International Journal of Mechanical and Civil Engineering
ISSN: 2689-940X
Volume 7, Issue 1, 2024 (pp. 98-115)
www.abjournals.org

DEVELOPING PLASTERING SKILLS APPROPRIATE BY BUILDING CONSTRUCTION STUDENTS FOR SELF-EMPLOYMENT IN TECHNICAL COLLEGES IN SOUTHERN SENATORIAL DISTRICT OF CROSS RIVER STATE

Ebeten Bassey Otu (Ph.D.)

Department of Vocational and Technical Education, University of Cross River State, Calabar, Nigeria.

Email: otuebeten@gmail.com; Tel.: 08062699590

Cite this article:

Ebeten B. O. (2024), Developing Plastering Skills Appropriate by Building Construction Students for Self-Employment in Technical Colleges in Southern Senatorial District of Cross River State. International Journal of Mechanical and Civil Engineering 7(1), 98-115. DOI: 10.52589/IJMCE-24AFX7FT

Manuscript History

Received: 29 Jan 2024

Accepted: 25 Apr 2024

Published: 28 May 2024

ABSTRACT: *This study sought to develop and validate plastering skills appropriate by building construction students for self-employment in Technical Colleges in Southern Senatorial District of Cross River State. The research design that was employed for this study was descriptive survey research design. The study was carried out in five local government areas in . The population for the study wads 672 e dress sdColleges in the , seven experts (lecturers) (four from University of Cross River State and three from College of Education, Akamkpa) and 653 masons from the 42 registered building construction companies in the Southern Senatorial District of Cross River State. The sample size used for the study was 250. This comprised 12 building construction teachers, seven experts and 231 masons from the 42 registered building construction companies in the district. Teachers and experts were not sampled; however, simple random sampling was used to sample 231 masons. The instrument that was used for data collection was researcher structure questionnaire titled: "Plastering Skills Appropriate by Building Construction Students for Self-employment (PLASABUCONSSE)." The instrument contained 31 items, 5 points Likert type scale. Cronbach Alpha reliability was used to determine the internal consistency of the instrument which yielded a reliability coefficient of 0.85. The data collected were analyzed using mean, standard deviation and One Way Analysis of Variance (ANOVA). Mean and standard deviation were used to answer the research questions while ANOVA was used to test the null hypothesis at .05 level of significance. Items with mean of 3.00 and above were considered appropriate while items with mean below 3.00 were considered not appropriate. From the study, 14 items out of 16 lime plastering tasks were considered appropriate for lime plastering skills for self-employment while 13 items out of 15 cement plastering tasks were considered appropriate for cement plastering skills for self-employment. Conclusions were drawn and, based on the findings, it was recommended among others that The National Board for Technical Education (NBTE) as well as sister agencies should adopt the developed plastering tasks for teaching plastering skills in building construction.*

KEYWORDS: Development, Plastering, Skills, Building Construction, Self-employment, Technical Colleges.

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

International Journal of Mechanical and Civil Engineering
ISSN: 2689-940X
Volume 7, Issue 1, 2024 (pp. 98-115)

www.abjournals.org

INTRODUCTION

Plastering skills in buildings are aspects of the job areas in Building Construction curriculum that is taught in Technical Colleges. It is the outer surface of a building which is easily visualized or seen by people. Lack of good plastering can affect the value attached to a building. The authors further stated that lack of good finishing can affect the psychology, appreciation, aesthetics and the atmosphere around the buildings. Building construction finishing skills are aimed at training and imparting necessary skills leading to the production of craftsmen who will be self- reliant and enterprising in the building industry (NBTE, 2003).

Plastering skills embedded in Building Construction are part of the subjects by which students are examined by the National Business and Technical Examination Board (NABTEB) based on the NBTE curriculum for the award of National Technical Certificate (NTC). Plastering skills comprise different areas which require varying skills to perform them. The plastering areas considered include lime plastering and cement plastering.

Plastering is the application of a mixture of lime or cement, sand and water (mortar) on uneven exposed wall surface. The application of these mortars gives a building a good, appreciable and final appearance. It is aimed at equipping students with the necessary finishing skills as technicians in the construction/building industry. Teachers are expected to teach and perform practicals of lime and cement plastering so that students can learn and acquire these skills. This is very important if students must excel in this area.

