EFFECTIVE UTILIZATION OF POWER TOOLS BY STUDENTS OF METAL WORKS IN TECHNICAL COLLEGE WORKSHOPS IN RIVERS STATE

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Abstract
This study examined effective utilization of power tools by students of metal works in Technical College workshops in Rivers State. The population of the study is 143, comprising of 26 Metal works Teachers and 105 Metal works Technicians of private owned metal workshops in Rivers State. Two research questions were posed to guide the study while two hypotheses were also formulated to guide the focus of the study. A self-designed instrument structured on 5 point Likert scale was used and was validated by three experts in the metal work unit, Mechanical Engineering Workshop, Ken Saro Wiwa Polytechnic, Bori. The instrument was pilot tested with five Metalwork Technicians of the Department of Vocational and Technology Education, Rivers State University, Port Harcourt and five Metalwork Teachers of Boy's Technical College, Osusu Aba, Abia State and subjected to Cronbach alpha coefficient which yielded 0.89. Mean and Standard Deviation was used to answer the research questions while t-test statistical tool was used to test the hypotheses. The finding identified 10 benefits of effective utilization of power tool which include reduction of hazards, save materials from wastage. The study also identified 20 safety precautions to be observed when using power tools in Technical College Workshops which include; putting on hand gloves to protect hands and use of safety shoes during operations. The study further recommended that Government should increase budgetary allocations on provision of safety apparatus in technical college workshops, management of technical colleges should regularly organize symposium on safety precautions in the workshop for metal work Teachers and Instructors, metal processing industries should provide safety gadgets to Technical College workshop operators.

Keywords: Education, Workshop, Metal Work Programme, Power tools, Effective utilization

Introduction

Education is a key agent of national development, either as a way of developing human capacity, increasing the skilled workforce for modernization or as a matter of personal freedom, developing capability and empowerment (Okwelle & Ayonmike, 2014). Education particularly vocational and technical education is the factory for production of the needed technologists, technicians and craftsmen as well as skilled artisans who are required to turn the nation's economic development around (Makolo & Makolo, 2017). Ojo & Akhademe (2016) described education as a vital tool for piloting the affairs of any nation and it also helps to prepare citizens to take up responsible roles in the society. One form of education that equips its recipient to adapt to the changing world of work is Technical Vocational Education and Training (TVET). According to Baba, Peter and Bala (2017), technical vocational education and training is the most reliable vehicle for self-sustenance, economic prosperity and political supremacy of a nation over others. TVET programmes vary from one country to another and are delivered at different institutions which include universities, polytechnics, colleges of education (technical) and technical colleges.

Technical colleges are mainly established for the training of students to acquire practical skills, knowledge and attitudes essential for employment in various trades. According to Okorie (2001), technical colleges are established to prepare individuals to acquire practical skills and basic scientific knowledge. Okorie further stated that technical colleges train both males and females in the areas of electrical installation and maintenance and metal work programmes, among others.

Ugbelu (2015) described metalwork programme as an entrepreneurial based and skill oriented field of study that is expected to equip learners with sellable skills and make for self-reliance and paid employment. Ekeagwu (2015) stated that metal work programme in Nigerian technical colleges is designed to produce competent craftsmen in various metal work trade. According to the National Board for Technical Education (NBTE) (2001) in Okon (2011), metal work programme in technical colleges is geared towards the production of technicians and craftsmen who have skills, attitude, and knowledge to meet up the demands in the metal work industries.

A graduate of metal work is expected to operate machines and perform other metal work skills like welding, foundry, casting, metal forming and fabrication effectively for production purpose in private practices or public industries. In the view of Jadas (2010) metal works is a discipline aimed at training students on the general properties and use of metals in order to help the learners in material selection for particular job, train them on how to differentiate the techniques and approaches for a scientific work and how to utilize the safety rules and regulations during metalwork operations in the workshop. Longman (2011) stated that the objectives of teaching metal works include to assist students understand, use and handle tools, equipment and machines properly, and also help students to identify different properties of metal which aid in selection of material for a particular job in the workshop.

