

## RE-SKILLING NEEDS OF WOOD TECHNOLOGISTS TOWARDS SUSTAINABLE ENVIRONMENTAL PROTECTION IN NIGERIA

R. O. Okwori<sup>1,\*</sup>, J. D. Enemali<sup>2</sup>, W. B. Kareem<sup>3</sup>, F. A. Ogunsola<sup>4</sup>, M. Abdulkadir<sup>5</sup> and D. Ibrahim<sup>6</sup>  
<sup>1,3,4,5,6</sup>*Department of Industrial and Technology Education, Federal University of Technology, Minna*  
<sup>2</sup>*Department of Vocational and Technology Education, Abubakar Tafawa Balewa University, Bauchi*

\*Corresponding E-mail: [okworirobert@yahoo.com](mailto:okworirobert@yahoo.com) (Tel: +2348060966524)

*Abstract: Re-skilling boosts the morale of workers towards better performance in the organization. Re-skilling aids workers to improve their skills and knowledge which enhances their performance in their places of work. Failure in periodic re-skilling of technologists affects their performance across the globe. Hence, this paper explained extensively the needs for re-skilling wood technologists for sustainable environmental protection in Nigeria. The paper identified areas wood technologists need to be re-skilled in order to protect the environment. These areas include roof design and construction (carpentry), joinery work, use of woodworking machines, tree planting, tree pest and disease control.*

*Keywords: Re-Skilling, Wood Technology, Sustainable Environmental Protection*

### Introduction

Skill according to Hornby (2000), is the ability, experience and knowledge to be able to do well. It can therefore be deduced from this expression that skill is an acquired knowledge associated with ability to perform in a practical term which may involve subjecting a material to manipulation to produce an item using hands and equipment. Technologists are laboratory workers in charge of tools, materials and equipment used for practicals. They are also charged with the maintenance of tools and equipment. Turkman (2005) referred to technologist as a specialist who satisfies societal needs by exploiting modern technologies and environmental conservations and also works in a formal sector of the economy. Wood technologists are specialists that work to determine composition, properties, behaviour, utilization, development, treatment and processing of wood and wood products. They analyze physical, chemical and biological properties of wood, study method of curing wood to determine the best and most economical procedure, develop and treating methods (seasoning), preservation and resistance to wear, fire, fungi, insects and marine borers. They conduct tests to determine the ability of wood adhesives to withstand water, oil penetration, temperature extremes and ability, strength and hardness of wood under varieties of conditions (Tan, 2000). They were trained in polytechnics, monotechnics and other relevant tertiary institutions where they are made to take course in forestry studies, carpentry and other wood related courses during their course of study and obtain National Diploma and Higher National Diploma certificates. The contribution of wood technologists in national economy is of a great importance, they are involved in tree protection, research work into re-creational environment and environmental protection, construction of wood products and as well maintenance of tools, equipment and workshop management. However, the wood industry is undergoing a lot of transformation as a result of technological development in wood tools and equipment (Kareem & Okwori, 2018). Similarly, wood technologists are faced with various challenges in the performance of their duties and this calls for acquainting them with modern wood processing so as to keep them updated and be relevant in their jobs. Some of the areas where wood technologists need re-skilling are carpentry works, tree planting, harvesting, and re-planting skills towards sustainable environmental protection in Nigeria.

### Concept of re-skilling need

The term skilling has been defined in various ways by several authors for example Jackson and Schuler (2003) defined skilling as improving competencies presently needed by individuals. Training is also described as acquisition of knowledge, skills and ability to enable individual function optimally in the performance of the careers and as well for development and growth of nation (Olumukoro & Marbel, 2012). However, skilling and re-skilling has always been discovered

