Asian Journal of Education and Social Studies

31(3): 1-7, 2022; Article no.AJESS.88613
ISSN: 2581-6268

Up-skilling Metalwork Technology in TVET Institutions in Rivers State for Relevance in the 21st Century Work Place

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJESS/2022/v31i330747

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/88613

Original Research Article

Received 27 April 2022
Accepted 23 June 2022
Published 26 July 2022

ABSTRACT

The study examined the up-skilling needs of metalwork technology in TVET institutions in Rivers state for relevance in 21st century workplace. The study adopted the descriptive survey design. The population of the study was 174 respondents which comprised 67 lecturers and 107 instructors in metalwork/mechanical department. No sampling was done as the population was manageable. Two research questions and two hypotheses were formulated. A survey questionnaire was developed to elicit responses from the respondents. The instrument was structured on 4-point rating scale, which was validated by two experts. The reliability of the instrument was established using Cronbach Alpha Reliability Coefficient which yielded a reliability index of .84. Descriptive mean and standard deviation were used to answer the research questions and to determine the disparity in the responses of the respondent. While t-test was used to test the stated null hypotheses at .05 significance level. The study found that general skills in metalwork technology to be up-skilled include problem solving, ICT applications, creativity, and effective communication skills. Also the study found that machining operation skills that needed to be up-skilled includes turning skills, thread cutting skills, filing skills, grooving skills drilling, forging, welding, and fabrication. It was recommended among others that from time to time, there should be on-the-job- training for all technologists on the improvement of their practical skills, level of ICT application skill, leadership skills effective communication skills, creativity skills for effective workplace relevance in the 21st century in higher institutions in Rivers State.

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Keywords: Up-skilling; metalwork technology; machining operation; workplace.

1. INTRODUCTION

Tertiary institutions in Nigeria is in dire need of up-to-date skilled technologist for proper workplace relevance especially as it concerns machine operation in metalwork technology for students skill learning which in turn leads to national development. Metalwork technology is the application of scientific knowledge in the activity of making objects or machine parts out of metal in an artistic, machining, and or skillful way. In other words, it is the totality of all the process involved in the production of metal article most time with the use of various sensitive machines. Ehimen and Ezeora [1] opined that metalwork practice is one of the courses in technical education or engineering which aims at training skilled labour for self-reliance or paid jobs. More so, Ugbelu [2] described metalwork programmes 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.

The objective of technical education (metalwork technology) is to prepare a candidate to become independent and to increase their employability skill so that they will get accepted in the industries in turn leading to national development. In the field of metalwork technology, skills encompass everything that students need to succeed in the competitive and increasing complex world.

Those saddled with the responsibility of imparting skill in metalwork technology in tertiary institutions are the (lecturers and instructors). Pauline, Noor & King [3] stated that researches in teachers education has shown that lecturers and instructors practical skill competences are a prerequisite for effective teaching and learning because of its relation in students learning outcome. Similarly, Affero, Hassan, Alias & Hamzah [4] are of the opinion that study areas in technical education is a bit different from the existing educational system as technical education (metalwork technology) is more on hand and practical activity, hence the practical knowledge of the teacher often become a major concerns. These competences reflect knowledge, as well strategic and tactical skills that are required by metalwork lecturers and instructors [5].

