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EVALUATION OF AVAILABILITY OF FABRICATION AND WELDING INSTRUCTIONAL FACILITIES IN SCIENCE AND TECHNICAL COLLEGES IN GOMBE STATE, NIGERIA

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ABSTRACT

The study sought to evaluate the availability of fabrication and welding instructional facilities in science and technical colleges in Gombe State. Two research questions and two hypotheses guided the study. It was a survey research design used and the entire population of metalwork technology teachers and laboratory technologies were used. Due to the size of population no sampling was carried out. Instrument for data collection was structured and validated questionnaire with reliability coefficient of stability 0.86. The questionnaire distributed by hand and also collected back with help of three research assistants. Mean and standard deviation were used to answer the research questions. t-test was used to test the null hypotheses with reliability coefficient of stability 0.86. Statistical package for the social sciences (SPSS) version 25 was used for data analyses. The decision rule for the research questions was to accept if the computed mean score value exceeds 2.50 and otherwise reject when the computed mean score value falls below 2.50 while the decision rule for the hypotheses was to accept the null hypothesis if the calculated p-value is greater than 0.05 and otherwise reject if the calculated p-value is less than 0.05. The findings revealed that many vital facilities are not available while some available are not adequate for the teaching of fabrication and welding. It was therefore recommended that all stakeholders should contribute financially and materially to enhance availability of metalwork technology instructional facilities.

INTRODUCTION

Fabrication and welding is one of the areas of engineering trades taught in science and technical colleges in Nigeria. Fabrication and welding is a trades offered in the nation's technical college which lay emphasis on acquisition of requisite skills for self-reliance and employment in the world of work (Yisa & Olakotan, 2019). The trade is offered at two levels, leading to the award of National Technical Certificate (NTC) and Advance National Technical Certificate (ANTC) for craftsmen and master craftsmen respectively (FGN, 2014). The curriculum is prepared in modules at these two levels. The modules are Arc and Gas Welding, Sheet Metal and Structural steel work, with basic electricity and engineering drawing as trade related courses (NBTE, 2014). The trainees on the completion of the programmed for fabrication and welding are equip with basic skills in technology that can make them acquainted with the materials, tools, equipment and machines of fabrication and welding to produce articles of metals that will source income and means of self enterprise after graduating from school (FGN, 2014). Therefore, graduates of fabrication and welding are expected to make use of hand tools as well as operate machine tools effectively for manufacturing articles or objects, also to carry out maintenance culture on machine and hand tools.

Evaluation of instructional facilities is the process of obtaining information for use in judging the worth of programme, procedure, product or objectives (Ajayi, 2018). Evaluation according to Ajayi provides the basis for decision making that affect directly the selection of facilities and equipment for installation for classroom or workshop used. The essence of evaluation is take relevant decision about the instructional facilities under consideration. In the same manner Ipaye (2010), asserted that evaluation helps to reveal strength and weaknesses of facilities. The identification of weakness helps to seek for solutions to the problems and remedy the situation whether or not the facilities has obtained the purpose for which it was provided for, it has to be critically analyzed and measured using appropriate techniques with a view to restating the general

goals and objectives. Evaluation of fabrication and welding instructional facilities in science and technical college can be carried out by an instructor and instructional technologists in the schools

For student to attain competency in fabrication and welding, they must be taught with best methods using appropriate teaching facilities. Different methods of teaching are employed in education. Methods have to evolve to enhance teaching and learning, specifically in applied teaching such as fabrication and welding with teacher engaged in use of instructional facilities. With the development of modern technology facilities and tools in 20th century, the interaction between teachers and students has increased drastically. For instance, computer, the internet, digital presentations audio and video strategies are now available for better learning experience, while such advancement has made things simpler for most teachers and students (Ghaviferk & Rosdy, 2015). With the new instructional aids in both the traditional and new technology methods, it is necessary that metalwork technology teachers must be prepared to attain a certain competencies for the effective instruction. Fabrication and welding teachers make use of instructional facilities available to demonstrate skills to students in various modules; hence they must carry out checks on equipments, machines and tools to ascertain their functionality through periodic assessment. In the light of the above, science and technical colleges in Gombe State require competent teachers that would use instructional facilities to deliver quality instruction to the students. When appropriately applied, instructional facilities will prove to be vital tools for producing competent graduates who will be skillful in metalwork technology.

