Up-skilling Metalwork Technology for Relevance in 21st Century Workplace: Innovative Approach towards Repositioning TVET Institutions in Rivers State for Global Competiveness

Abstract

The study examined the up-skilling needs of metalwork technology for relevance in 21st century workplace as innovative approach towards repositioning TVET institutions in Rivers state for global competiveness. The study adopted the descriptive survey design. The population of the study was 174, which comprised 67 technologists (43 lecturers and 24 instructors) and 107 final year students of 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 was 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 hypothesis at .05 significance level. The study found that general skills in metalwork technology that needed to be up-skilled include problem solving, ICT applications, creativity, and effective communication skills. Also 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.

Keyword: up-skilling, metalwork technology, Machining operation, Workplace.

Introduction

Tertiary institutions in Nigeria is in dare 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 (2018) 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 (2015) 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.

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Those saddled with the responsibility of impacting skill in metalwork technology in tertiary institutions are the (lecturers and instructors). Pauline et al (2012) 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 et al (2016) 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 reflected, knowledge, as well strategic and tactical skills that are required by metalwork lecturers and instructors (Ali et al, 2013).

In a study by Okwelle et al (2017) 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 (2017) 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 (2018) 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 (Beako et al, 2018).

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 (Rebecca et al, 2017). Knowing 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 (Beako et al, 2018). 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 (2016) identified the following skills as general skills needed by the technologist in this age: problem solving skills,

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information technology application skills, analytic skills, creativity/ innovative skills, effective communication skills, leadership skills, media /information literacy skills etc. In similar vein Amaechi & Thomas (2021) 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 on 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. 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 is to ascertain metalwork technology skill areas that need up-skilling for relevance in 21st century workplace in a way of repositioning our TVET tertiary institutions in for global competiveness.

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.

However, Kennedy (2012) 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.

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Hence the problem of this study is what are the up-skilling needs of metalwork technology for relevance in 21st century workplace as innovative approach to repositioning TVET institutions in Rivers state for global competiveness?

Purpose of the Study

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

1. General skills that needed to be up-killed for relevance in the 21st century workplace to reposition TVET institutions in Rivers State for global competitiveness.
2. Machining operation skills that needed to be up-skilled for relevance in the 21st century workplace to reposition TVET institutions in Rivers State for global competitiveness.

Research Questions

The following research questions guided the study:

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

Hypotheses

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

Methodology

The study adopted a descriptive survey design in conducting the investigation. The population for the study was 174, which comprised of all 67 technologist (43 lecturers and 24 instructors) and 107 final year students 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 consisting of 20 items for data collection. The instrument for the data collection was structured on a 4-point rating scale using the following options: strongly agree (AS), agree (A), disagree (D), and strongly disagree (SD). The

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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 2.50test the hypotheses at .05 levels of significance. Mean value less than 3.00 was rejected while mean value equal or greater than 3.00 was accepted.

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Results and Discussion

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

Table 1: General skills that needed to be up-skilled for relevance

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General skill needed to be up-skilled		Technologist(67)			Students(107)		
S/N		X	SD	RMK	X	SD	RMK
1	ICT application skill	3.46	.70	Agreed	3.59	.62	Agreed
2	Problem solving skill	3.58	.63	Agreed	3.39	.64	Agreed
3	Analytic skill	3.40	.74	Agreed	3.49	.60	Agreed
4	Creativity skill	3.58	.63	Agreed	3.59	.59	Agreed
5	Innovative skill	3.37	.77	Agreed	3.52	.52	Agreed
6	Effective communication skill	3.73	.53	Agreed	3.64	.50	Agreed
7	Media Information Literacy skill	3.24	.72	Agreed	3.46	.69	Agreed
8	Working drawing interpretation skill	3.40	.71	Agreed	3.47	.58	Agreed
	Total	**3.47**	**.68**	**Agreed**	**3.10**	**.59**	**Agreed**

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

Data in table 1 shows that the respondents had means ranging from 3.10 - 3.73 which is higher than the cut-off mean of 3.00. This means that respondents agreed that all the general skills items needed to be up-skilled for relevance in the 21st century workplace. Also the standard deviations ranges from .50 to .77 indicated that there was homogeneity in both the technologists and students response.

