

TECHNOLOGY TEACHERS' PRACTICE SKILLS AND STUDENTS' ACHIEVEMENT IN MECHANICAL ENGINEERING CRAFT PRACTICE IN SCIENCE AND TECHNICAL COLLEGES IN BENUE STATE, NIGERIA

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Abstract

The main purpose of the study is to find out the relationship between technology teachers' practice skills and student achievement in mechanical engineering craft practice (MECP) in science and technical colleges in Benue State, Nigeria. The aim is to find out whether technology teachers' qualification, use of hand tools and machine operational skills affect student performance in MECP. Three research questions and two hypotheses guide the study. The data are collected using a self-prepared performance check list from a sample of 50 respondents comprising of 15 technology teachers and 35 MECP students in Benue State. Data collected are analysed using Frequency, Mean, Standard deviation as well as Pearson Product Moment Correlation to answer the research questions. Pearson product moment correlation is used to test the hypothesis at 0.05 significant level. Using the correlational statistics, it is found that the significant difference that exist between technology teachers and MECP students are positive. It means that students' achievement in MECP is dependent on how correctly the technology teachers use hand tools and how they possess machine operational skills. The study recommends that technology teachers should make deliberate effort to improve in the correct use of hand tools in teaching MECP and also on machine operational skills through retraining programmes. The government should also provide the needed training equipment so that the technology teachers with the skills can utilise the knowledge they have to make positive impact on the MECP students.

Keywords

MECP Students- Mechanical Engineering Craft Practice students used as one of the respondents in this study.

Practice skills- Specific skills required by Technology teachers to effectively carry out activity in Mechanical Engineering Craft Practice Trade in science and technical colleges in Nigeria.

Introduction

For Nigeria to actualise her dream to provide trained manpower in applied sciences, technology, agriculture and business, particularly in science and technical colleges, students must exhibit optimum performance in mechanical engineering craft practice trade. Mechanical engineering craft practice (MECP) is a trade offered by science and technical colleges and other related technology training institutions. According to the National Business and Technical Examination Board (NABTEB, 2015), the aims and objectives of the trade is to train technicians to acquire productive skills in general metal work, lathe turning, milling, shaping, heat treatment, drilling, cutting, drafting, forging and fitting for the improvement of science and technology. It is based on this fact that The Federal Government of Nigeria, states, and private organisations have established science and technical colleges to train people in this trade. The technicians after graduation are expected to be engineering craft machinists whose duties are to create precision engineered parts and components, using machine tools to shape blank metal or plastic sections. The MECP students will hardly achieve these aforementioned skills if the technology teachers themselves do not possess the skills. The MECP students are likely to work on machine tools including among others grinding, milling, cutting machines, lathes, drills and presses. According to Science Engineering and Manufacturing Technologies Alliance (SEMTA, 2015), the Craft Machinists make small quantities of parts for various uses, for example, components of machines used in production companies such as Nigerian Breweries, Dangote Cement, Miva Rice, Power Station, turbines or aero-engines to mention but a few of these companies. The craft machinist also make parts of equipment such as tractors, combine harvesters and other post-harvest machines in the area of agriculture. Dike (2010) in Nevkar and Ukuma (2011) maintained that Mechanical Engineering Craft Practice (MECP) has been an integral part of national development in many societies due to its impact on productivity and economic development.

Despite the important role of the craft machinist in the socio-economic development of Nigeria, the Mechanical Engineering Craft Practice (MECP) as a trade subject seems not to receive proper attention following the poor performance of students when assigned duties in their area of work. Barky (2005), Audu (2013) averred that technical schools are not producing technicians, craftsmen, technologist with the desired skill and knowledge that will enable them to be employed, self-employed and to employ others. According to the National Business and Technical Examination Board (NABTEB, Chief examiners report of 2012, 2013 2014 2015), students performed poorly in

mechanical engineering craft practice in Benue State. The poor performance of technical students in mechanical engineering craft practice has become a worrisome situation to both parents and teachers. On personal observation, parents on several occasions in the parents' teachers association (PTA) complain to the BSU Science and Technical college authority about the poor performance of students in Mechanical Engineering Craft Practice. Since technology plays a major role in any country's development, failure in MECP will heavily affect the economy of Nigeria negatively.