In a study by Okwelle, Ajie & Beako [6] they observed that knowledge and skill facilitators in technical education in recent days (the 21st Century) lacks core practical skill required for relevance in their workplaces, as such needs up skilling. According to Mohammed & Saud (2016) up-skilling means upgrading of existing skill. The upgrading of skills can be accelerated by doing and joining programmes in other institutions or training centers. Succinctly, Okwelle et al. [6] emphasized that performance of teachers in technical education in general, is important for proper workplace performance and knowledge, especially to make learners more productive in the larger society. Also Ehimen [1] further opined that it is necessary to note that practical skills are very important to life, for among nation to service, the provider of goods and services must be practically skilled at a rate that should improve the living standard of the people. Hence, to sustain the pace of development in metal industry in Nigeria and the metalwork programme, there is need to inculcate in the graduates the skills needed to sustain the economic reality for sustainable employment [7] This 21st Century is characterized by rapid technological advancement and innovation, our lifestyles and ways of interaction has advanced significantly as digital technologies turn ubiquitous in our life as sensitive machines are now used in our workshops for learning [8]. Knowing fully aware that metalwork technology programmes in Nigerian school is designed to produce competent craftsmen in various metalwork trades. A graduate in this field is expected to operate effectively the various machines and perform other metalwork skills like welding, foundry, casting, metal forming and fabrication, and be productively employed in private practices or public industries [7]. For these expectation to be fully achieved in this 21st Century, the skill facilitator, need to be up-skilled with the requisite up-to-date practical knowledge and skills, need to demonstrate outstanding practical skills to enable the students understand and demonstrate orderly procedures for construction activities step by step. Erickson & Oliveri [9] identified the following skills as general skills needed by the technologist in this age: problem solving skills, information technology application skills, analytic skills, creativity/ innovative skills, effective communication skills, leadership skills, media /information literacy skills etc. In similar vein Amaechi & Thomas [10] revealed in their study that to high extent

practical skills in milling, shaping, planning, slotting, drilling, grinding, and turning are required by mechanical engineering trade students for self-reliance in a post covid-19 economy in Rivers State. These skills need to be up-skilled in 21st Century workshop machines operation which activities may include: turning operation i.e. plain or straight turning, rough turning, shoulder turning, taper turning, eccentric turning etc [11,12]. Facing operation, chamfering operation, knurling operation, thread cutting (internal and external) operation, filing operation, polishing operation, grooving operation, spinning operation, spring winding, forming, drilling operations, reaming operation, counter boring operation, cutting operation, fabrication, foundry, forging and so on.

The current trend of globalization has brought series of demands in employee skills in order to be able to meet with the need of the 21st Century workplace. Employers world-over require highly trained employees with academic, technical and employability skills in order to meet the demand of the ever-changing world of technology. According to Barnett (2015) employers need employees who can assimilate organization valve and operate comfortably with the technological and cultural demands of the 21st Century workplace.

Based on the foregoing, this research aims to ascertain metalwork technology skill areas that need up-skilling for relevance in 21st century workplace in a way of repositioning our TVET in tertiary institutions in for global competiveness.

1.1 Statement of the Problem

Generally, technologist plays pivotal roles in ensuring that graduates are skilled with excellent personality. Competent and skilled knowledge facilitators in metalwork technology are imperative for an effective teaching and learning process in TVET institutions [13,14].

However, Kennedy [15] observed that one of the challenges on needed skills by youths and individuals who graduate from this field in recent times (21st century) is skills mismatch; skills obtained through training and those required to create job often do not match, resulting in skill shortage and inappropriate placement. Lack of workplace skills as it concern metalwork technology such as machine operation, welding and fabrication, foundry and forging, creativity, critical thinking etc, are what the employers often complain about their new employees in recent time. Many people who have enrolled in metalwork technology in Nigeria higher institutions often find themselves with general or theoretical knowledge that does little to prepare them for the actual tasks they encounter on their job placement. This may likely lead to the production of graduates that may not fit in the 21st century work place.

Hence the problem of this study is what are the up-skilling needs of metalwork technology in the TVET institutions in Rivers State for relevance in the 21st century workplace?

1.2 Purpose of the Study

This study sought to unravel the up-skilling needs of metalwork technology in the TVET institutions in Rivers state for relevance in 21st century workplace. Specifically, the study would identify the:

1. General skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace.
2. Machine operation skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace.

1.3 Research Questions

The following research questions guided the study:

1. What are the general skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace?
2. What are the machine operation skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace?

1.4 Hypotheses

The following null hypotheses were tested at .05 level of significance.

1. There is no significant difference between the mean responses of lecturers and students on the general skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace.

2. There is no significance difference between the mean responses of lecturers and students on the machining operation skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace.

