

Perceived Factors Affecting Practical Skill Acquisition amongst Mechanical Technology Education Undergraduates in Tertiary Institutions in Rivers State

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Abstract

The study focused on the perceived factors affecting practical skill acquisition amongst mechanical technology education undergraduates in tertiary institutions in Rivers State. It investigated available facilities for the implementation of practical skills lessons, factors affecting the effective delivery of mechanical technology education skills and practical lessons and strategies for improving the delivery of mechanical technology education skills practical lessons in tertiary institutions in Rivers State. Three research questions and hypotheses were answered and tested at a 0.05 level of significance. A descriptive survey design guided the study. The population of the study comprised 41 mechanical technology education lecturers and 47 years three mechanical technology education students in three tertiary institutions in Rivers State. The population was manageable; therefore, the entire population were sampled. A self-made survey questionnaire served as the instrument for the study. The instrument was validated by two experts. Reliability of the instrument was established using Cronbach Alpha reliability coefficient which yielded a coefficient of 74. Mean and Standard Deviation were used to answer the research questions while z-test statistical tool was used to test the hypotheses. The study found, among others that machine tools, oxy-acetylene, welding machines, drilling machines, etc. are some of the available facilities for the delivery of practical skill lessons, more so that some of the factors affecting practical skill delivery include, lack of practical materials, lack of practical skills of lecturers, brain drain, unstable electricity, finally, it find out that the strategies for improving practical skills delivery include, on the job training lecturers on machine operation, training them on hands-on experience. It was recommended among others that the Nigerian and Rivers State governments should ensure that practical materials are always available, and lecturers are given steady on-the-job training for the effective skill delivery of lecturers to undergraduates in mechanical technology education in tertiary institutions in Rivers State.

Keywords: Perceived Factors, Practical Skill, Mechanical Technology Education, Undergraduates.

Introduction

Investing in education and skills for men and women to help economies to achieve dynamic growth with quality jobs is a pressing priority throughout the nation. The development of adequate skills and competencies is an important characteristic of technical education programmes which mechanical technology education is part and parcel of in any level of the Nigerian education system. In support of this, one of the National Educational Objectives stated that the acquisition of appropriate skills, abilities, and competencies, both mental and physical, are important for all Nigerians to live and contribute to the development of their society (FRN in Udo, 2015). One of the key elements of mechanical technology education as viewed by many and the government in the past years, is its orientation towards the world of work with the curriculum emphasizing the acquisition of employable skills. Okorie and Ezeji in Udo (2015) state that the acquisition of the requisite skills is a means of increasing the productive power of nations. Consequently, they added that the Nigerian society should recognize the fact that every citizen should be equipped to contribute effectively to the welfare of the country. The acquisition of such practical skills is important because when efficient and skilful hands are employed in any field of human endeavor, high productivity is usually achieved.

Skill acquisition is knowledge and training in the area of using intellectual thinking and skillful manipulation of instruments and equipment to produce functional designs and products, and such training acquired by skilled workers is a job that cannot be performed by anybody, (Dashen in Bulus, 2015). In line with this (Ubong and Oguzor in Kumazhege and Egunsola, 2014) opine that practical skill acquisition is best defined by the learner as the process of obtaining knowledge of technical and practical nature from an individual, group, or institution that can impart such knowledge.

Mechanical technology education is an education for practical skills. It is any form of training which the expected end is to produce skilled personnel for employment, being self-reliant, and contribute meaningfully to national development. Mechanical technology education is that segment of technical education which leads to the acquisition of practical skills in motor vehicle, mechanic, machining, scaffolding, pipe fitting, welding, fabrication, foundry, forging, operation of equipment, appliances and other industrial machines

During undergraduate years, students of mechanical technology education must acquire a vast number of practical skills that will prepare them for the job market or for further studies. The required skills must not only be related to the topic being studied but must also be skills that are readily transferable across a range of contexts and that can be easily adapted to changing job or study demands. The achievement of higher order cognitive skills such as conceptual, analytical, communication, production, machine operation, welding, fabrication, material selection, inventory taking, forging, auto-body repair, auto-serving, vulcanization, battery repair, problem solving skills etc. (Okwelle, Beako, and Ajie, 2017), represents key aspects of the quality of learning and teaching outcomes in mechanical technology education. Therefore, this must be a relevant aspect to be considered during

undergraduate studies in this field. The development of relevant skills is also a major instrument for better working conditions.