Generally, poor performance of students in any area of study has been the concern of the general public. In order to ensure that the academic performances of students improve positively, several researches have been conducted to investigate the root causes leading to poor performance of students. According to Ekwueme (2010), the major setback in effective students' academic performance is the problem of unqualified teachers, especially specialist teachers in areas like vocational and technical subjects. Otubanjo (2005), Habibu (2007), Ede, Miller and Bakare (2012), Nwokolo (2012) and Lawal (2013) identified poor performance of students in trade related subject in the recent times due to lack of workshop skills, tools and equipment. Anyaburu (2014) noted that what is described as workshop in most technical trade areas to be a classroom with few tools and equipment and this has been attributed as being one of the major causes of students' failure in trade related subject. Owoeye and Olatunde (2011) in Eniekenem, Onuotu and Ofnmbuk (2016) state that most technical and vocational colleges in Nigeria have under-equipped workshops and laboratory facilities. The researchers further conclude that this inadequacy in the number of workshops and laboratories with adequate facilities has been responsible for insufficient acquisition of skills for candidates to scale through in NABTEB certificate examinations and to become certified craftsmen. Similarly, Eniekenem, Onuotu and Ofnmbuk (2016) aver that aside the non-availability of insufficient equipment in the schools, the teaching method employed in teaching also influences students' academic achievement in trade related subjects. Raymond and Hassan (2016) state that the declining performance of students in technical subjects may be attributed to the abstract nature of teaching methods adopted by some teachers in teaching subject such as mechanical engineering craft practice. These assertions might be true because the academic success of every school child is depended on how well the teacher is skilled.

The present performance of technical students in mechanical engineering craft practice in science and technical colleges in Nigeria has called for serious attention especially at this point where Nigeria is in search for possible ways to diversify the economy of the nation through agriculture. The agricultural project that has to do with mechanised farming needs the services of engineering craftsmen who will not only maintain the equipment used on the farm but also manufacture some parts and components that will be used on the machines in order to keep them in a workable and efficient condition. It will not be of interest if people are hired from other countries that fully embrace

technology to train Nigerians to be highly skilled in carrying out such services. It is time the researchers in this country strive to double their efforts by ensuring that adequate development of manpower in mechanical engineering craft practice is achieved. It is through the investment in skilled craft mechanical technicians that the billions invested in agriculture will yield a positive result.

Purpose of the study

The main purpose of the study is to find out the relationship between technology teachers' practice skills and student achievement in mechanical engineering craft practice (MECP) in science and technical colleges in Benue State, Nigeria. Specifically the study seeks to find out whether;

1. educational qualification of technology teachers affects students' performance in MECP;
2. there is a relationship between use of tools and students' performance in MECP;
3. there is a relationship between machine operational skills and students' performance in MECP.

Research questions

1. What is the relationship between educational qualification of technology teachers and students performance in MECP?
2. What is the relationship between use of tools and students' performance in MECP?
4. What is the relationship between machine operational skills and students' performance in MECP?

Research Method

Correlational survey research design is used for the study. The study population comprises all the technology teachers teaching mechanical engineering craft practice and all the mechanical engineering craft practice students in Benue State Science and Technical Colleges. A total of 15 teachers and 35 students formed the sample. A performance checklist (PC) is developed to obtain data for the study. The PC is validated by three experts, one expert in measurement and evaluation in the department of curriculum and teaching and the other two experts in mechanical technology in the department of vocational and technical education in Benue State University Makurdi. The PC instrument is subjected to reliability analysis using Cronbach's coefficient alpha, which is suitable for the instrument composed of items of attitude scales that provide responses on a continuum, (Nworgu, 2006; Pallant, 2007). This yields a reliability index of 0.70 on a scale of 0.50. Both descriptive and inferential statistics are

used to analyse the data. Specifically, frequency distribution is used to answer research question one. While mean and standard deviations as well as Pearson Product Moment Correlation are used to answer research question two and three. Pearson product moment correlation is used to test the hypotheses at 0.05 significant level.

Results of Data Analysis and Interpretation

Data obtained are used for answering the research questions.

Research question one

1. What is the educational qualification of the technology teachers teaching MECP?

Data for answering research question one is presented in Table 1.