However, employers of labour have continued to express worry over the quality of graduates of Technical Vocational Education and training institutions in Nigeria who are experiencing set-backs due to lack of relevant skills for employment and workplace participation. According to Adamu (2009), in Kano State (where most of the industries in the North are situated), employers decried the low performance of their employees especially those from Technical Colleges. Most Technical Education graduates have not been able to gain employment in their respective fields of training due to deficiencies in relevant skill areas. Unemployment among students, especially graduates, has led to increasing and serious social problems in Nigeria. Abanyam *et al.* (2016) perceived that it is very pathetic to see Technical Vocational Education and Training (TVET) students and graduates hovering everywhere in search of non-available jobs, when they should be at the forefront of job creation. Attempts by students and graduates to free themselves from problems of unemployment and poverty, often lead youths to involvement in criminal activities (Ozoemena, 2013).

Students of Building Construction are expected to possess these plastering skills for effective participation in the world of work. But Technical College students still graduate without employable skills though the building construction curriculum has up to 60 percent practical skills content (Cyril *et al.*, 2014). Carnevale *et al.* in Moses *et al.* (2014) stated that Technical School graduates should acquire academic and technical skills that would afford them employment and sustain their longevity to be competent and proficient in a complex work environment. After graduation, students are expected to acquire relevant knowledge, skills, initiative and creative abilities for self-reliance or to secure sustainable jobs in industries.

Plastering skills consist of practical skill activities which form a major part of instruction and assessment. Practical skill is an organized and coordinated form of physically observable activities exhibited in the process of carrying out tasks in Vocational and Technical Education

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

and other related fields (Padelford in Okwelle & Okeke, 2012). Afeti in Otu and Usoro (2017) posited that the quality of training in Technical Vocational education institutions in Nigeria is low with undue emphasis on theory and certification rather than on skills acquisition and proficiency testing. Constant involvement of students in coordinated practical activities would build confidence, satisfaction, feeling of mastery and pride. There are many types of plastering but, for this study, two are considered: lime plastering and cement plastering.

Okoro in Ogbuzuro (2011) asserted that graduates need necessary building skills in order to take up jobs in industries. In order to reduce unemployment among Building Construction graduates and for them to contribute their quota to the development of the nation, the teaching of building plastering skills must be practical based.

However, the method of performing practical skills is subjective and prone to abuse by raters (Eggah, 2010). The reason for the lopsided practice by the teachers could be that they lack the necessary practical skills for carrying out the various stages of finishing skills and the definite procedures for teaching these skills. Practicals in TVET require teachers to perform tasks and not just answer questions, and this is the most credible and appropriate method for teaching and acquiring skills. Students are expected to perform these tasks during internal and external examinations after observing their teachers. NABTEB uses a marking checklist to grade students' practicals in National Technical Certificate Examination (NTC) (Okwelle & Okeke, 2012; Cyril *et al.*, 2014). It does not prepare and give detailed highlights of the various stages of specific operational skills involved in the process of carrying out practical tasks.

In order to improve on the level of skill acquisition by students in Building Construction, especially building finishing, there is a need to develop valid and reliable instructional packages which would be used by teachers for teaching building construction finishing. Such packages have been developed and validated in other trades in Technical Education such as lathe machine operations, mechanical engineering trade, metal drilling, radio and television systems, auto- electricity/electronics maintenance, carpentry and joinery, motor vehicle mechanics, sand casting (Dangana, 2010; Cyril *et al.*, 2014; Idris, 2014; Ombugus & Ogbuanya, 2014; Alpha, 2013; Okwelle & Okeke, 2012; Adamu *et al.*, 2015; Bukar, 2006; Chiejile, 2006; Yalams, 2005; Okeke, 2004; Mohammed, 2016; Robert, 2018). Literature available to the researcher indicates that no such instrument has been developed and validated for use in teaching practical skills in building finishing in Technical Colleges in Cross River State. Hence, it became necessary to develop and validate instructional packages for teaching Building Construction finishing tasks that would contain step by step details of operational skills.