Science and technical college are training grounds for individual to acquire technical awareness and useful skills necessary for mastery in a particular trade (Okole, Elon, Osuji & Igwe, 2019). The authors further stressed that science and technical college are educational institutions established with the aim of training students to acquire appropriate vocational skills, knowledge, attitudes, habits of thoughts and qualities of character that enable them develop their intellectual, social, physical, emotional and economic capacities to become self reliance and contribute to economic growth and development of their nation. Science and technical college create and provide teaching and training in trade includes: fabrication and welding, Automobile, Electrical and Electronic Installation Work, Carpentry and Joinery, Plumbing, Painting etc. In addition to general education, all science and technical subjects offered in science and technical colleges are in two parts these are: theory and practical. The National Policy on Education (2014) defines Vocational and Technical Education as that form of education which is obtainable at the science and technical colleges in Nigeria. This is equivalent to the senior secondary schools education but designed to prepare individual to acquire practical skills, basic scientific knowledge and attitudes required as craftsmen and technicians at sub-professional level. The policy also enumerated the objectives of vocational and technical education as follows:

a. To provide trained manpower in applied science, technology and commerce particularly at sub professional grades.
b. To provide technical knowledge and vocational skills necessary for agriculture, industrial, commerce and economic development.
c. To provide people who can apply specific knowledge to the improvement and solution of environmental problems for the use and convenience of mar;
d. To give an introduction of professional studies in engineering and other technologies;
e. To give training and impact the skills leading to the production of craftsmen, technicians and skilled personnel who will be enterprising and self reliant and
f. To enable our young men and women to have an intelligent understanding of the increasing complexity of technology.

The above goals are intended to make vocational and technical education more practical, functional and job oriented. If these goals were properly implemented they could bring about a desired technological change and development.

Instructional facilities are machines, tools and equipments in the metal workshop which offers wealth of experience that stimulates students' ability for creative work and thinking.

Availability of machines, tools and equipment with constant practice in Science and Technical Colleges will improves teaching and learning of metalwork. Facilities are teaching aids, device, and equipment or tool that teacher or student finds it relevant and brings into the classroom or workshop to enhance teaching and learning (Ajayi, 2018, Zuhunba, Maikano & Gokun, 2018). Instructional facilities in fabrication and welding can thus be regarded as all inputs, be it tools, equipment and machines towards effectiveness of the course programme. For the purpose of this study, metalwork technology instructional facilities can be categorized into two these are: Machine Tools and Hand Tools. Machine Tools are: Lathe machine, Drilling machine, Milling machine, and Grinding machine. On the other hand, Hand Tools are, Measuring tools, Marking Out tools, Cutting tools, Driving Out tools and Holding Device other facilities that aid in teaching learning of metalwork such as projector, books etc.

Statement of the Problem

Fabrication and welding instructional facilities in science and technical colleges in Gombe State are at the state of decline. Machine tools, hand tools and other teaching equipment for teaching and learning of fabrication and welding are not made available in most of the science and technical colleges (Bako, 2018). Furthermore, the installed machine tools do not seem to be use due to minor fault and maintenance. When the hand tools and machine tools for instructional purpose are not available, there is doubt that it could affect the quality of instruction and consequently the performance of students as evident by the result for National examination bodies like WAEC, NECO and NABTEB (WAEC/ NECO/NABTEB, 2020 Result).

From the personal observation and literatures, teaching and learning of fabrication and welding in Gombe State science and technical colleges do not seen to observe the best practice. This is therefore is a problem that needs to be attended to in order to improve the teaching and learning of metalwork. The problem of the study there is the absence of information on availability of machine tools and hand tools for fabrication and welding as instructional facilities in Science and Technical Colleges in Gombe State.

Purpose of the Study

This study, examined the availability of fabrication and welding instructional facilities in science and technical colleges in Gombe state. The specific objectives are to:

1. Ascertain the availability of machine tools for teaching fabrication and welding in Science and Technical Colleges in Gombe state.
2. Ascertain the availability of hand tools for teaching fabrication and welding instructional facilities in Science and Technical colleges in Gombe state.

Research Questions

To guide this study, the following research questions were asked:

1. What is the level of availability of machine tools necessary for teaching fabrication and welding in Science and Technical Colleges in Gombe state?
2. What is the level of availability of hand tools necessary for teaching fabrication and welding instructional facilities in Science and Technical colleges in Gombe state?