Workshop is a building meant for carrying out teaching and learning activities that are practical oriented activity (Ahmed & Ezekiel, 2017). Theory learned in the classroom is supposed to be put into practice in the workshop using relevant tools, equipment and materials under thorough supervision of the instructors.

Workshop instructors are individuals trained to supervise all the technical or practical activities being carried out by others in the workshop. Saidu and Abubakar (2017) observed that instructors guide the learners to practice correct handling of tools and equipment, clean working environment to enhance the effective use of time, consciousness of safety and judicious use of tools and equipment during practical exercise. However, equipment and tools used in the metal work workshop to carry out metal work operations include screwdrivers, scribers, dividers, punches, chisels, calipers, hammers, gas cylinders, eye goggle, safety boots, bench vices, saw blades, welding machines, power tools among others (Ekeagwu, 2015)

Power tool is a tool that is actuated by an additional power source and mechanism other than the solely manual labour with hand tools (Danjuma & Umaru, 2017). Bakare (2010) described power tools as various types of tools and mechanical devices that operate when they are initiated by an electrical source. The most common types of power tools use electrical motors, internal combustion engines and compressed air. According to Ekeagwu (2015), power tools are tools or machines that are powered by electricity in the metal workshops, Examples include, lathe machines, milling machines, drilling machines, grinding machine, power hacksaw. These machines are used in metal working such as material testing, metal finishing, forging, casting, matching, welding and other fastening methods in metal manufacturing. Eze (2011) instructed that operators should ensure no flammable materials near the working area when using power tools, put on ear plugs to dampen machinery noise and put on safety glasses to shield bits of flying or flying materials. Eze further stated that poor handling of power tools gives room to greatest hazard such as electrocution, burn and slight shock which can lead to injuries or even heart failure, fracture. If students and instructors strictly adhere to these instructions, it will ensure effective utilization of power tool in the workshops.

Saidu and Abubakar (2017) stated that effective utilization of power tools and equipment will stimulate student senses and generate greater interest in the learning system and assist in the retention of ideas. Effective utilization of power tools demands strict handling, absence of water or wet substance from the palm during operations in the workshop. Saidu and Abubakar (2017) further maintained that effective utilization of equipment and materials in technical college workshops makes the practical aspect of teaching and learning of metal work programme more interesting to the students. According to Audu, Kamin and Balash (2013) teachers of metalwork are expected to equip students with work skills and knowledge that will enable the graduates able to utilize the power tools effectively during metal work operation, be employable and self-reliant. This operation demands strict adherence to safety measures which include application of hand gloves, eye

goggle, safety boots and ensuring effective utilization of power tool for proficiency (Maigida, 2013).

Technical college needs to demonstrate outstanding management skills. These skills enables students to understand and demonstrate orderly procedures for construction activities, step by step approaches, organization of materials, appropriate time limits and self-evaluation of the task or product when completed. It further enables students to use sophisticated equipment in the school and thereafter use the same equipment in the industry on graduation. It helps the students to demonstrate rightly, skillfully and strictly effective use of equipment and machines. It is in light of this background, the study becomes necessary to determine the effective utilization of power tools by students of metal work in technical college workshops in Rivers State.

Statement of the Problem

Power tool is an electric control device designed to carry out operation in drilling, grinding, fitting, threading, brazing, forging, tool sharpening, lathe machining and milling to produce or assemble metal articles such as cars, airplanes, machines and home appliance among others. These operations require expertise by students while handling the power tool effectively in the workshop for optimal production. However, Yakubu (2014) revealed that poor handling of power tools had made some students in the workshops often sustained injuries, damaged tools and rendered machines non-functional during practical works. Yakubu further revealed that lack of adherence to safety rules in handling power tools in the metalwork workshops had rendered many tools, machines and materials ineffective. However, if proper methods of effective utilizations of power tools are identified and incorporated into the modules of metal work students, there are possibilities of averting accident, damage to machines and other workshop facilities in technical college workshops in Rivers State.