2. METHODS

The study adopted a descriptive survey design in conducting the investigation. The population for the study was 174 respondents which comprised of all 67 lecturers and 107 Instructors in the Department of metalwork/mechanical technology in five (5) tertiary institutions in Rivers State. The entire population was used as sample, because it was considered to be of is manageable size. The study adopted a questionnaire as instrument for data collection, consisting of 20 items for data collection. The instrument for the data collection was structured on a 5-point rating scale using the following options: strongly agree (AS), agree (A), disagree (D), and strongly disagree (SD). The reliability of the instrument was determined using the Cronbach Alpha Reliability test after administering it to 21 respondents in University of Uyo who were not part of the study. The instruments were face and content validated by two experts (Lecturers) in the department of Vocational and Technology Education, Rivers State University, Port Harcourt. Copies of the instruments were administered directly to the respondents by the researchers and their assistants. Mean and standard deviation were used to answer the research questions while t-test was used to test the hypotheses at .05 levels of significance. Mean value 3.00 was set as cut off point for mean less than 3.00 was rejected while mean value equal or greater than 3.00 was accepted.

3. RESULTS AND DISCUSSION

Research Question 1: What are the general skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace?

Data in Table 1 shows that the respondents had means ranging from 3.24-3.73 which is higher than the cut-off mean of 3.00. This means that respondents agree that all the general skills items needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace. Also the standard deviations ranges from .53 to .77 indicated that there was homogeneity in both the Lecturers and Instructors response.

Research Question 2: What are the machine operation skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace?

Data in Table 2 shows that respondents had means ranging from 3.42 - 3.79 which is higher than the cut-off mean of 3.00. This means that respondents agree that all the machine operation skills items needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace. Also the standard deviations ranges from .52 to .87 indicated that there was homogeneity in both the technologists and students response.

Hypothesis 1

There is no significant difference between the mean responses of lecturers and instructors on the general skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace.

Table 1. ***Mean scores of the respondents on the general skills needed to be up-skilled for relevance in the 21st century***

General skill needed to be up-skilled		Respondents 174	
S/N	**X**	**SD**	**RMK**
1 ICT application skill	3.46	.70	Agree
2 Problem solving skill	3.58	.63	Agree
3 Analytic skill	3.40	.74	Agree
4 Creativity skill	3.58	.63	Agree
5 Innovative skill	3.37	.77	Agree
6 Effective communication skill	3.73	.53	Agree
7 Media Information Literacy skill	3.24	.72	Agree
8 Working drawing interpretation skill	3.40	.71	Agree
Total	**3.47**	**.68**	**Agree**

Source: Field Survey. 2021. X =Mean; SD=Standard Deviation; RMK=Remark

Table 2. Mean scores of the respondents on the machine operation skills needed to be up-skilled for relevance in the 21st century

Metalwork skills needed to be up-skilled	Respondents (174)		
S/N	**X**	**SD**	**RMK**
9 Turning operational skill	3.57	.67	Agree
10 Machine facing operational skill	3.48	.74	Agree
11 Chamfering skill	3.52	.70	Agree
12 Knurling skill	3.54	.63	Agree
13 Thread cutting skill	3.79	.41	Agree
14 Grooving skill	3.69	.52	Agree
15 Spring winding skill	3.60	.62	Agree
16 Drilling skill	3.48	.61	Agree
17 Reaming Operational skills	3.48	.87	Agree
18 Counter boring skill	3.45	.61	Agree
19 Welding & fabrication skills	3.52	.58	Agree
20 Foundry & forging skill	3.42	.70	Agree
Total	**3.87**	**.70**	**Agree**

Source; Field Survey, 2021. X =Mean; SD=Standard Deviation; RMK=Remark

Table 3. T-test Analysis on the general skills needed to be up-skilled for metalwork technologist workplace relevance

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Group	N	X	SD	df	t-cal	t-crit.	decision
Lecturers	67	3.47	.68	172	.45	1.96	Accepted
Instructors	107	3.10	.59				

