



Development of Objectives, Instructional Materials and Methods for Capacity Building Module in Teaching Maintenance of Milling Machine in Mechanical Engineering Craft Practice in Technical Colleges in Delta State

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Abstract

The study developed objectives instructional materials and methods for teaching maintenance of milling machines in mechanical engineering craft practice in technical colleges in Delta State. The study employed research and development (R&D) design. A questionnaire titled 'Module for Teaching Maintenance of Milling Machine in Mechanical Engineering Craft Practice' (MTMMMMECP) was used as instrument for data collection. The targeted populations for the study were 70 subjects (26 technical teachers and 44 workshop instructors) in technical colleges in Delta State. The study adopted census method in the sample and sampling technique as the entire population of technical teachers and workshop instructions were studied. The instrument for data collection was subjected to face and content validity by three experts. To ensure the reliability of the instrument, the Cronbach Alpha (α) reliability coefficient method was used to establish the reliability coefficient value of the items at 0.87 with the use of SPSS. Mean and standard deviation were used to answer research questions, whereas, standard deviation was used to determine the homogeneity of the respondents while t-test was used to analyzed the null hypotheses at 0.05 level of significance. The finding from the study indicated that technical teachers and workshop instructors agreed that the items of the objectives are appropriate to be included in developed module and likewise other such as: the instructional materials with their items which are very appropriate and should be included in the developed module for the maintenance of milling machine in mechanical engineering craft practice in Technical Colleges in Delta State. Based on the findings, it was recommended among others that the developed module should be included in the technical college curriculum so that the students, technical teachers and workshops instructors will become knowledgeable and conversant in matters concerning maintenance of milling machine and other machine tools in mechanical engineering craft practice department in technical colleges.

Keywords: Development of Objectives, Instructional Materials, Methods, Capacity, Building Module, Teaching, Maintenance, Milling Machine, Mechanical Engineering, Craft Practice, Technical Colleges, Delta State.

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INTRODUCTION

Capacity building involves improving individuals' abilities to produce, perform, or develop skills and competencies, enhancing their effectiveness, efficiency, sustainability, and problem-solving capabilities. Heslop (2010) defined capacity building as strengthening the capacities of systems and stakeholders, including individuals, communities, civil societies, governments, and private sectors, to achieve results. This concept encompasses human, scientific, technological, organizational, institutional, and resource capabilities. A key objective of capacity building is to enhance the ability to evaluate and address critical questions related to policy choices and implementation methods, based on an understanding of environmental potentials and limits, and the needs perceived by the people (Potter & Brough, 2019).

Technical colleges are vital in providing post-primary education aimed at producing craftsmen, master craftsmen, and low-level manpower. Atsumbe et al. (2012) described technical colleges as institutions where students acquire relevant knowledge and skills in various occupations for real-world employment. The Federal Republic of Nigeria (FRN, 2014) emphasized that technical colleges are part of technical and vocational education, designed to produce craftsmen at the secondary school level and master craftsmen at the advanced craft level. Technical colleges offer a full vocational course for three years to junior secondary school leavers and six years for students with the First School Leaving Certificate, culminating in examinations like the National Technical Certificate Examination (NTCE) and the Senior School Certificate Examination (SSCE) (Okoro in Osuyi et al., 2021).

Mechanical engineering craft practice is a trade offered in technical colleges, focusing on imparting skills necessary for self-reliance and entrepreneurship in fields such as metal fitting, machining, welding, and fabrication (Adamu, 2015). Students are examined by the National Business and Technical Examination Board (NABTEB) for the National Technical Certificate (NTC) and the Advanced National Technical Certificate (ANTC) (Ombugus, 2013). The goal is to produce skillful individuals proficient in producing goods and services relevant to society (Atsumbe et al., 2012).

A milling machine is crucial in mechanical engineering craft practice. According to Kalpakjian and Schmid (2018), a machine uses mechanical power with several parts to perform specific tasks. Milling involves using a machine where cutters rotate to remove material from a work piece at an angle (Groover, 2017). Milling machines remove material from work pieces by feeding them past a rotating multipoint cutter, with high metal removal rates due to the cutter's speed and multiple cutting edges (Dhruvkumar & Chauhan, 2020). They are essential for machining flat surfaces, slotting, contoured surfaces, complex areas, gear cutting, and thread machining (Yudiono et al., 2019).