On completion of the course or training, it is expected that students will obtain work in industries or establish business on their own, as the National Policy on Education sets the objective for graduates of technical education institutions which mechanical technology education is part and parcel of, to be "immediately employable". However, since the inception of the policy, some major constraints to its effective implementation have been identified to include: dearth of qualified teachers, lack of adequate learning materials, equipment, and tools (Mupo and Tendeukai, 2016). In line with this, Daramola in Ogwa and Ndem (2017) posited that the hindrances to skills acquisition by technical students which include the attitude of individual students to practical work, lack of machine operational skills by lecturers and others workshop workers brain drain, lack of funds, lack of tools and equipment and others. Consequently, these students fail to acquire the required skills before graduation. It is necessary to ascertain the efforts required to increase practical skill acquisition.

Patrick *et al* in Ishaya & Shiabu (2016) posited that one of the philosophies of occupational education is pragmatism which stresses practical skill acquisition at technical college level of education. For this to be achieved, a more serious approach of instruction and exposure are desired to improve the present trend in Vocational Technical Education. Review the technical and vocational education curriculum in consultation with industry to ensure a demand-driven approach and increase the relevance of programmes to the needs of the industry, ensure that practical skills are assessed as part of all science and technical education examinations, initiate and articulate appropriate technology programmes that will enhance the capacity of vocational centres to support and service cottage industries, broaden and localize the vocational education curriculum to make formal crafts more relevant to immediate communities, mandate technical colleges to develop products and provide services to their immediate communities to a commercial basis, establish small scale enterprises managed by staff and students in technical colleges, solicit private sector sponsorship to supplement government subventions to technical colleges, encourage government patronage of goods and services offered by technical colleges.

Furthermore, Ayonmike Okwelle & Okeke (2015) added that the workshop attendants must ensure that each student participates in the process of practical projects, he or she should always encourage team work among students undertaking practical activities, the teacher should encourage students to be open minded and creative about the applications of techniques to their challenges during practical session, The teachers must make sure each individual is provided with needed materials at the beginning of the practical. In addition, (Speelman & Kirsner in Costa and George 2015), opine that, challenging lecturers to the application of the 21st century instructional delivery, thus, a shift from traditional instructional delivery tools to more modern technologies in teaching the right type of knowledge, skills, attitudes and values to enable students graduate with the expected

quality required to man our industries and match the products with market and employer's demand and skill competencies.

More so, the current state of workshop facilities in most institutions is very worrisome. According to Umar & Ma'aji, in Audu, Umar, Atsumbe, Ma'aji & Adedokun (2020), the current state of facilities in Technical Vocational Education and training institutions is poor, there is no scheduled measure of maintenance of the broken-down machines, equipment or resources for acquiring new ones, there is no much concern on the part of authorities, teachers and students for the deplorable state of the facilities in the schools. Afeti (2014) stated that the quality of training in TVET schools is too poor with much emphasis on academics and certification at the expense of skill acquisition and proficiency. Lack of adequate instructor training, outdated training equipment, and inadequate teaching aids are a number of problems that lead to the reduction of the effectiveness of TVET programmes. High quality skills training in mechanical technology education in tertiary institutions needs qualified teachers and workshop instructors, adequate and right workshop equipment, machinery, tools, adequate, provision of instructional resources, and practice by the students

Consequently, instructions in mechanical technology education today have remained essentially devoid of practical skills in different sections. The implication is that this programme is graduating students with inadequate or complete lack of practical skills in various areas of study. This portrays a bleak future for the attainment of the lofty goals of the National Policy on

Education of making these graduates "immediately employable" or self-employed. It is against this that this research is focused on investigating the perceived factors affecting practical skill acquisition amongst mechanical technology education undergraduate students in tertiary institutions in River State.

Problem of the Study

The National Educational Policy document in Tomlinson (2018) states that the Nation's educational activity should be centered on the students in order for them to acquire maximum skills for self-reliance and national economic growth and fulfilment in the labour market. Regrettably, due to some barriers, the level of practical skills acquired by these students, compared with the demands of the labour market and technological advancement is nothing to write home about. This explains why most employers of labour in this nation and abroad believe that the products of mechanical technology education programmes in higher institutions in Nigeria are half-baked and unusable without further training (Ekpenyong as cited in Dignath, 2016). Consequently, most graduates of mechanical technology education in Nigeria in the last decades are without gainful employment. Worst still, most of these graduates too are unable to establish their entrepreneurial skills ventures because they would not be able to put into practice what they studied in the tertiary institution since such skills were poorly acquired. It is against this

background that this paper is written to explore perceived factors affecting practical skill acquisition amongst mechanical technology education undergraduates in tertiary institutions in Rivers State.