and known to be a universal remedy that helps to improve performance of workers. Skilling and re-skilling are set of activities planned and arranged to assist individual in the industries or related field to acquire knowledge, skills, right attitude and services as enthusiasm to enhancing the effectiveness of the performance in a specific task (Imhabekhai, 2000). Every career requires skilling and re-skilling at all levels in the organizations since it can be used to develop mental ability, dexterity, skills and renew or update of workers at all levels. Momoh (2012) did classified types of training and re - training (re-skilling) techniques into three categories, namely; on - the - job techniques, formal techniques and executive techniques. Also, in the context, the major forms of training and re - training for craftsmen are in - service training and formal training (Olomukoro&Marbel, 2012). In other words, retraining is a development encompasses the revitalization of workers' knowledge, attitude, skills, competences and work habits to enable them perform optimally to the expectation of their employers (Imhabekhai, 2000). Re-skilling can also be said to mean re- training and as a result changes occur during the process. The need to retrain or up-grade skill otherwise known as train again is an indication of occurrence of discrepancy (Needs). The reason for re-skilling is to bring about transformation in performance of the technologists which is planned based on needs (Kareem & Okwori 2018). This kind of re-skilling takes place in a formal settings which include, tertiary institutions, UNESCO Nigeria Technical Vocational Education project North Central Nigeria, National Agency for Science and Engineering Infrastructure (NASeni), the National Directorate of Employment (NDE), Federal Ministry of Labour and Productivity and industries among others.

### **Re-skilling needs of wood technologists for sustainable environmental protection**

Technologically, re-skilling needs should be related to the technological problems and should provide answer to technological problems. The only way to achieve this is to re-train wood technologists in all the wood technology courses taken during their course of studying especially in the area of sustainable environmental protection. These areas of retraining needs include re-training in carpentry and joinery work, tree planning and re-planting, seed selection and dressing, bed preparation, maintenance of trees, and harvesting among others (Okwori, 2012). The professional areas of wood that need re-skilling by wood technologists includes carpentry works, design of various roof to aid in breaking wind to protect the environment. These includes gable or pitch roof, hipped roof, shed roof and mansard roof for residential houses, market store, bus parks shed. Other areas are shopping complex, stadium, recreational environment and public places. High roof is essential for breaking wind and if properly constructed it cannot easily be blown by wind. In the light of the above, the technologists will need re-skilling in selection of appropriate timber, appropriate joints for rafters, beams, king posts, nailing skills, application of preservative and finishing on interior works and skill in trimming the roofing sheets. Wood technologists also need re-skilling in tree planting, this includes bed preparation Skills such as tilling of the soil, fertilizer application (Natural or Artificial) that is, the use of manure and fertilizer using manual mechanical application, skills in planting or transplanting. They also need re-skilling in maintenance of tree, pest and disease control. Pests and diseases affect the proper growth and health of trees.

### **Re-skilling needs in tree planting towards sustainable environmental protection**

Trees are infested with diseases as a result of some reasons emanated from lack of proper skill in planting and nurturing of the tree. When trees are planted very close to each other without enough space, the branches of trees or shrubs touching each other allow spreading of diseases (Okwori, 2012). Controlling insects and pests infesting forest trees is very important. The following are outlined for controlling tree insects and pests in the forest. All residues in the forest need to be cleared as this will prevent attraction of insects and pests. Also, all branches and leaves cut from the plants should be removed from the forest. Note that once trees are infested, it is only chemical that is effective in bring them back to life. This is because infested trees need applications of

insecticide which needs knowledge and skill for effective application by wood technologists for sustainable environmental protection.

**Re-skilling needs in carpentry and joinery towards sustainable environmental protection**

A study was conducted on Evaluation of practical skills possessed by woodwork graduates of technical colleges in Niger State, Nigeria by Okwori, Adamu and Odo (2013) and objectives of the study was to determine the level of skills possessed and the extent in the use of woodworking hand tools by graduates produced by the technical colleges. The finding of the study showed that woodwork graduates of Niger State technical colleges possess skills in the use of some powered machines except band saw machines, tenonning machine, mortiser and thicknesser and mortiser. However, the graduates need re-skilling in the use of an identified machines such as modern lathe machine and Computer Numeric Control (CNC) machine that they cannot put into use to enable them function effectively in environmental protection projects. The study recommended that Government should intensify efforts in the provision of modern tools and equipment for improving practical skills of woodwork students.