Purpose of the Study

The purpose of the study is to determine effective utilizations of power tools by students of metal works in technical college workshops in Rivers State. Specifically, the study sought to:

1. ascertain the benefits of effective utilization of power tool in technical college workshops in Rivers State
2. determine safety precautions to be observed when using power tools in the technical college workshops in Rivers State.

Research Questions

The following research questions were posed to guide the study.

1. What are the benefits of effective utilization of power tool in technical college workshops in Rivers State?
2. What are the safety precautions to be observed when using power tools in the technical college workshops in Rivers State?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance:

1. There is no significant difference in the mean responses of metal works teachers and metal work technicians on the benefits of effective utilization of power tool in the technical college workshops in Rivers State.

2. There is no significant difference in the mean responses of metal works teachers and metal work technicians on the safety precautions to be observed when using power tools in the technical college workshops in Rivers State.

Methods

The study adopted descriptive survey design. The study was carried out in Rivers State. The population of the study were 143, comprising of 26 metal work teachers drawn from the four state Government owned technical colleges in Rivers State and 105 metal work technicians registered with Metal Works Association of Nigeria, Rivers State branch. Two research questions were posed to guide the study while two hypotheses were formulated and tested at 0.05 level of significance. There was no sampling considering the manageable size of the population. A five point likert scale questionnaire was developed and used for the study. The instrument was validated by three experts in the metal work unit, Mechanical Engineering workshop, Department of Mechanical Engineering, Ken SaroWiwa Polytechnic, Bori, Nigeria. The instrument was pilot tested on five technicians of Metalworks workshop at the Metalworks unit, Technological Workshop, Department of Vocational and Technology Education, Rivers State University, Port Harcourt, and five Metalworks Teachers of Boy's Technical College, Osusu, Aba, Abia State. The results of the pilot test were subjected to Cronbach-Alpha coefficient which yielded 0.89. The questionnaire was personally collected by the researchers and two research assistants. A total of 143 copies of the instrument was administered but only 131 copies retrieved, analyzed and was used for the study. Mean and standard deviation were used to answer the research question and t-test statistical tools were employed to test the null hypotheses at 0.05 level of significance. Mean values greater than or equal to 3.50 were accepted while mean values less than 3.50 were rejected. However, the null hypotheses were accepted if the value of the t-calculated is less than the value of the t-critical, while the null hypotheses was rejected if the value of the t-calculated is greater than the value of the t-critical.

Results

Table 1 Mean and Standard Deviation of Respondents on Benefits of Effective Utilization of Power Tools in Technical College Workshops in Rivers State.

S/No	Benefits of effective utilization of power tools	Metalwork Technicians			Metalwork Teachers		
		Mean	**S.D**	**Remark**	**Mean**	**S.D**	**Remark**
1.	Reduction of hazards.	3.61	1.22	Needed	3.70	1.14	Needed
2.	Save materials from wastage	4.03	0.91	Needed	3.63	1.18	Needed
3.	Save lives of users	4.20	0.89	Needed	4.20	0.92	Needed
4.	Encourage mass production	3.69	1.19	Needed	3.81	0.97	Needed
5.	Increase learners performance	3.56	1.08	Needed	3.86	1.01	Needed
6.	Increase lifespan of power tool.	3.73	1.03	Needed	3.58	1.36	Needed
7.	Avoid injury to users	3.92	0.96	Needed	3.97	0.92	Needed
8.	Save power tool from damage	3.56	1.35	Needed	4.11	0.84	Needed
9.	Speedy and fast in operation	3.54	1.32	Needed	3.66	1.15	Needed
10	Enable users to be perfect operators.	3.81	1.01	Needed	3.90	0.95	Needed
Total mean/S.D		**37.95**	**10.96**		**38.42**	**10.44**	
Grand mean/S.D		**3.79**	**1.09**		**3.84**	**1.04**	

The data presented on table 1 shows that the grand means are 3.79 and 3.84. These values are greater than the criterion mean of 3.50. This indicates that all the items listed are benefits of effective utilization of power tool in technical college workshops in Rivers State.