Table 4. T-test Analysis on metalwork skills needed to be up-skilled for metalwork technologist workplace relevance

Group	N	X	SD	df	t-cal	t-crit.	decision
Lecturers	67	3.87	.70	172	1.28	1.96	Accepted
Instructors	107	3.92	.60				

Table 3 shows that t(t-cal=.45), is less than the (t-crit=1.96). Hence, there was no significance in the mean responses of lecturers and instructors on the general skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace**.**

Hypothesis 2

There is no significance difference between the mean responses of lecturers and instructors on the metalwork skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace.

Table 4 shows that the calculated value of t(t-cal=1.28) was less than the critical value of t(t-crit=1.96). This implies that the null hypothesis which stated that there is no significance difference between technologist and final year students on the metalwork skills needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace, is upheld.

3.1 Discussion of Finding

Results in Table 1 revealed the respondents' unanimous agreement that, ICT application, problem solving, analytic, creativity, innovative, effective communication, working drawing interpretation, media information literacy skills amongst others are all the general skills that needed to be up-skilled. Furthermore, there was no statistical significant difference in the mean responses of lecturers and instructors on the general skills needed to be up skilled. This implies that general skills in metalwork technology needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace. This finding is in line with the view of Erickson & Oliveri [9] who identified that, general skills needed by the technologist in this age: Problem Solving Skills, Information

Technology Application Skills, Analytic Skills, Creativity/ Innovative Skills, Effective Communication Skills, Leadership Skills, Media /Information Literacy Skills etc.

Results in Table 2 revealed respondents unanimous agreement that machining operation skills, turning operation, machine facing skill, chamfering skills, knurling skills, thread cutting skills, machine grooving skill, spring winning skill, drilling skill, reaming, counter boring, welding and fabrication skills, foundry and forging skills are metalwork technology skills that needed to be up-skilled in the TVET institutions in Rivers State for relevance in the 21st century workplace. This finding is in line with Amaechi & Thomas [10] who revealed that to a high extent practical skills in milling, shaping, planning, slotting, drilling, grinding, and turning are required by mechanical engineering trade students for self-reliance in a post covid-19 economy in Rivers State. Similarly, Okwelle et al. [6] observed that the performance of teacher in technical education in general is important for proper workplace performance and knowledge, especially to make learners more productive in the larger society. This study also agree with Ehimen [1] that it is necessary to note that practical skills are very important to life, for among nation to service, the provider of goods and services must be practically skilled at a rate that should improve the living standard of the people.

4. CONCLUSION

Metalwork technologist at the tertiary institutions in the 21st century requires continuous on-the-job training on the trending changes in their field in other to enhance their knowledge and practical skills. Knowledge and skills enhancement through relevant courses as well as the sensitive machines operation is a continuous effort towards producing quality technologist. Technologist who has been trained in the development of professionalism display more positive attitude and enhanced efficiency in their job performance, therefore making them more relevance. Thus, it is imperative that metalwork technologist in tertiary institutions in Rivers State are provided with opportunities to attend relevant courses on the various sensitive machine operation, mentor mentee programmes, seminars, and industrial attachment programmes, locally or abroad, which can serve to develop their professionalism. The public skills training institutions should be impartial in their management to allow more technologists to attend such courses and gain exposure to the most recent technology. Therefore, the need for a competent and skilled technologist is imperative in today's 21st century work place.

5. RECOMMENDATIONS

1. There should a fund created in all tertiary institutions in Nigeria for the training (skilling) of new employees and retraining (up-skilling) of all lecturers and instructors on general skills needed for up-skilling for workplace relevance in the 21st century and for economic and national development
2. There should be a compulsory overseas and local on-the-job training on the trending machine operation skills such as welding and fabrication, foundry and forging, and machining, of the technologist yearly, for them to be abreast with the changing and current trend on machine tool operation.

CONSENT

As per international standard or university standard, respondents' written consent has been collected and preserved by the author(s).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/88613