Purpose of the Study

The main focus of the paper is geared toward perceived factors affecting practical skill acquisition amongst mechanical technology education undergraduates in tertiary institutions in Rivers State.

Specifically;

1. Investigate the available facilities for the implementation of practical skills lessons.
2. Determine the factors affecting effective delivery of mechanical technology education practical skills lessons.
3. Identify strategies for improving the delivery of effective mechanical technology education practical skills lessons.

Research Questions

1. What are the available facilities for the delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State?
2. What are the factors affecting effective delivery of mechanical technology education practical skills in tertiary institutions in Rivers State?
3. What are the strategies for improving the delivery of effective mechanical technology education practical skills in tertiary institutions in Rivers State?

Hypothesis

The following hypotheses guided the study and was tested at 0.05 level of significance.

HO₁. There is no significant difference between the mean responses of mechanical technology education lecturers and students on the available facilities for the delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State.

HO₂. There is no significant difference between the mean responses of mechanical technology education lecturers and students on the factors affecting effective delivery of mechanical technology education practical skills in tertiary institutions in Rivers State.

HO₃ There is no significant difference between the mean responses of mechanical technology education lecturers and students on the strategies for improving the effective delivery of mechanical technology education practical skills in tertiary institutions in Rivers State.

Methodology

The design of the study was a descriptive survey. The study was carried out in the three tertiary institutions that offer mechanical technology education in Rivers State. These tertiary institutions are Rivers State University Port Harcourt, Ignatius Ajuru University of

Education Rumuolomini, Port Harcourt, and Federal College of Education (Technical) Omoku River State in affiliation with University of Nigeria Nsukka. The population of the study comprised 41 mechanical technology education lecturers and 47 years three mechanical technology education students in the three tertiary institutions in Rivers State. From this population, all lecturers and year three students were sampled for the study using purposive random sampling technique. The study adopted a three-sectioned survey questionnaire tagged "perceived factors affecting practical skill acquisition amongst mechanical technology education undergraduates in tertiary institutions in Rivers State", for the study. The instrument for data collection was faced and content validated by two experts in the Department of Vocational and Technology Education in Rivers State University, Port-Harcourt. The instrument was structured in a 5 likert rating scale of strongly agree (SA), agree (A), undecided (U), disagree (D), and strongly disagree (SD). The reliability of the instrument was determined using the Cronbach Alpha Reliability test after administering it to 12 mechanical undergraduates and 8 lecturers as respondents in Niger Delta University, Bayelsa state, who were not part of the study, the reliability coefficient achieved was 0.89. The researchers administered the questionnaires to the respondents directly and all instruments were retrieved. Mean and Standard Deviation were used to answer the research questions while Z-test statistical tool was used to test the hypotheses of the instrument. Mean value 3.00 was set as cut-off point for mean less than 3.00 was rejected while a mean value equal or greater than 3.00 was accepted.

Results

Research question 1; what are the available facilities for the delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State?

Table 1: Mean responses on the available facilities for the delivery of practical skills

s/n	Items	Lecturers (n=41)		DECISION	Students (n=47)		
		$\bar{x}_1$	SD ₁		$\bar{x}_2$	SD ₂	DECISION
1	Impact and ratchet wrenches	3.85	1.01	Agree	3.36	.87	Agree
2	Universal dial gauge bracket	4.02	1.01	Agree	3.29	.97	Agree
3	Drilling machine	4.07	.81	Agree	4.12	1.07	Agree
4	Melting furnaces	3.24	1.26	Agree	3.21	1.61	Agree
5	Tool boxes	3.60	1.24	Agree	4.17	.89	Agree
6	Centre lathe	4.12	.84	Agree	4.34	.47	Agree

