintenance, furniture and upholstery, auto mechanics, fabrication and welding, and

radio and television electronics work. Individual interests, aptitude, and the programme's availability at the preferred technical institution all play a role in choosing one of these trades over another. However, these trades are thought by technical teachers, for anybody to assume the duty of serving as a technical teacher, such a person is expected to possess adequate maintenance skills for imparting technical knowledge and skills, especially now that the emphasis is on competency-based learning. According to Abassah (2011), a qualified technical teacher should possess the required maintenance skill to keep facilities running safely and reliably. Teachers with a minimum of Bachelor of Science (B.Sc.) plus Post Graduate Diploma in Education (PGDE) or higher degree in vocational teacher training may possess more maintenance skills due to the level of qualification and the training received during training. Consequently, the availability of a workshop and all the other facilities required for the training programme is a key factor in whether the aims of these programmes are achieved.

This is because all programmes in vocational and technical education are skill-based, necessitating an environment where students might experiment, research, develop, construct, design, and repair, among other things. This can be done successfully in a well-equipped workshop (Umaru, 2010). The workshop is a structure that houses the equipment used to instruct students in technical courses so they can gain practical skills that will improve their economic well-being (Asiyai, 2012). It may also be thought of as a structure where equipment is housed and used to produce or maintain goods. A workshop is a special learning setting where students can experiment, test, build, fix, design, assemble, deconstruct, create, and research. Therefore, various workshop facilities are used to do this.

Additionally, workshop facilities include everything in a workshop that can support efficient teaching and learning so that students can get the necessary skills for practice (Abdulkadir & Ma'aji, 2014). Facilities and consumables are materials that are used by teachers, instructors, and students to meet the programme objectives in a normal workshop. They include structures, furnishings, tools, and vehicles, as well as access to electricity, water, seating areas, and other teaching aids. These resources are required for teaching and learning in technical colleges to give students a greater sense of purpose and meaning in the subjects they are being taught. To achieve the intended goals as effectively as possible, workshop facilities must be in good shape. Additionally, workshop facilities in good condition will undoubtedly aid in providing students with high-quality training. The quality of the training activity will suffer if the tools and equipment are not in good shape. As a result, it's important to make sure the facilities are properly maintained for the training exercise to go as smoothly as possible.

Any activity conducted on an item to maintain its operation or to get it back into excellent working order is referred to as maintenance (Amanchukwu & Ololube, 2015). As much as is practical, the basic goal of maintenance is to keep the facilities in their original, functional state so that they can continue to fulfil their intended functions. Any work done on a college facility component to keep it in excellent functioning order is referred

to as maintenance in technology and vocational education institution. As a result, they are sets of tasks necessary to keep the workshop environment functioning as planned. It consists of all machinery and tools necessary for day-to-day operations as well as the facilitation of the workshop's instructional process. In various ways, workshop facilities are maintained. A facility's current needs will determine the kind or nature of maintenance that has to be done on it.

However, generally speaking, they come in the form of both preventive and predictive measures (Babatope, 2010). A type of maintenance called predictive maintenance focuses on measuring and/or monitoring equipment to detect or foresee equipment wear and tear. It entails keeping an eye on the vibration of spinning machinery to spot early issues and avoid catastrophic collapse (Asiegbu, 2014). By planning the interventions of equipment's vulnerabilities at the most advantageous period, preventive maintenance refers to the procedures put in place to maintain a level of specific service. It is a series of procedures carried out on plant machinery, equipment, and systems before a breakdown to safeguard them and stop or reverse any deterioration in their operational conditions (Xaba, 2012). It is used methodically to ensure that the equipment is inspected even if there are no symptoms of a problem; this is often done at somewhat regular intervals. The main objective is to stop equipment failure before it happens.

It is disappointing to see that the majority of technical institutions in Nigeria appear to be operating below expectations, allegedly as a result of inadequate maintenance or complete disregard of the resources needed in the workshops for an efficient training programme. According to Lukman and Oviawe (2021), there were some highly unsettling data shown by student performance on the National Business and Technical Examination Board (NABTEB) exam given in technical colleges in 2019 and 2020. The results showed failure rates in the Electrical and Mechanical trades ranging from 14 per cent to 48 per cent, in the Construction trades from 12 per cent to 50 per cent, and the other trades from 18 per cent to 94 per cent. This might be related to poor workshop maintenance procedures, which, according to NBTE (2013), should make up 60% of the technical college curriculum.