**Study focus**

A research was conducted on up-skilling needs of woodwork technologists in tertiary institution in North central, Nigeria by Kareem & Okwori (2018). The study determined the skills required, the skill possessed and up-skilling needs of technologists in Colleges of Education, Polytechnic, Mono-technic and Universities with NCE, B.Tech/B.Sc and HND qualifications within the study of area. The finding of the study showed that fifteen (15) items out of forty-two (42) showed a level of significant difference which indicates areas of skill improvement needs by technologists. The finding also shows that technologists with degree and NCE needed more skills in various items than those with H.N. D qualification, this finding was due to the fact that the H.N.D holder had more practical experience than NCE & B.Sc/B.Tech holders during their course of study. The result of the study is in Table 1.

**Table 1: Mean and z-test of Skill Required and Possessed by the Woodwork Technologists for Optimal Performance in Woodwork Technology in Tertiary Institutions in the North Central Nigeria**

S/N	ITEMS	$\bar{x}_1$ N=101	$\bar{x}_2$ N=101	SD <sub>1</sub>	SD <sub>2</sub>	Sig.	Remark
<b>Skills in General Woodworking</b>							
1.	Classifying of wood into hard and soft wood.	3.62	2.96	1.35	1.44	0.01	S
2.	Identification of both physical and mechanical properties of timber and its characteristics	3.60	2.76	1.13	1.30	0.01	S
3.	State technical names for marketing wood.	3.71	2.59	1.13	1.39	0.09	NS
4.	Identification of wood defects both natural and artificial.	3.62	2.62	1.26	1.24	0.38	NS
5.	Identification of types of wood preservative.	3.62	2.62	1.27	1.16	0.11	NS
6.	Treat wood with relevant preservative.	3.83	2.50	1.18	1.27	0.37	NS
7.	State the process of manufacturing board and its application.	3.62	2.35	1.27	1.15	0.07	NS
8.	Produce a detailed drawing and transfer details to a full size set out	3.86	2.65	1.13	1.14	0.01	S
9.	Utilization of factors of a good design.	3.81	2.73	1.18	1.36	0.07	NS
10.	Design works with emphasis on	3.80	2.54	1.04	1.15	0.00	S

S/N	ITEMS	$\bar{x}_1$ N=101	$\bar{x}_2$ N=101	SD <sub>1</sub>	SD <sub>2</sub>	Sig.	Remark
	construction techniques.						
11.	Sharpen saws and other cutting tools	3.71	2.74	1.28	1.35	0.09	NS
12.	Prepare bill of materials	3.61	2.43	1.36	1.24	0.23	NS
13.	Read and interpret drawings to determine materials required for construction.	3.74	2.51	1.15	1.19	0.11	NS
14.	Restores a structure to a former state in all aspect of woodwork.	3.78	2.51	1.03	1.17	0.01	S
15.	design based on elements and principles of good design	3.66	2.35	1.10	1.09	0.02	S
16.	Mix pigments, oils and other ingredients to obtain the required colour	3.69	2.53	1.14	1.30	0.32	NS
	Skills in Joinery Work						
17.	Mark off and produce the joint commonly used in the profession, such as mortise and tenon joints, halving joints, cut housings; bridle joints; and angle bridle joint	3.65	2.71	1.27	1.22	0.03	S
18.	Set off and construct framed; ledged and braced doors, and framed for transparent roof sheets in buildings	3.72	2.82	1.21	1.20	0.00	S
19.	Identification of various types of wood adhesives, abrasives and wood finishes.	3.69	2.67	1.10	1.20	0.00	S
20.	Apply preservatives to joints and frames	3.57	2.52	1.17	1.33	0.38	NS
21.	Carryout trial assembling of joints	3.65	2.43	1.33	1.28	0.96	NS
22.	Apply adhesives to joints	3.83	2.57	1.10	1.22	0.06	NS
23.	Nailing of joints together perfectly joints	3.67	2.50	1.17	1.08	0.01	S
24.	Cleaning of excess glue from the joints	3.76	3.13	1.16	1.45	0.00	S
	Skills In Carpentry Work						
25.	Construct roof that are high to serve as wind breaker	3.56	2.54	1.27	1.34	0.11	NS
26.	Construct facial board and fixed to the rafters	3.71	2.73	1.26	1.30	0.02	S
27.	Nail roofing sheets to rafters	3.72	2.54	1.13	1.25	0.21	NS
28.	Trim roofing sheets	3.44	2.47	1.24	1.25	0.13	NS
29.	Erect a free standing scanford in a safe manner	3.90	2.62	1.13	1.17	0.01	S
30.	Locate and construct building geometry (roofs, centre for archies, beams and others).	3.70	2.60	1.20	1.19	0.11	NS
31.	Ability to set out for big and small building	3.82	2.42	1.17	1.21	0.53	NS
	Skills in Machine Woodworking						
32.	Identification of modern woodworking tools.	3.70	2.62	1.21	1.31	0.33	NS
33.	Observe simple rules in the use of machine and equipment	3.50	2.79	1.37	1.31	0.13	NS
34.	Carryout various types of maintenances of wood.	3.47	2.51	1.27	1.25	0.50	NS
35.	Use modern powered methods of finishing	3.66	2.41	1.22	1.17	0.57	NS