Table 2. Mean and Standard Deviation of Respondents on Safety Precautions to be observed when using Power Tools in the Technical College Workshops in Rivers State.

S/No	Safety precautions to be observed when using power tools	Metalwork Technicians			Metalwork Teachers		
		Mean	S.D	Remark	Mean	S.D	Remark
1.	Read instructional guideline before operating a power tool.	4.29	0.91	Needed	3.74	1.06	Needed
2.	Put on tightly fitted safety goggles or face shield during operation	3.82	1.29	Needed	3.99	0.89	Needed
3.	Put on hand gloves to protect the hands	3.97	1.16	Needed	3.69	1.13	Needed
4.	Avoid putting on rings or jewelries when operating power tools	4.01	1.11	Needed	3.71	1.10	Needed
5.	Use safety shoes during operation	3.50	1.49	Needed	3.57	1.31	Needed
6.	Ensure your workshop is clean and free from hazard.	3.75	1.32	Needed	4.19	0.79	Needed
7.	Do not breathe the air in the fume plume directly above the tool.	3.89	1.21	Needed	4.21	0.75	Needed
8.	Ensure the working area around your power tool is clear, safe and oil free.	4.06	1.09	Needed	3.61	1.25	Needed
9.	Listen to sound and vibration of the power tool to know when the cutting tool is dull and need replacement	3.60	1.39	Needed	3.83	0.96	Needed
10	Wear rubber boots and stand on a dry insulated platform when it is necessary to operate power tool in a damp or wet area.	3.78	1.30	Needed	3.51	1.41	Needed
11.	Use safety belt or lifeline when operating power tool on high surface.	4.23	0.96	Needed	4.40	0.61	Needed
12.	Ensure that scaffold, ladder or work surface is solid when operating power tool above ground.	3.64	1.36	Needed	3.63	1.22	Needed

13.	Put on safety glasses to shield against bits of flying metals	3.53	1.44	Needed	3.89	0.91	Needed
14.	Put on ear plugs to dampen machinery noise.	3.86	1.23	Needed	4.28	0.70	Needed
15.	Operate power tools with extreme care	4.18	0.99	Needed	3.68	1.17	Needed
16.	Properly installed and grounded power tools in good working condition.	3.58	1.40	Needed	3.59	1.20	Needed
17.	Ensure no flammable materials are or near the working area when using power tool.	3.69	1.34	Needed	4.32	0.64	Needed
18.	Avoid operating power tools in a container held combustible	3.93	1.19	Needed	3.76	0.99	Needed
19.	Hang power tool on the brackets when not in use.	4.12	1.03	Needed	4.03	0.86	Needed
20.	Do not operate power tool in a contained space without special precautions.	3.99	1.15	Needed	3.54	1.34	Needed
Total mean/S.D		**77.4**	**24.36**		**79.17**	**20.37**	
Grand mean/S.D		**3.87**	**1.23**		**3.85**	**1.02**	

The information presented on table 2 shows that the grand means are 3.87 and 3.85 which are above the cut-off point of 3.50. This implies that all the items listed are safety precautions to be observed when using power tools to avoid damage to students, instructors and other facilities in the metal work workshop in Technical college of Rivers State.

Table 3 t-test Analysis Comparing Mean Response of Metal works Technicians and Metal Works Teachers on the Benefits of effective utilization of power tools in Metal Works Workshops.