In line with the preceding argument, Audu, Umar, and Idris (2020), the technical college workshop's vocational and technical education facilities are currently in a very poor state and there are no planned methods for maintaining the already-broken-down equipment or ways to buy new ones. This finding is consistent with the argument made above. Government, educators, technicians, and students seem to have little to no interest in improving the current status of the facilities, which appears to have resulted in the removal of workshop maintenance practice from the majority of the technical college's timetable. To achieve the objectives of vocational and technical education as outlined in the National Policy on Education of Nigeria, this pitiful situation must be changed Federal Government of Nigeria, (FRN, 2013). Given the aforementioned circumstances, it is possible that Delta State's technical colleges would experience a similar issue. However, there is no empirical evidence to prove or disprove such assertion;

hence the need to ascertain the technical teachers' ratings of workshop facilities maintenance practices in technical colleges in Delta State.

### ***Statement of the Problem***

Despite the admirable goals of technical college programmes, as stated in NBTE (2013), it seems that graduates of technical colleges nowadays hardly can fit into any field without further training or, establishing their businesses. Due to a lack of workshop space or outdated workshop space in technical institutes, there is a connection between this and restricted exposure to workshop practice. The majority of Delta State's technical colleges lack the necessary workshop facilities, and those that are there are typically in bad shape. The facility maintenance culture embraced by the technical colleges is called into question by this circumstance. The result of this situation is that training programmes in technical colleges, especially in Delta State, are negatively impacted and their goals are not successfully met. This situation necessitates the need to ascertain the technical teachers' ratings of workshop facilities maintenance practices in technical colleges in Delta State.

### ***Purpose of the Study***

The main purpose of this study was to determine technical teachers' ratings of workshop facilities maintenance practices for an effective training programme in technical colleges in Delta State. Specifically, the study determined the ratings of:

- i. predictive maintenance practices on workshop facilities by technical teachers in technical colleges in Delta State.
- ii. preventive maintenance practices on workshop facilities by technical teachers in technical colleges in Delta State.

### ***Research Questions***

The following research questions were raised and answered in the study:

- i. What is technical teachers' rating of predictive maintenance practice on workshop facilities in technical colleges in Delta State?
- ii. What is technical teachers' rating of preventive maintenance practice on workshop facilities in technical colleges in Delta State?

### ***Hypotheses***

The following null hypotheses were tested at a 0.05 level of significance.

- H<sub>01</sub>:** Less experienced technical teachers do not differ significantly from more experienced technical teachers in their ratings of predictive maintenance practices in technical colleges in Delta State.

**H<sub>02</sub>:** Less experienced technical teachers do not differ significantly from more experienced technical teachers in their ratings of preventive maintenance practices in technical colleges in Delta State.

## **METHODOLOGY**

The study adopted a survey research design. This design is considered appropriate because the study is aimed at investigating technical teachers' opinions on workshop facilities maintenance practices in technical colleges in Delta State. The area of this study was Delta State. The population for this study comprises 292 technical teachers in the six technical colleges in Delta State. Consequent to the fact that the population size is manageable, there was no sampling and hence the entire population participated in this study. The instrument for data collection was a 16 items structured questionnaire developed by the researcher and titled- Workshop Facilities Maintenance Practices Rating Questionnaire (WFMPRQ). The questionnaire was a five-point scale of very high (VH) high (V) moderate (M) low (L) very low (VL) and the scale was rated 5, 4, 3, 2, 1, respectively. The questionnaire was vetted for face validity by three experts. To establish the reliability of the instrument, the instrument was administered to 10 technical teachers from Government Technical College (GTC) Onitsha, Anambra state who were not part of this study. Cronbach Alpha was used to analyze the data obtained for internal consistency and a reliability coefficient of 0.82 was obtained.

The researcher personally administered the instrument to the teachers with the help of two research assistants. Four days were given to the respondents to respond to the questionnaire items after which 263 copies representing 90.1% were retrieved and utilised for the study. However, any mean score between 1 – 2.33; 2.34 – 3.66; and 3.67 – 5 is regarded as low, moderate and high technical teachers' rating of predictive and preventive maintenance practice on workshop facilities respectively. The data collected was analyzed using mean, standard deviation and the t-test statistic. Mean statistics was used to answer the research questions and standard deviation was used to determine the spread of scores within the data collected in line with the real limit of numbers, while the t-test was used to test the null hypotheses at a 0.05 level of significance. Where the p-value is less than or equal to the level of significance (0.05), the null hypotheses will be rejected, otherwise, it was accepted.