7	Power hack saw machine	3.19	1.05	Agree	4.38	.49	Agree
8	Shaper machine	4.43	.50	Agree	4.36	.48	Agree
9	Tool & cutter grinder	3.87	1.16	Agree	3.72	.82	Agree
10	Universal drilling machine	3.73	1.07	Agree	3.78	1.14	Agree
11	Shearing machine	4.17	.38	Agree	3.06	1.25	Agree
12	Open Hearth furnace	4.04	1.11	Agree	3.85	1.10	Agree
13	Swage block	3.63	.99	Agree	3.03	1.11	Agree
14	Submerged arc welding machine	3.51	.77	Agree	3.12	1.40	Agree
15	Fume extractor	2.17	1.13	Disagree	2.23	1.67	Disagree
16	Gas welding & cutting machine	3.02	1.21	Agree	4.08	.77	Agree
17	Portable abrasive cutter	3.90	1.04	Agree	3.57	1.19	Agree
18	Venier calipers	4.31	.47	Agree	3.95	.93	Agree
19	Micrometer	4.60	.49	Agree	4.31	.62	Agree
20	Wheel balance equipment	3.07	1.43	Agree	3.86	1.30	Agree
21	Vee-block	3.26	1.41	Agree	4.14	.88	Agree
22	Tool maker clamp	2.75	1.06	Disagree	2.90	1.01	Disagree
	Total	3.52	.97	Agree	3.67	1.00	Agree

Source: Field survey, 2024.

Table 1: on the available facilities for the delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State, shows that lecturers and students agreed that all the items posted above outside item 22 and item 15, are facilities available for the delivering of practical skills in mechanical technology education in tertiary institutions in Rivers State. This is based on the grand mean score of 3.52 and 3.67 respectively which is above 3.00 that was earlier stated as the acceptable means. Furthermore, the closeness in

the standard deviation for the two groups which is .97 and 1.00 shows homogeneity in their responses.

Research question 2; what are the factors affecting effective delivery of mechanical technology education practical skills in tertiary institutions in Rivers State?

Table 2: Factors affecting effective delivery of mechanical technology education practical skills

s/n	Items	Lecturers (n=41)		DECISION	Students (n=47)		DECISION
		$\bar{x}_1$	SD ₁		$\bar{x}_2$	SD ₂	
1	Not all technical student enjoy activity based learning	3.33	1.07	Agree	4.22	.42	Agree
2	Time allocation	4.40	.49	Agree	3.66	1.15	Agree
3	Unstable electricity power supply	4.11	.55	Agree	3.39	1.28	Agree
4	Obsolete equipment	3.92	.80	Agree	4.38	.49	Agree
5	Lack of up-to-date practical skills of lecturers	4.42	.50	Agree	3.16	1.58	Agree
6	Brain drain	3.85	1.00	Agree	3.62	1.31	Agree
7	Economic hardship	3.16	1.49	Agree	3.02	1.50	Agree
8	Lack of practical materials	4.45	.50	Agree	3.79	1.12	Agree
9	Political involvement	4.30	.81	Agree	3.07	.97	Agree
	Total	3.99	.80	Agree	3.59	1.09	Agree

Source: Field survey, 2024.

Table 2: on the factors affecting effective delivery of mechanical technology education practical skills in tertiary institutions in Rivers State, shows that lecturers and students agreed that all the items listed above, factors affecting delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State. This is based on the grand mean score of 3.99 and 3.59 respectively which is above 3.00 that was earlier stated as the acceptable means. Furthermore, the closeness in the standard deviation for the two groups which is .80 and 1.09 shows homogeneity in their responses.

Research question 3; what are the strategies for improving the effective delivery of mechanical technology education practical skills in tertiary institutions in Rivers State?

Table 3: Strategies for improving the effective delivery of mechanical technology education practical skills

S/N	Items	Lecturers (n=41)		DECISION	Students (n=47)		
		$\bar{x}_1$	SD ₁		$\bar{x}_2$	SD ₂	DECISION
1	Regular workshop practical exercises	4.35	.48	Agree	4.33	.47	Agree
2	Adequate number of skilled & experienced lecturers/workshop technologist	4.09	.82	Agree	4.14	.54	Agree
3	Provision & adequate utilization of training materials	3.80	1.34	Agree	4.39	.49	Agree
4	On the job training for lecturers and technologist to adequately update their practical skills	3.71	1.40	Agree	4.22	.58	Agree
5	Emphasis should be more on practical skills than certificates	4.00	1.08	Agree	4.18	.60	Agree
6	Encouraging lecturers to use more of demonstration teaching method.	4.07	.86	Agree	4.14	1.01	Agree
7	Practical skills should be part or core assessment process	4.21	.41	Agree	4.27	.84	Agree
8	Electricity power supply should be improved	4.45	.50	Agree	4.12	.76	Agree
9	Allocation of more time to workshop activities than classroom activities	4.21	.64	Agree	3.43	1.18	Agree
10	Encourage application of practical project method of teaching	3.55	1.01	Agree	3.77	1.05	Agree
	Total	4.04	.85	Agree	4.09	.75	Agree

Source: Field survey, 2024.