Maintenance is vital to ensure the efficient operation and longevity of milling machines. It includes preventive, corrective, predictive, and proactive maintenance (Cabral, 2016). Preventive maintenance involves regular, scheduled checks to prevent unplanned downtime (Bayle, 2017). Corrective maintenance focuses on repairing or replacing failed equipment components (Wang et al., 2013). Predictive maintenance uses historical data to predict and prevent equipment failures (Khatete, 2018). Proactive maintenance aims to address the root causes of failures before they escalate (Trojan & Marcal, 2017). Effective maintenance ensures machinery remains in good working condition, enhancing safety and efficiency (Egle, 2019). Safety measures are essential to protect individuals and equipment. They involve activities and precautions to improve safety and reduce risks of injury or damage (Ridley & Channing, 2003).

Safety measures ensure that maintenance activities are performed without compromising the health and well-being of operators and the integrity of machines (Igweabara, 2019).

An instructional module is a unit within a course, organized by topic, theme, or chronology, and includes a combination of pages, discussions, assignments, quizzes, and links to resources (Abdelmohsen, 2020). Modules help structure course content and create a linear flow of learning activities (Benito et al., 2022). In the context of this study, the module includes objectives, content, instructional materials, methodologies, teachers' and students' activities, evaluation techniques, and safety measures. Effective modules promote content mastery, critical thinking, and core learning skills (Vinokurova et al., 2016; Khoza, 2016).

Instructional materials, both visual and audio-visual are crucial for enhancing learning (Alciso et al., 2023), they stimulate student engagement and facilitates understanding. Methodologies including teacher-centered and student-centered approaches, determine the effectiveness of instruction (Maksum & Purwanto, 2022). Teacher-centered methods involve direct instruction, while student-centered methods encourage active learning and critical thinking (Green & Harrington, 2020).

Teachers' activities include lesson planning, classroom management, and assessment (Daryono & Rochmadi, 2020). Teachers must work in synergy with workshop instructors to enhance practical learning (Kowitlawakul et al., 2017). Students' activities should be designed to engage them in the learning process, promoting participation, cognitive and emotional engagement, and academic achievement (Homillano, 2023).

Evaluation is essential to assess the effectiveness of teaching and learning (Hamid et al., 2017). It includes various techniques such as tests, quizzes, projects, and observations to provide feedback and inform instructional adjustments (Putra et al., 2018). Alciso et al. (2023) carried out a study on development of outcomes-based instructional materials in professional teacher education courses for a flexible set-up. A descriptive research design was used to collect data while a developmental research design was applied for the development of outcomes-based instructional materials. The researchers constructed a questionnaire using a 4-point Likert scale. The online questionnaire was completed by 38 faculty members and 655 pre-service teachers from Batangas State University, Philippines. The data collected were analyzed using descriptive statistics and the Mann-Whitney U Test. The results showed that there are various instructional materials used in the three professional courses and they are used based on appropriateness and suitability.

Ordu (2020) carried out a study which focused on the development of a module for teaching maintenance of Lathe in mechanical engineering craft practice in technical colleges in Rivers State. The study employed research and development (R&D) design. The activities involved in Research and Development in the study were articulated into five major phases. Arithmetic Mean was used to answer research questions whereas, standard deviation was used to determine the homogeneity of the respondents while t-test was used to analysis the null hypotheses at .05 level of significance. The finding in research showed that the items of the objectives are appropriate to be included in developed module and likewise other the contents, teachers' activities, students' activities etc. with their items are very appropriate and should be included in the developed module for the maintenance of lathe in mechanical engineering craft practice in Technical Colleges in Delta State.

The development of a capacity-building module for teaching maintenance of milling machines in mechanical engineering craft practice in Delta State technical colleges aims to enhance the skills and competencies of students, ensuring they are well-prepared for employment

and societal contributions. The module incorporates comprehensive content, instructional materials, methodologies, safety measures, and evaluation techniques to provide a structured and effective learning experience.

Statement of the Problem

There is a general concern over the low performance of technical college graduates, most especially those of mechanical craft practice who cannot cope with the world of work. The goal of mechanical craft engineering practice in technical colleges in Nigeria according to National Board for Technical Education cited in Amadi and Obed (2018) is to produce skilled craftsmen with good knowledge of the working principles of machines and the techniques and safety practices involved in its maintenance. Technical college graduates have prospects of either being employed in the industries or set-up their own mechanical workshop and become self-employed. Better still, technical college graduates should have the opportunity of furthering their education in higher institutions.

Contrary to achieving the above goal, majority of students have been completing the programme with very poor academic performance and inadequate skills which is not capable of earning them a living. This decline in students' performance has been associated to a number of factors, among which are no equipment and machines including milling machine in technical colleges and even they are available, they lack maintenance. According to Osuyi et al. (2021), the deteriorable state of equipment, tools, and machines in laboratories and workshops are unfortunate and regrettable because of inability of the users to apply preventive and total maintenance culture as at when due. It is against this backdrop that the study looked into the development of capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.