Hypotheses

The following hypotheses will be tested at 0.05 level of significant:

1. There will be no significant differences between the mean responses of rural and urban fabrication and welding teachers of science and technical colleges on the problem associated with availability of metalwork technology machine tools.
2. There will be no significant differences with the mean responses of rural and urban fabrication and welding teachers of science and technical colleges on problems associated with hand tools.

Research Method

The study adopted survey research design. A survey research design according to Chuck and Schutt (2012) is the collection of information from a sample of individuals through their responses on questions. Survey design is said to be suitable for this study for data was collected, analyzed, and described based on how they exist. The design is also considered suitable because this is soliciting information from fabrication and welding teachers and laboratory technologists on evaluation of availability and adequacy of fabrication and welding instructional facilities in science and technical colleges in Gombe State.

Population of the Study

The population of the study was the entire principals, vice principals, fabrication and welding teachers and laboratory technologists in Science and Technical Colleges in Gombe State. The target population will be 57 respondents which consist of seven Principals, 14 Vice Principals, 30 fabrication and welding teachers and six laboratory technologists.

There was no sampling in the study, since all the principals, vice principals, fabrication and welding teachers and laboratory technologists in science and technical colleges was captured.

Instrument for Data Collection

The instrument for data collection was 39 item questionnaires titled "Questionnaire on fabrication and welding Instructional Facilities MTIF". The questionnaire was subjected to face and content validation by four experts, one from the Department of Science and Technology Education and one Educational Foundation Department University of Jos, one Metal work Technology teachers and one laboratory technologist from Science and Technical College in Gombe State.

. The instrument was trial-tested on 14 Science and Technical College Teachers and Laboratory in Gombe State Science and Technical Colleges. Data collected were used to compute the reliability coefficient of internal consistency using Crombach Alpha which gave reliability index of 0.83. MTIF questionnaire was divided into two sections A and B. Section A, sought information on the respondent's demographic data. Section b, was structured to elicit information on the available and not-available with items lists of facilities based on 4 – point of likert of very available (VA) = 4; available (A) = 3; sometimes available (SA) =2; not available (NA) =1. The method of administration of the instrument was on the spot administration with help of three research assistants to ensure 100% return. All the research questions were answered and analyzed using Mean and Standard Deviations on the level of decision. A mean rating of 2.50 and above was accepted as indicative of available, while 2.49 and below indicates not available. The null hypotheses were tested using the t-test at 0.05 level of significance.

Results

Table 1: Mean and standard deviation ratings of the availability of machine tools for teaching fabrication and welding

S/N	Items	N	$\bar{X}$	SD	Remark
1.	Lathe Machines	57	3.68	.659	VA
2.	Milling Machines	57	1.16	.621	NA
3.	Grinding Machines	57	3.65	.641	VA
4.	Shaping Machines	57	2.23	.690	SA
5.	Sawing Machines	57	2.32	.805	RA
6.	Shearing Machines	57	2.35	.811	SA
7.	Drilling Machines	57	3.19	.854	VA
8.	Folding Machines	57	3.12	.965	VA
9.	Kiln/Blacksmith Furnace	57	2.48	.967	RA
10	Arc Welding Equipments	57	3.05	.953	VA
11	Oxy-acetylene Welding Equipments	57	2.91	.987	RA

Keys: VA = Very Available, R A = Rarely Available, SA = Sometimes Available,

NA =Never Available

The result of Table 1 indicates the mean and standard deviation of the availability of machine tools for teaching fabrication and welding. The values of the mean ranged from 1.16 to 3.68, thus, indicating that the participants' responses of item 1,3,7,8 and 10 fall under very available, 5,9 and 11 was rarely available while item 2 was never available, as showed on the above table 1. Similarly, the standard deviation ranged from .621 to .967 which shows that the participants' responses were around the mean. It can be deduced from Table 1 that science and technical colleges in Gombe are not adequately equipped with available machine tools for teaching metalwork technology.