S/N	ITEMS	$\bar{x}_1$ N=101	$\bar{x}_2$ N=101	SD <sub>1</sub>	SD <sub>2</sub>	Sig.	Remark
	wood.						
36.	Service and repair tools and equipment used in wood laboratory or workshops.	3.71	2.61	1.13	1.26	0.02	S
37.	Take inventories, replacements, installation and dismantling of equipment.	3.65	2.47	1.23	1.19	0.23	NS
38.	Install machinery and equipment according to lay out plans, blueprints, and other drawing in Industrial establishment or schools	3.89	2.45	1.25	1.20	0.26	NS
39.	Operate CNC lathe, router, drill machines to perform operations such as turning, facing and many other	4.30	1.70	1.11	1.08	0.08	NS
40.	Operate glue-size machines	3.72	2.71	1.26	1.30	0.00	S
41.	Operate one or more manual or power-fed woodworking machines for surfacing, sizing, joint construction, cutting tongues, groves, bevels, beads or molding patterns.	3.74	2.32	1.21	1.18	0.74	NS
42.	Operate band saw machines, circular saws, thickness and mortise	3.63	3.02	1.28	1.40	0.02	S

**Key:** N = Number of Respondents,  $\bar{x}_1$  = Mean of Skill Required,  $\bar{x}_2$  = Mean of Skill Possessed, SD<sub>1</sub> = Standard Deviation of Skill Required SD<sub>2</sub> = Standard Deviation of Skill Possessed, Sig. = Level of Significance, S = Significant, NS = Not Significant.

The table above presents the analyzed the outcome on the skill required, skill possessed and the up-skilling needs by woodwork technologists in tertiary institutions in north central, Nigeria.

The skill required shows that the respondents required up-skilling in all 42 items with an average mean of 3.10. However, the mean result ranging from 3.44 to 4.30 as displayed in the table, is an indication that all the presented items are required skills by woodwork technologists and are within the range of moderately required at required levels. Also, the standard deviation outcome ranged from 1.03 to 1.35 indicated that the technologists have closer opinion in their responses to the items. In other words, the technologists have similar view on the woodwork skills required for optimal performance in their tasks.

The skill possessed by woodwork technologists showed that the respondents possessed skill slightly and moderately with mean range of 1.70 to 2.96. The average mean of skill possessed by the technologists is 2.33 (moderately possessed). This implies that the respondents possessed some level of skills in woodwork technology that actually made them employable but the skills possessed are very low. The standard deviation on skill possessed ranged from 1.03 to 1.35 which shows that the respondents share similar view on the skill possessed in woodwork technology, this is noted in the closeness of their responses as indicated by the standard deviation.

The z-test of the mean contrast between the skill required and skill possessed showed that there are significant differences in 16 items. This implies that the respondents have different opinions in their ratings of the items in terms of needs which is an indication that technologists need up-skilling at different levels in 15 items which are 1,2,8,10,14,15,17,18,19,23,24,26, 29,36, 40 and 42.