## **RESULTS**

Table 1, shows the summary of the data collected for research question 1. The result shows that the mean response of the eight items presented ranged from 1.68 to 4.83 with a grand mean of 2.99. The standard deviation of the eight items ranged between 0.34 and 1.86. Based on the foregoing, the overall opinion of technical teachers showed that they practice predictive maintenance on workshop facilities at a moderate rate in technical colleges in Delta State, because the benchmark weighted mean score

stood at 2.34 – 3.66 and their weighted mean score is 2.99 which is between the benchmark weighted mean score.

Table 1. Mean of Predictive Maintenance Practices on Workshop Facilities

S/N	Predictive Maintenance Practices	Mean ( $\bar{x}$ )	SD	Remark
1	Regular vibration analysis and monitoring of moving machine parts	3.56	1.65	High
2	Consistent Thermographic inspection of machines to identify and measure any temperature variation	2.31	.47	Low
3	Periodic oil sampling of machine lubricant and analysis	2.31	.34	Moderate
4	Regular ultrasound detection test to identify any variation in the machine sound	2.53	1.86	Moderate
5	Electric power quality analysis to ascertain the quality of the electric power the machines are utilizing for their operations	3.61	1.67	High
6	Visual inspection of all the machines and their moving parts	4.83	.42	High
7	Shock pulses analysis of the machine while in motion	1.68	1.57	Low
8	Wear and dimensional measurement of moving machine parts	2.77	1.17	Moderate
<b>Grand Mean</b>		<b>2.99</b>		<b>Moderate</b>

The data presented in Table 2 reveals the ratings of the response of technical teachers on preventive maintenance practice on workshop facilities in technical colleges in Delta State. The mean rating for the eight items ranges from 2.23 to 4.79. The standard deviation of the eight items ranges from 0.24 to 2.34. The overall opinion of technical teachers shows that they carry out preventive maintenance practices on workshop facilities moderately because the benchmark weighted mean score stood at 2.34 – 3.66 and their weighted mean score is 3.38 which is between the benchmark weighted mean score.

Analysis of Table 3, reveals the mean response of less experienced (3.19) and more experienced (2.79) technical teachers; the data indicated that both agreed on the ratings of predictive maintenance practices on workshop facilities in technical colleges in Delta State. The data from the table also indicates that there is no significant difference between the mean response of less experienced and more experienced technical teachers ( $t = 0.68$ ,  $df = 261$ ,  $p = 0.51 > 0.05$ ) on their ratings of predictive maintenance practices in workshop facilities in technical colleges in Delta State.

Table 2: Mean of Preventive Maintenance Practices on Workshop Facilities

S/N	Preventive Maintenance Practices on Workshop Facilities	Mean ( $\bar{x}$ )	SD	Remark
9	Ensuring operators' participation in a normal routine check of all machines	2.64	.97	Moderate
10	Immediate correction of potential failure when inspection indicates the need for that	2.95	.46	Moderate
11	Regular lubrication of all moving machine parts to avoid friction and corrosion	4.54	.24	Very High
12	Overhauling equipment periodically to upgrade general equipment condition	2.23	.67	Low
13	Regular cleaning of workshop facilities to remove dust and other unwanted elements	4.79	1.55	Very High
14	Periodic adjustments of machine components to ensure their tightness	3.54	2.34	High
15	Replacement of components that shows visible sign of wear regularly before they fail	4.02	.30	High
16	Regularly updating maintenance inventory after every major repair	2.34	.35	Low
<b>Grand Mean</b>		<b>3.38</b>		<b>Moderate</b>

Table 3. Summary of t-test Analysis on Predictive Maintenance Practices on Workshop Facilities

Variable	N	Mean	SD	df	t-value	p-value	Remarks
LE	125	3.19	0.33	261	0.68	0.51	<b>Accept H<sub>0</sub></b>
HE	138	2.79	0.21				

\*L E = Less Experienced (0-5years); H E = Highly Experienced (6 years and above)