Aim and Objectives of the Study

The main aim of the study was to develop a module for teaching maintenance of milling machine in mechanical engineering craft practice department in Technical Colleges in Delta State. Specifically, the objectives of the study determined the:

- Objectives to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.
- Instructional Materials to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.
- Methodology to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.

Research Questions

The following research questions were posed to guide the study:

- What are the objectives to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State?
- What are the instructional materials to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State?
- What is the methodology to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State?

Hypotheses

The following null hypotheses have been formulated to guide the study and were tested at the .05 level of significance:

- **H₀1:** There is no significant difference between the mean responses of technical teachers and workshop instructors on the objectives to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.
- **H₀2:** There is no significant difference between the mean responses of technical teachers and workshop instructors on the instructional materials to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.
- **H₀3:** There is no significant difference between the mean responses of technical teachers and workshop instructors on the methodologies to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.

Significance of the Study

This study will be of great benefit to mechanical engineering craft practice students, technical teachers and workshop instructors, National Board of Technical Education (NBTE) and Curriculum planners; school administrators and government.

The findings of this study will be of immense benefit to students in mechanical engineering craft practice department in technical college. The finding will enable the technical teachers and workshop instructors to be conversant with all round teaching of milling, its maintenance in mechanical engineering craft practice and safety measures since the developed module covered objectives, contents, teachers' activities, students' activities, instructional materials, methodologies, evaluation techniques and safety measures it becomes very easy for the technical teachers and the workshop instructors to perfect teaching in this area and optimize the use of milling machine

Scope of the Study

The scope of the study was delineated to development of capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in

Delta State. Specifically, the following variables formed the gratified areas of the study: objectives, instructional materials, and methodologies.

METHODOLOGY

The study adopted Research and Development (R & D). The study adopted this design since it sought the opinions of experts on module for teaching milling machine maintenance based on objectives, instructional materials, and methodologies for integration into Mechanical Engineering Craft Practice Trade in technical colleges.

Population for the Study

The targeted population for the study was 70 staff which comprised of 26 Technical Teachers and 44 Workshop Instructors in six technical colleges in Delta State.

Sample and Sampling Technique

The sample of the study was 70 staff of the four technical colleges in Delta State which comprised of 26 Technical Teachers and 44 Workshop Instructors. This implies that the study was a census as the entire population was studied; hence, no sampling technique was used.

Validity of the Instrument

The validity of the instrument for data collection was determined by subjecting it to face and content validation by three experts; two from the Department of Technical Education of Ignatius Ajuru University of Education Port Harcourt and one from Government Technical College, Agbor.

Reliability of the Instrument

To ensure the reliability of the instrument, the questionnaire was subjected to a face and content reliability on twenty (20) teachers and ten (10) instructors of Government Technical College, Ahoada, Rivers State. On return of the instrument, the Cronbach Alpha (α) reliability coefficient method was used to establish the reliability coefficient values at .87.

Instrument for Data Collection

The instrument used for data collection for the study was a structured questionnaire developed by the researcher titled 'Module for Teaching Maintenance of Milling Machine in Mechanical Engineering Craft Practice' (MTMMMMMECP) after the review of related literature.

The structured questionnaire comprises four sections ("A", "B", "C", and "D") based on the four objectives of the study. The questionnaire items were formulated based on 5-point likert scale. Items for all the Sections contained five response categories each. The response categories are Highly Appropriate (HA) = 5, Appropriate (A) = 4, Moderately Appropriate (MA) = 3, Inappropriate (IA) = 2 and Highly Inappropriate (HI) = 1 respectively. The respondents are required to tick (\surd) against the response category that best satisfied their opinion.

Method of Data Analysis

The data generated for the study from the use of structured questionnaire was analyzed using mean and standard deviation statistical tools to answer the research questions on a 5-point likert scale. However, the cut off mean for the Likert scale is 3.50 with an interval of .05 from the mean. Therefore, any item with mean less than 3.50 was regarded as ‘inappropriate’ whereas any item with mean equal or greater than 3.50 was regarded as ‘appropriate’. On the other hand, t-test statistical tool was used to test the hypotheses at probability value of .05. All statistical analysis was accomplished with the use of Statistical Package for Social Sciences (SPSS) version 23.

Data Presentation/Analysis

Research Question One: What are the objectives to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State?