Table 3: on the strategies for improving the effective delivery of mechanical technology education practical skills in tertiary institutions in Rivers State, shows that lecturers and

students agreed that all the items listed above, strategies for improving the effective delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State. This is based on the grand mean score of 4.04 and 4.09 respectively which is above 3.00 that was earlier stated as the acceptable means. Furthermore, the closeness in the standard deviation for the two groups which is .85 and .75 shows homogeneity in their responses.

Hypothesis 1: There is no significant difference between the mean responses of mechanical technology education lecturers and students on the available facilities for the delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State.

Table 4: Z-test analysis on the available facilities for the delivery of mechanical technology education practical skills

Category	N	X	SD	DF	z-cal	z-crit.	Remark
Lecturers	41	3.52	.97	86	.71	1.98	Not Significance
Students	47	3.67	1.00				

Source: Field survey 2024.

Data in table 4 above reveal that z-calculated (.71) is not greater than z-critical (1.96) at 0.05 level of significance. Therefore, the null hypothesis was accepted, hence there is no significant difference between the mean responses of lecturers and students on the available facilities for the delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State.

Hypothesis 2: There is no significant difference between the mean responses of mechanical technology education lecturers and students on the factors affecting effective delivery of mechanical technology education practical skills in tertiary institutions in Rivers State.

Table 5: Z-test analysis on the factors affecting the effective delivery of mechanical technology education practical skills

Category	N	X	SD	DF	z-cal	z-crit.	Remark
Lecturers	41	3.99	.80	86	1.97	1.98	Not Significance
Students	47	3.59	1.09				

Source: Field survey 2024.

Data in table 5 above reveal that z-calculated (1.97) is not greater than z-critical (1.98) at 0.05 level of significance. Therefore, the null hypothesis was accepted, hence there is no significant difference between the mean responses of lecturers and students on the factors

affecting effective delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State.

Hypothesis 3: There is no significant difference between the mean responses of mechanical technology education lecturers and students on the strategies for improving the effective delivery of mechanical technology education practical skills in tertiary institutions in Rivers State.

Table 6: Z-test analysis on the strategies improving effective delivery of mechanical technology education practical skills

Category	N	X	SD	DF	z-cal	z-crit.	Remark
Lecturers	41	4.04	.85	86	.29	1.98	Not Significance
Students	47	4.09	.75				

Source: Field survey 2024.

Data in table 6 above reveal that z-calculated (.29) is not greater than z-critical (1.96) at 0.05 level of significance. Therefore, the null hypothesis was accepted, hence there is no significant difference between the mean responses of lecturers and students on the strategies for improving effective delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State.

Conclusion

From the findings, the study concluded that wrenches, dial gauges, drilling machine, melting furnace, tool boxes, entre lathe, power sawing machine, among others, are some of the available facilities for the delivery of practical skills in mechanical technology education in tertiary institutions in Rivers State. More so, it was found that the factors that hinder effective skill acquisition amongst mechanical technology education undergraduates in tertiary institution in Rivers State among others include time allocated for practical activities, most of the equipment in the workshops are obsolete, lack of up-to-date practical skills of lecturers etc. this findings is in line with the view of Umar & Ma'aji, in Audu, Umar, Atsumbe, Ma'aji, & Adedokun, (2020) which stated that the current state of facilities in technical education and Training institutions is poor, there is no scheduled measures of maintenance of the broken down machines, equipment or resources for acquiring new ones, there is no much concern on the part of authorities, teachers and students for the deplorable state of the facilities in the schools. Finally, it was found that the strategies for improving this include, Provision & adequate utilization of training materials, Regular workshop practical exercises, Emphasis should be more on practical skills than certificates Encourage application of practical project method of teaching, and so on. As this is in line with Afeti (2014) stated that, the quality of training in TVET schools

is too poor with much emphasis on academics and certification at the expense of skills acquisition and proficiency.

Recommendations

Haven identified some perceived factors affecting practical skill acquisition amongst mechanical technology education undergraduates in tertiary institutions in Rivers state, the following recommendations are made;

1. Nigeria and Rivers State government should ensure that practical materials are always available for the effective delivery and students' participation in mechanical technology education in tertiary institutions in Rivers State.
2. There should be steady on-the-job training for lecturers for the effective skill update and delivery of practical skills to undergraduate in mechanical technology education in tertiary institutions in Rivers State.
3. More time should be allocated to practical activities for the effective participation of undergraduates in mechanical technology education in tertiary institutions in Rivers State.

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