Table 4. Summary of t-test Analysis on Preventive Maintenance Practices on Workshop Facilities

Variable	N	Mean	SD	df	t-value	p-value	Remarks
LE	125	3.18	0.47	261	-0.59	0.40	<b>Accept H<sub>0</sub></b>
HE	138	2.90	0.36				

\*L E = Less Experienced (0-5years); H E = Highly Experienced (6 years and above)

Data presented in Table 4 indicates the mean response of less experienced (3.18) and more experienced (2.90) technical teachers; the data shows that both the less experienced and more experienced technical teachers agree with their ratings of preventive maintenance practices on workshop facilities in technical colleges in Delta State. The table also reveals that there is no significant difference between the mean response of less experienced and more experienced technical teachers ( $t = -0.59$ ,  $df = 261$ ,



$p = 0.40 > 0.05$ ) on their mean ratings of preventive maintenance practices on workshop facilities in technical colleges in Delta State.

## **DISCUSSION OF THE FINDINGS**

Findings from research question one show that technical teachers practice predictive maintenance on workshop facilities at a moderate rate in technical colleges in Delta State. Prominent maintenance practices include regular vibration analysis and monitoring of moving machine parts, a consistent thermographic inspection of machines to identify and measure any temperature variation, Periodic oil sampling of machine lubricant and analysis, and electric power quality analysis to ascertain the quality of the electric power the machines are utilizing for their operations, Visual inspection of all the machines and their moving parts, Wear and dimensional measurement of moving machine parts.

These findings are in disagreement with Abdulkadir and Ma'aji (2014) that studied "Assessment of Workshop Facilities Management Practices in Technical Colleges of Niger State". Findings from their study revealed among others that technical teachers were not allowed to participate in the planning of the workshop facilities, workshop facilities were not stored according to their characteristics and predictive maintenance are not regularly observed. The researchers recommended that technical teachers should be involved in the planning of workshop facilities, workshop facilities should be stored according to their characteristics and predictive maintenance should be observed regularly in the workshop.

This divergence in findings may be due to disparity in the geographical location of the institutions under consideration. While Abdulkadir and Ma'aji (2014) conducted their study in Technical Colleges in Niger State, the current study was carried out in Delta State. In addition to that, the level of qualification and relevant industrial experience of technical teachers from the two locations may not be the same to warrant similar conclusions.

The results of research question two show that technical teachers carry out preventive maintenance practices on workshop facilities in technical colleges in Delta State at a moderate rate. The most among the findings include: Ensuring operators' participation in a normal routine check of all machines, immediate correction of potential failure when inspection indicates the need for that, regular lubrication of all moving machine parts to avoid friction and corrosion, Overhauling equipment periodically to upgrade general equipment condition, Regular cleaning of workshop facilities to remove dust and other unwanted elements, Replacement of components that show visible sign of wear regularly before they fail.

These findings are consistent with that of Husaini (2014) who investigated the perceived roles of technical teachers in the maintenance of workshop equipment in Kogi and Kwara State. Findings from their study indicated that the need for preventive maintenance practices is non-negotiable as it has the potential to forestall any possible breakdown of a facility at critical times of need.

The emergence of these findings may be due to the increasing cost of maintenance of facilities after they fail to function optimally. This might have necessitated the need to engage in practices that may likely arrest the situations before escalation. For instance, regular lubrication of all moving machine parts will reduce friction and corrosion which eliminate or retard the pace of emergence of wear and tear of the moving parts.

## **CONCLUSION**

The study determined the technical teachers' ratings of workshop facilities maintenance practices for an effective training programme in technical colleges in Delta State. Predictive and preventive maintenance practices were carried out on those facilities at a moderate rate. It can therefore be concluded that the realization of the goals of every technical education programme is hinged largely on the functionality of the workshop facilities. Where the facilities are not in good shape, the goals may not be convincingly achieved.

## **RECOMMENDATIONS**

Based on the findings of this study, it was recommended that proprietors of technical colleges should make funds available for procurement and maintenance of workshop facilities for an effective training programme; Technical college managers should ensure that competent teachers preferably those with industrial experience are recruited so that minor maintenance issues it affects workshop facilities are handled by them; Technical college managers should ensure that technical teachers are adequately trained whenever new facilities are procured so that they can able to handle their maintenance needs.

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