Table 1: Mean and standard deviation of objectives to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State

S/N	Objectives	Technical Teachers N =26			Workshop Instructors N = 44		
		\bar{X}	SD	Remark	\bar{X}	SD	Remark
1	Preventive Maintenance	4.66	.61	Appropriate	4.60	.87	Appropriate
2	Corrective Maintenance	3.96	.93	Appropriate	4.04	.94	Appropriate
3	Predictive Maintenance	4.04	.89	Appropriate	4.12	.95	Appropriate
4	Proactive Maintenance	3.88	.72	Appropriate	4.65	.86	Appropriate
5	Safety Measures	4.55	.55	Appropriate	4.32	.81	Appropriate
Grand Mean		4.14	.72	Appropriate	4.33	.88	Appropriate

Data in Table 1 revealed that technical teachers had a mean range of 3.88-4.66 and standard deviation range of .55-.93 with the grand mean and standard deviation as 4.22 and .74 respectively. The workshop instructors had a mean range of 4.04-4.65 and standard deviation range of .81-.95 with the grand mean and standard deviation as 4.35 and .89 respectively. This indicate that the respondents agreed that items of the objectives are appropriate to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State. The closeness of the standard deviation shows the homogeneity of the respondents.

Research Question Two: What are the instructional materials to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State?

Table 2: Mean and standard deviation on instructional materials to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State

S/N	Instructional Materials	Technical Teachers N =26			Workshop Instructors N = 44		
		\bar{X}	SD	Remark	\bar{X}	SD	Remark
6	Installed Milling machine	4.02	1.15	Appropriate	3.92	1.00	Appropriate
7	Common hand tools like spanners, ally keys, etc.	4.07	1.08	Appropriate	4.24	.93	Appropriate
8	Detectors/sensor monitoring	4.20	.98	Appropriate	4.24	.88	Appropriate
9	Damaged V-belts	4.09	.71	Appropriate	4.12	.83	Appropriate
10	Poster/charts	4.07	.97	Appropriate	3.80	.96	Appropriate
11	Coverall of moderate sizes	4.16	1.14	Appropriate	3.92	1.04	Appropriate
12	Goggles, Gloves, hard shoes Fire extinguisher	4.14	.98	Appropriate	4.32	.69	Appropriate
13	milling machines spare-parts	3.98	.93	Appropriate	4.00	.96	Appropriate
14	All kinds lubricants	4.14	.93	Appropriate	3.72	.98	Appropriate
Grand Mean/SD		4.09	.99	Appropriate	4.03	.92	Appropriate

Data in Table 2 revealed that the technical teachers had a mean range of 3.98-4.20 and that of standard deviation was .71-1.15 with the grand mean and standard deviation as 4.09 and .99 respectively. The workshop instructors had a mean range of 3.72-4.32 and that of standard deviation was .69-1.04 with the grand mean and standard deviation as 4.03 and .92 respectively. This indicate that the respondents agreed that instructional materials are appropriate to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State. The closeness of the standard deviation shows the homogeneity of the respondents.

Research Question Three: What is the methodology to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State?

Table 3: Mean and standard deviation on methodologies to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State

S/N	Teaching Methods	Technical Teachers N =26			Workshop Instructors N = 44		
		\bar{X}	SD	Remark	\bar{X}	SD	Remark
15	Activity method	3.91	1.18	Appropriate	4.04	1.02	Appropriate
16	Discussion method	4.14	.96	Appropriate	4.00	.91	Appropriate
17	Question-and-answer method	3.98	.762	Appropriate	3.96	1.2	Appropriate
18	Demonstration method	3.86	.93	Appropriate	4.16	.99	Appropriate
19	Interactive method	4.45	.79	Appropriate	4.24	1.01	Appropriate
20	Project method	4.43	.76	Appropriate	4.00	.91	Appropriate
Grand Mean/SD		4.13	.90	Appropriate	4.07	1.01	Appropriate

Data in Table 3 revealed that the technical teachers had a mean range of 3.86-4.45 and that of standard deviation was .76-1.18 with the grand mean and standard deviation as 4.13 and .90 respectively. The workshop instructors had a mean range of 3.96-4.24 and that of standard deviation was .90-1.20 with the grand mean and standard deviation as 4.07 and .1.01 respectively. This indicate that the respondents agreed that the methodologies to be adopted are appropriate to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State. The closeness of the standard deviation shows the homogeneity of the respondents.

Test of the Postulated Hypotheses

The three (3) hypotheses postulated for the study were tested in this section using t-test statistical tool at the .05 level of significance:

H₀1: There is no significant difference between the mean responses of technical teachers and workshop instructors on the objectives to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.