Variables	Mean	S.D	N	Df	Sig.	t-cal	t-crit	Remark
Metal work Technicians	3.79	1.09	105					
Metal work Teachers	3.84	1.04	26	129	0.05	-0.214	1.96	Needed

Number of Metal Work Technicians = 105
Number of Metal Work Teachers = 26

The information presented on table 3 shows that the value of t-calculated is -0.214 at 0.05 level of significance which is less than the value of t-critical of 1.96. Hence, the null

hypothesis was accepted that there is no significant difference in the mean response of Metalwork Technicians and Metalwork Teachers on the benefits of effective utilization of power tools in the Technical College Workshops in Rivers State.

Table 4. t-test Analysis Comparing Mean Response of Metal work Technicians and Metal Works Teachers on the Safety Precautions to be observed when using Power Tools in the Metal Works Workshops.

Variables	Mean	S.D	N	Df	Sig.	t-cal	t-crit	Remark
Metal work Technicians	3.87	1.23	105					
Metal work Teachers	3.85	1.02	26	129	0.05	0.307	1.96	Needed

Number of Metal Work Technicians = 105
Number of Metal Work Teachers= 26

The data presented on table 4 shows that the value of t-calculated is 0.307 at 0.05 level of significance which is less than the value of t-critical of 1.96. Hence, the null hypothesis was accepted that there is no significant difference in the mean response of Metalwork Technicians and Metalwork Teachers on the safety precautions to be observed when using power tools in the Technical College Workshops in Rivers State.

Discussion of Findings

The finding revealed 10 benefits of effective utilization of power tool in technical college workshops in Rivers State. The findings are: increase learners performance, reduction of hazards, save materials from wastage, increase lifespan of power tool, save lives of users. This finding is similar to that of Saidu and Abubakar (2017) which stated that effective utilization of tool and equipment will stimulate student senses and generate greater interest in the learning system and assist in the retention of ideas.

The finding of the study further revealed 20 safety precautions to be observed when using power tools in the technical college workshop in Rivers State. The findings include: use of safety shoes, put on tightly fitted safety goggles, do not breathe the air in the fume plume directly above the tool, avoid putting on jewelries when operating power tools, ensure working area is clear, safe and oil free, use of safety belt or lifeline when operating power tool on high surface, properly installed and grounded power tools, ensure no flammable materials are in or near the working areas. The finding also revealed that operator of power tool should avoid operating it in a container held combustible, hang power tools on the brackets when not in use, put on ear plugs to dampen machinery noise, ensure that scaffold, ladder or work surface is solid when operating power tools above ground among others. This finding is in line with the opinion of Eze (2011) which stated that for power tool to be effectively utilized demands strict handling, absence of water or wet substances from the palm during operation in the workshop. This finding also agreed with Ekeagwu (2015) who

stated that, there should be no flammable materials near the working area when using power tools, and operators should be able to put on ear plugs to dampen machinery noise and safety glasses to shield bits of flying or flying materials during operations. The finding of the study also revealed that there is no significant difference on the mean responses of Metalwork Technicians and Metalwork Teachers on the safety precautions to be observed when using power tools in the technical college workshops in Rivers State.

Conclusion

Safety demands optimal priority considering the degree of injuries and loss emulated to the management of an establishment or technical college when safety rules are bridged in terms of death of students or instructors, damages to equipment, tools and other valuable facilities in the technical college workshops. Hence, the management most times is expected to enact laws enforcing strict compliance to safety directives and rules among students and instructors operating in the workshop as a means to reduce accident. This will enable students and instructors to realize the importance of safety and be conscious of its regulations regularly. The instructors through regular safety symposia will constantly be alerted as a point of duty on emphasizing on the safety precaution to be observed in the technical college workshops. These symposia are expected to orientates the teachers/instructors and inculcate same to the students during practical exercises in the Technical College workshops in Rivers State.

Recommendations

1. Government should increase budgetary allocation on provision of safety apparatus to technical college workshops.
2. Management of technical college should regularly organize symposium on safety precaution in the workshop for metal works teachers and instructors.
3. Metal processing industries should provide safety gadgets to technical college workshop operators.

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