Development on the other hand has been defined in different ways: educational, economic, physical, social and mental wellbeing of people and nations. Adenle and Olukayode (2007) viewed development in human society as a complex, many-sided phenomenon that means different situations to different thinkers. Development, according to Rawson (2014), means to build something or make something grow. Ingwu (2003) defined development as change from traditionalism to modernism, that is, a change from the traditional cultural practices to a modern way of thinking and doing things following discoveries in science and technology. It could also mean development of structures such as houses, well equipped and functional schools, airports, tourist sites, good roads, sports, bridges, banks, studia, good security network employment opportunities as well as development of people in terms of education attained and skills possessed. The author further supported that development could be in the form of improved

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

sanitation, well equipped and functional hospitals, better housing, good transportation system, good and functional educational system and enhanced quality of life of the people. Therefore, development in this work represents skillful personnel, quality service delivery and modern buildings with good finishing.

Lime Plaster: Before the nineteenth century when Portland cement was not manufactured, the matrix then was lime (Barry, 2000). Lime is mixed with sand and water in the proportion of 1 part of lime to 3 parts of sand (1:3) by volume, and mixed with water as a finish coat. As lime plaster dries and hardens, it shrinks and fine hair cracks may appear on the surface. To restrain shrinkage and to reinforce the plaster, long animal hair is included in the wet undercoat mix, with 5 kg of hair used for every square metre of the lime undercoat (coarse stuff) (Emmitt & Gorse, 2010). The resulting haired, coarse stuff is plastic and dries out and hardens without appreciable shrinkage and cracking. Barry affirmed that lime has been replaced by Portland cement for undercoats and gypsum plaster for both undercoats and finishing coat. It is used in the restoration and preservation of older buildings.

Cement Plaster: Today, with the manufacturing of Portland cement, the commonest matrix used is cement. Cement plaster is a mixture of cement, sand and water used for bonding brick and block walls, plastering, flooring and partitions. Cement plaster uses cement as the binding agent. It is water resistant (not waterproof); it is weather resistant and it is typically built up in two or three coats to 5/8″ or 7/8″ thickness (Whitacre, 2018). It is used on a strong background as 1 part of cement to 3 or 4 parts of clean washed sand (1:3 or 1:4) (Emmitt & Gorse, 2010). A wet mix of cement and clean sand (sharp sand) forms a very hard surface as it sets, but it is not plastic and it requires a deal of labour to spread (Barry, 2000). It is therefore necessary to add a plasticiser or lime to the wet mix in order to obtain a mixture that is plastic, and which sets and hardens to form a hard surface. According to Whitacre (2018), lime will make the plaster easier to work, but it can result in a slightly longer curing time. The author supported that cement plaster "recipes" have varying amounts of portland cement, lime, sand and water. Usual mixes are 1 part of cement, 1 of 4 part of lime to 3 parts of sand; 1 part of cement, 1 part of lime to 6 parts of sand; or 1 of cement to 4 of sand, with a mortar plasticiser by volume (Emmitt & Gorse, 2010).

As cement plaster dries out, it shrinks fiercely and cracks may appear on the surface. In general, the more cement used, the greater the shrinkage. The extent of the cracking that may appear depends on the strength of the surface on which the plaster is applied and the extent to which the plaster binds to the surface (Barry, 2000).

Statement of the Problem

Wall plastering is an important aspect of Building Construction that students need to acquire skill. Teachers are expected to teach these skills to students in such a way that at the end of the programme, the students can acquire these skills to enable them to become self-employed and contribute to societal development. However, the researcher has observed that the teaching of wall plastering skills in Technical Colleges in the Southern Senatorial Zone of Cross River State is not very effective. This could be due to the absence of well-developed plastering and painting which would guide the teachers in the teaching of these building finishing skills. Due to the absence of well-developed wall finishing, plastering and painting skills, students' performance in plastering and painting building finishing has been very poor. In addition, many graduates trained in building construction trade become keke riders while others become

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

hawkers in cities; some still roam the streets looking for unavailable jobs. Based on this, the researcher developed wall finishing plastering and painting skills appropriate for building construction students for self-employment in Technical Colleges in the Southern Senatorial Zone of Cross River State.