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Research Question 2: What machining operation skills that needed to be up-skilled for relevance in the 21st century workplace to reposition TVET institutions in Rivers State for global competitiveness?

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Table 2: Operation skills that needed to be up-skilled for relevance

Metalwork skills needed to be up-skilled		Instructors (67)			Students (107)		
S/N		X	SD	RMK	X	SD	RMK
9	Turning operational skill	3.57	.67	Agreed	3.78	.48	Agreed
10	Machine facing operational skill	3.48	.74	Agreed	3.48	.58	Agreed
11	Chamfering skill	3.52	.70	Agreed	3.61	.50	Agreed
12	Knurling skill	3.54	.63	Agreed	3.57	.60	Agreed
13	Thread cutting skill	3.79	.41	Agreed	3.55	.57	Agreed
14	Grooving skill	3.69	.52	Agreed	3.72	.49	Agreed
15	Spring winding skill	3.60	.62	Agreed	3.48	.52	Agreed
16	Drilling skill	3.48	.61	Agreed	3.75	.49	Agreed
17	Reaming Operational skills	3.48	.87	Agreed	3.55	.75	Agreed
18	Counter boring skill	3.45	.61	Agreed	3.45	.61	Agreed
19	Welding & fabrication skills	3.52	.58	Agreed	3.72	.45	Agreed
20	Foundry & forging skill	3.42	.70	Agreed	3.51	.55	Agreed
Total		**3.87**	**.70**	**Agreed**	**3.92**	**.60**	**Agreed**

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

Data in Table 2 shows that respondents had means ranging from 3.42 - 3.78 which is higher than the cut-off mean of 3.00. This means that respondents agreed that all the machining operation skills items needed to be up-skilled for relevance in the 21st century workplace. Also the standard deviations ranges from .41 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 students on the general skills that are needed to be up-skilled for metalwork technologist workplace relevance in the 21st century in tertiary institutions in Rivers State'

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

Group	N	X	SD	df	t-cal	t-crit.	decision
Technologist	67	3.47	.68	172	0.45	1.96	Accepted
Students	107	3.10	.59				

Data from table 3 above revealed that t-calculated is less than the t-critical value 1.96. Hence, there was no significance In the mean responses of technologist and final year students on the general skills needed to be up skilled for metalwork technologist workplace relevance in the 21st century in tertiary institutions in Rivers State.

Hypothesis 2

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There is no significance difference between the mean responses of lecturers and final year students on the metalwork skills that are needed to be up-skilled for metalwork technologist workplace relevance in the 21st century in tertiary institutions in Rivers State.

Table 4, t-text Analysis on metalwork skills needed to be up-skilled for metalwork technologist workplace relevance.

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

Table 4 showed 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 for metalwork technologist workplace relevance in the 21st century in tertiary institutions in Rivers State, is upheld

Discussion of finding

Results in table 1 revealed the respondents unanimous agreement that, ICT application (3.34), problem solving (3.58), analytic (3.40), creativity (3.58), innovative (3.37), effective communication (3.73), working drawing interpretation (3.40), media information literacy skills (3.24) amongst others are all the general skills that needed to be up-skilled for relevance in the 21st century workplace to reposition TVET institutions in Rivers State for global competitiveness. This finding is in line with the view of Erickson & Oliveri (2016) 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 (3.57), machine facing skill (3.48), chamfering skills (3.52), knurling skills (3.54), thread cutting skills (3.79), machine grooving skill (3.69), spring winning skill (3.60), drilling skill (3.48), reaming (3.48), counter boring (3.45), welding and fabrication skills (3.52), foundry and forging skills (3.42) are metalwork technology skills that needed to be up-skilled for relevance in the 21st century workplace to reposition TVET institutions in Rivers State for global competitiveness. This finding is in line with Amaechi & Thomas (2021) 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 (2017) 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 (2018) that it is necessary to note that practical skills are very important to life, for among nation to service, the

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provider of goods and services must be practically skilled at a rate that should improve the living standard of the people.

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. For the need for a competent and skilled technologist is imperative for an effective teaching and learning process in metalwork technology in this age.

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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 skills as it concern 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.
3. There should be memorandum of understanding between tertiary institutions on the need to request for already up-skilled technologist to tertiary institutions where technologist are yet to be up-skilled on relevant metal work areas.

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