Table 1. Frequency count of educational qualification of technology teachers

| | Frequency | Percent | Valid Percent | Cumulative Percent |
|---|-----------|---------|---------------|--------------------|
| National Diploma | 3 | 20.0 | 20.0 | 20.0 |
| National Certificate in Education (Technical) | 3 | 20.0 | 20.0 | 40.0 |
| Higher National Diploma | 2 | 13.3 | 13.3 | 53.3 |
| Bachelor of Science. (Education Technology) | 4 | 26.7 | 26.7 | 80.0 |
| Bachelor in Education Technology | 1 | 6.7 | 6.7 | 86.7 |
| Master's Degree in Science Technology Education | 2 | 13.3 | 13.3 | 100.0 |
| Total | 15 | 100.0 | 100.0 | |

Data presented in Table 1, reveals that two (2) representing 4.0% of the respondents had ND, one (1) representing 2 % had NCE, three (3) representing 6.0 % had HND, five (5) representing 10 % had B.Sc. (Ed) Technology, three (3) representing 6.0 % had B.Ed. Technology, one (1) representing 2.0 % had M.Sc. Technology while thirty five (35) representing 70.0 % of the respondents are students.

Research Question Two

1. What relationship is there between correct use of tools and students' achievement in MECP?

Data for answering research question two is presented in Table 2.

Table 2: Pearson Moment correlation for use of tools and students' achievement in MECP

| | Std. | N | R |
|-------------------------------|------|----|-------|
| Teachers' correct use of tool | 2.73 | 15 | .53** |
| Student class achievement | 2.17 | 15 | |

Table 2, shows that the teachers' use of tools mean is 2.73 and standard deviation is .69 while that of their class achievement mean is 2.17 and standard deviation is .52. The relationship between use of tools by teachers and students' achievement in MECP is $r = .53$. This shows that the relationship is positive and is moderate.

Research Question Three

Data for answering research question three is presented in Table 3.

1. What is the relationship between teachers' machine operational skills and students' achievement in MECP?

Table 3: Pearson Moment correlation for teachers' machine operational skills and students' achievement in MECP

| Variable | \bar{X} | Std. | N | R |
|--------------------------------------|-----------|------|----|-------|
| Teachers' machine operational skills | 3.13 | 1.82 | 15 | .63** |
| Student class achievement | 2.22 | .51 | 15 | |

Table 3, shows that the teachers' machine operational skill mean is 3.13 and standard deviation is 1.82 while that of their class achievement mean is 2.22 and standard deviation is .51. The relationship between machine operational skills of teachers and students' achievement in MECP is $r = .63$. This shows that the relationship is positive and moderate.

Discussion

Findings with respect to research question one Table 1, reveals that the technology teachers teaching MECP have the required educational qualifications for teaching the trade. The result with respect to research question two on Tables 2 and 4 reveals that the relationship between use of tools and students' achievement in MECP is positive and moderate. The implication here is that students' achievement in MECP is dependent on how correctly the technology teachers use hand tools in teaching them. The assertion is in agreement with Otubanso (2005), Habibu (2007), Ede, Miller and Bakare (2012), Nwokolo (2012) and Lawal (2013) who identified poor performance of students in trade related subject in recent times is due to lack of workshop skills, tools and equipment. The finding is also in consonance with Raymond and Hassan (2016) who stated that the declining performance of students in technical subjects may be attributed to the abstract nature of teaching methods adopted by some teachers in teaching subject such as mechanical engineering craft practice. The result with respect to research question three on Tables 3 shows that the relationship between machine operational skills of teachers and students' achievement in MECP is positive and moderate. This

implies that students' performance will improve only when the technology teachers have the necessary skills to operate and construct engineering components on the machines as a guide to the students. It is by doing so that it will enable the students to develop the skills that will help them do well in their NABTEB examinations and subsequently possess employment skills that perhaps qualify them to operate on their own on assigned duties. This assertion further confirms the result of Fajonyomi (2011) who discovered that the performance of any student in trade related subject depend on how well the teacher is competent in the subject matter.

Conclusion

The researchers have observed that there is a positive relationship between technology teachers and technical students on academic performance in Mechanical Engineering Craft Practice in Benue State. This is because the more technology teachers possess the skills in the correct use of hand tools for practical teaching, the more the students' performance in MECP improve. It has also confirmed that most technology teachers lack machine operational skill to teach the students the right skills on the machines. Even those that have the skills cannot display them due to lack of functional machines in the workshop. The implication is that the poor performance of students in MECP is as a result of inability of the technology teachers to teach the right skills on how to use tools correctly and also how to operate machines to construct certain components.

Recommendations

The study recommends that technology teachers should make deliberate effort to improve in the correct use of hand tools in teaching MECP and also on machine operational skills through retraining programmes including workshop and seminar. The government should also provide the needed training equipment so that the technology teachers with the skills can utilise the knowledge they have in order to have positive impact on the MECP students' achievement.

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