Table 2: Mean and standard deviation of the availability of hand tools necessary for teaching fabrication and welding in Science and Technical Colleges

S/N	Items	N	$\bar{X}$	SD	Remark
23	Steel Rule	57	3.60	.884	VA
24	Calipers (inside and outside)	57	3.09	.714	VA
25	Try-square	57	3.33	.873	VA
26	Screw Pith Gauge	57	1.02	.954	NA
27	Micrometer Gauge	57	3.33	.831	VA
28	Dial Indicator	57	2.18	.658	RA
29	Vanier Caliper	57	3.33	.764	VA
30	Vee Block	57	3.07	.821	VA
31	Spring Divider	57	2.12	.867	RA
32	Center Punch	57	3.16	.774	VA
33	Scriber	57	3.39	.796	VA
34	Hammers	57	3.05	.875	VA
35	Mallet	57	3.11	1.012	VA
36	Screw Driver	57	3.88	.983	VA
37	Bench Vice	57	3.07	.979	VA
38	Tool Maker Clamp	57	2.92	.1.061	SA
39	Spanners	57	2.91	1.005	RA

The result presented in Table 3 shows the mean and standard deviation of the availability of hand tools for the teaching of fabrication and welding in science and technical colleges. The values ranged from 1.02 to 3.60, thus , indicating that the participants' responses for item 23 to 27,29,30 and 32 to 37 fall around very available,28, 31 and 39, were rarely available while item 26 shows to be never available of hand tools. Also, the values of the standard deviation ranged from .658 to 1.061 which shows that the responses of the respondents' were clustered around the mean. It can therefore infer from Table 3 that science and technical were not adequately equipped with available hand tools for the teaching fabrication and welding.

Table 3: summary of t-test result on availability of machine tools and availability of hand tools of teaching fabrication and welding in respect to location

Hypotheses	Group	N	M	SD	t	Df	Sig.	Remark
H1	Urban	22	2.8636	.22046	-2.214	55	.493	NS
	Rural	35	2.9896	.20180				
H2	Urban	22	2.9895	.27885				

				-2.913	55	.475	NS
	Rural	35	3.1897	.23488			

The t-test analysis
Table 3: summary of t-test results on availability of machine tools and hand tools in respect to location.
The t-test analysis on Table 3 showed the outcomes for the urban and rural teachers and technologists on the availability of fabrication and welding instructional facilities. The t-test analysis of the responses of urban and rural teachers and laboratory technologists on the availability of machine tools revealed that no significant difference exist for all the 11 items M(2.8636, 2.9896) = t(-2.414, p=.493) therefore, the hypothesis of no significant difference was upheld for all the 11 items of the cluster. Furthermore, Table 3 showed the t-test analysis of responses on the availability of hand tools. The result revealed that the p-value is greater than 0.05 level of significance M(3.0836, 3.1614) = t(-1.111, p= .722). Therefore, the hypothesis of no significant location difference was upheld for all the 17 items of the cluster.

DISCUSSION

From Table 1, the findings of the study revealed that, lathe machines, grinding machines, drilling machines, folding machines and arc welding equipment indicating very available, sawing machines, kiln/blacksmith furnace and oxy-acetylene equipments shows rarely available while shaping machines, and shearing machines indicating sometimes available and milling machines was never available in the science and technical colleges for teaching of fabrication and welding. With respect to Table 2, the availability of hand tools, the finding revealed that, steel rules, calipers, try-square, micrometer gauge, Vanier caliper, vee-block, center punch, scriber, hammers, mallet screw driver and bench vice indicating very available in the colleges. Dial indicator, spring divider and spanner shows rarely available while tool maker clamp indicating sometimes available with screw pith gauge shows to be never available in the science and technical colleges for teaching of fabrication and welding.

CONCLUSION

The findings of the study has provided the basis for the researcher to conclude that most of machine tools, hand tools and other instructional equipment for teaching fabrication and welding were available but a good number of them were not properly utilized by the teachers. The findings also revealed that appropriate teaching or strategies to be employed in teaching of fabrication and welding in science and technical college were not used. Therefore, to achieve the goal of technical education in general which fabrication and welding is involved, all stakeholders (government, principals, teachers and even students) should device a very good strategies to ensure adequate provision and utilization of instructional facilities in for teaching fabrication and welding in science and technical colleges in Gombe State.

RECOMMENDATIONS

The following were the recommendations that should be considered for implementation

1. Government and other educational stakeholder should ensure adequate provision of instructional facilities for teaching of fabrication and welding in science and technical colleges.
2. Examination bodies such as NBTE, NABTEB/ Labor Trade Test should carry out prompt assessment of fabrication and welding instructional facilities in the science and technical colleges.

Limitations of the Study

In the process carrying out this study, the following limitations were identified

1. The study could not be able to have the exact number of the instructional facilities in each of the participating college, due to nature of the research instrument
2. The study could not give a good time to the researcher to observe how available instructional facilities were use in the teaching of fabrication and welding in the participating colleges.

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