Table 4: T-test analysis of objectives to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State

Respondents	N	Mean	SD	df	p-value	t-cal.	t-crit.	Remark
Technical Teachers	26	4.14	.72	69	.05	.13	1.67	Accepted
Workshop Instructors	44	4.33	.88					

Table 4 showed that t-cal. at .13 is less than t-crit. at 1.67 which indicated that the stated null hypothesis was accepted. Thus, there is no significant difference between the mean responses of technical teachers and workshop instructors on the objectives to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.

H₀2: There is no significant difference between the mean responses of technical teachers and workshop instructors on the instructional materials to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.

Table 5: T-test analysis on instructional materials to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State

Respondents	N	Mean	SD	df	p-value	t-cal	t-crit	Remark
Technical Teachers	26	4.09	.99	69	.05	.27	1.67	Accepted
Workshop Instructors	44	4.03	.92					

Table 5 showed that t-cal. at .27 is less than t-crit. at 1.67, which indicated that the stated null hypothesis was accepted. Thus, there is no significant difference between the mean responses of technical teachers and workshop instructors on instructional materials to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.

H₀₃: There is no significant difference between the mean responses of technical teachers and workshop instructors on the methodologies to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.

Table 6: T-test analysis on methodologies to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State

Respondents	N	Mean	SD	df	p-value	t-cal.	t-crit.	Remark
Technical Teachers	26	4.13	.90	69	.05	.39	1.67	Accepted
Workshop Instructors	44	4.07	1.01					

Table 6 showed that t-cal. at .39 is less than t-crit. at 1.67, which indicated that the stated null hypothesis was accepted. Thus there is no significant difference between the mean responses of technical teachers and workshop instructors on the methodologies to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State.

DISCUSSION OF FINDINGS

The finding of the study indicate that the objectived are appropriate to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State. The closeness of the standard deviation .55-.93 shows the homogeneity of the respondents. At the same time, t-cal. at .13 which is less than t-crit. at 1.67 indicated that the stated null hypothesis was accepted. Thus, there is no significant difference between the mean responses of technical teachers and workshop instructors on the objectives to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State. The findings of the study is in line with Okwelle (2011) who asserted that the quality of learning outcome demonstrated by students of a training programme will determine the extent to which instructional objectives have been achieved.

Findings from the study revealed that instructional materials is essential to develop capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State. The finding is in coherence with the study of Amosa (2015) and Ornsteinet et al. (2020) who declared that the effectiveness of instructional materials and strategies depends upon the manner and degree to which they meet the needs of the teacher and students. The finding also agreed with the study of Alciso et al. (2023) who avowed that instructional materials are selected based on the principles of provision

of accurate materials that will enrich and support the curriculum, taking into consideration the interest, abilities and maturity levels of the students.

Findings of the study also revealed that methodologies are appropriate to be included in the developed capacity building module for teaching maintenance of milling machine in mechanical engineering craft practice in technical colleges in Delta State. The finding is in consistency with the study of Al-Rawi (2013) who averred that choosing the appropriate teaching method brings instruction to life while encouraging students to actively engage with content and develop their knowledge and skills.

CONCLUSION

The search for trends and predictors yielded few conclusions that were quantitatively significant. It is very pertinent to bring to fore that observations, instructional materials and methodologies were the key objective of the study. By introducing this developed module it will help to resolve these acute lapses and the ugly trends existing in Technical Colleges in Delta State and Nigeria at large.

Conclusively, all the items in objectives such as; predictive maintenance, preventive maintenance, corrective maintenance, and safety measures were resolved to be included in developed module by the opinions of technical teachers and workshop instructors (respondents).

There are no significant differences between means responses of technical teachers and workshop instructors on the objectives, instructional materials and methodologies to be included in the developed module for the maintenance of milling machine in Mechanical Engineering Craft Practice Department in Technical Colleges in Delta State

Recommendations

The following recommendations are based upon the results of this research:

- The objectives captured preventive maintenance, corrective maintenance, predictive maintenance, proactive maintenance and safety measures were seemed to be appropriate therefore should be included in the developed module for teaching maintenance of milling machine in Mechanical Engineering Craft Practice.
- The teaching and learning materials items are important and appropriate therefore should be included in the developed module for teaching maintenance of milling machine in Mechanical Engineering Craft Practice.
- The methodologies adopted where seen most appropriate and should be included in the developed module for teaching maintenance of milling machine Mechanical Engineering Craft Practice.

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