### Federal environmental protection (FEPA) in Nigeria

Federal environmental protection agency (FEPA) act of 1988 was established by decree 55 of Dec 30<sup>th</sup> 1988. FEPA was vested with the statutory responsibility for overall protection of the environment. The FEPA decree covers all sectors that deals with environmental issues. The decree

contains penal provisions against offenders discharging hazardous substances in harmful quantities into the air, land and water. The decree requires FEPA to issue environmental guidance and standards for the abatement and control of all forms of waste management. This guideline was launched in 1990. In 1991, FEPA established an inspectorate and enforcement department with division for standard regulation, chemical tracking and compliance monitoring waste management. All these were directed by exercising control and preventing hazard towards environmental protection in Nigeria (FEPA, 1988). Environmental protection law was recently put in place by some states. These are laws or Edicts which make provision for the control of certain environmental issues (Gasali, 2017). These issues include Tree planting, cleaning gutters, enhancing the aesthetic quality of the environment nutshell. The purpose of these legislations is to make provisions towards the improvement of environmental quality of the states in line with the objective of the policy on Environmental and FEPA act. Cross River State for example legislated an edict on Environmental protection Agency Edict No 4 of 1996 as well as Enugu State Environmental project Agency Edict, No 2 of 1996. It was enacted by these states in order to provide law for the sustainable environmental management in terms of monitoring control of gaseous and other wastes discharged into the state environment so as to manage them towards environmental protection.

## Conclusion

There is no doubt about the fact that technologists across the globe need to be updated in their skill performance. This is because technological changes and advancement is evident in the society. This paper addressed the re-skilling needs of wood technologists for sustainable environmental protection in Nigeria. The paper identified areas of re-skilling by wood technologists which includes carpentry work, tree planting and its maintenance among others.

## Recommendations

1. The education stakeholders such as federal and state Ministry of Education should give needed attention to technology education by way of providing adequate funding for the skilling and re-skilling of wood technologists towards sustainable environmental protection.
2. The organization should partner with NGO and industries for the re-skilling of technologists towards environmental protection.
3. Educational institutions and other organizations should organize a periodical re-skilling programme for technologists in order to protect the environment effectively.
4. The practical period in technical institutions should be adequate, so as to enable the learners acquire necessary practical experience during the course of study in order to protect the environment effectively after graduation.

## Reference

- Federal Environmental Protection Agency (FEPA) (1989). *National policy on the environment*. 22
- Gasali S. A. (2016). *Evaluation of Automobile Waste and Disposal in Federal Capital Territory, Abuja and Niger State, Nigeria*. Unpublished Doctoral Degree Thesis, Federal University of Technology, Minna.
- Imhabeckhai, C.I. (2000). Manpower training and re-training for effective health care delivery. *Benin Journal of Education Studies*, 12(13), 1-8.
- Jackson, S.E., & Schuler, R.S. (2003). *Managing human resources through strategic partnership*. South-Western Pub.
- Kareem W.B & Okwori R.O. (2018), Assessment of Woodwork Technology upskilling needs using discrepancy model in Tertiary institution in North Central, Nigeria. Proceedings of international conference on education development and innovation (INIEDI). *Methodist University College, Ghana*. 105-116.

- Momoh, T. (2012). *Classification of types of training and re-training techniques*. (1<sup>st</sup> Edition). Lagos: Efuwa Media Association
- Okwori, R. O. (2012). Preservation of forest trees against pests and insects. *International Journal of Modern Botany*. 2(4), 92 – 96
- Okwori, R.O., Adamu, M. M., &Odo, I, M. (2013). Evaluation of practical skills possessed by woodwork graduates of technical colleges in Niger State, Nigeria. *Multilingual Academic Journal of Education and Social Sciences*, 1(2), 73-85.
- Olumukoro, C.O., &Marbel, O. (2012). Training and retraining Nigeria workers to enhance task performance. *Interdisciplinary Journal of Contemporary Research in Business*, 4(1), 69-80
- TAN, C.Y (2000). *Furniture industry in Malaysia:with special reference to SMIs*. Paper presented at the workshop on enhancing SMI participation in the furniture industry. Retrieved on 9<sup>th</sup> October, 2015 from [repository.um.edu.my/14802/1/BoonKwee%26ThiruFPE.pdf](http://repository.um.edu.my/14802/1/BoonKwee%26ThiruFPE.pdf)