Purpose of the Study

The major purpose of this study was to develop plastering and painting skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in the Southern Senatorial Zone of Cross River State. Specifically, the study sought to:

i. Develop lime plastering skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in Southern Senatorial Zone of Cross River State.

ii. Develop cement plastering skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in the Southern Senatorial Zone of Cross River State.

Research Questions

The following research questions were answered in this study:

1) What are the lime plastering skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in the Southern Senatorial Zone of Cross River State?

2) What are the cement plastering skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in the Southern Senatorial Zone of Cross River State?

Research Hypotheses

The following null hypotheses were formulated to guide this study:

H_{01}: There is no significant difference between the mean response of technical teachers and Building Construction workers on the lime plastering skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in the Southern Senatorial Zone of Cross River State.

H_{02}: There is no significant difference between the mean response of technical teachers and Building Construction workers on the cement plastering skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in the Southern Senatorial Zone of Cross River State.

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

METHODOLOGY

This study sought to develop flooring skills required by building construction students for self-employment in Technical Colleges in the Southern Senatorial District of Cross River State. The research design that was employed for this study was descriptive survey research design. The study was carried out in five local government areas in Southern Senatorial District of Cross River State, Nigeria. The population for the study was 672 comprising 12 building construction teachers in the five Technical Colleges in the district; seven experts (lecturers), four from Cross River University of Technology and three from College of Education Akamkpa; and 653 masons from the 42 registered building construction companies in the Southern Senatorial District of Cross River State. The sample size used for the study was 250 respondents. These consisted of 12 building construction teachers, seven experts and 231 masons from the 42 registered building construction companies in the district. Teachers and experts were not sampled; however, simple random sampling was to sample 231 masons. The instrument that was used for data collection was a research structure questionnaire titled: "Flooring Skills Required by Building Construction Students FOR Self-employment (FLOSREBUCONS)". The instrument contained 68 items, 5 points Likert type scale of Very appropriate = 5, Appropriate = 4, Fairly appropriate = 3, Inappropriate = 2 and Very Inappropriate = 1. The instrument was validated by three experts—one from Ekoinika Technical College, Ekori; one from Government Technical College, Ekpashi Boki and one from Industrial Technology Education, University of Uyo. Cronbach Alpha reliability was used to determine the internal consistency of the instrument, which yielded a reliability coefficient 0.85. The instrument was administered to respondents and all were retrieved. The data collected were analyzed using mean, standard deviation and One Way Analysis of Variance (ANOVA). Mean and standard deviation were used to answer the research questions while ANOVA was used to test the null hypothesis at .05 level of significance. Items with mean of 3.00 and above were considered appropriate while items with mean below 3.00 were considered not appropriate.

RESULTS

Research Question 1

What are the lime plastering skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in the Southern Senatorial Zone of Cross River State?

Table 1: Summary of Mean and Standard Deviation of Responses on the Lime Plastering Skills (n=250)

	Finishing Skills in Lime Plastering			
1.	Allowing the newly erected wall to dry.	2.46	0.89	Inappropriate
2.	Brushing the walls to remove all dirt.	3.73	0.97	Appropriate
3.	Brushing the walls to remove algae growth.	2.23	0.84	Inappropriate
4.	Dusting off the remains of loose or powder cement materials.	4.01	0.65	Appropriate
5.	Destroying growths on walls by applying ammonia copper solution for old walls.	4.00	0.68	Appropriate
6.		4.03	1.13	Appropriate

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

	Destroying any growths that cannot be removed by applying ammonia copper solution.			
7.	Spraying water on the wall to take care of suction on the wall surface.	3.63	1.10	Appropriate
8.	Applying polyvinyl chloride (PVC) bonding agent to improve the adhesion of plaster mortar to the wall surface.	3.52	1.12	Appropriate
9.	Removing all lumps, stones or foreign objects from fine aggregate.	4.04	0.62	Appropriate
10.	Measuring lime and sand in the ratio 1:4.	3.98	0.70	Appropriate
11.	Applying water and mixing the mortar to a workable state.	4.16	0.50	Appropriate
12.	Scooping the mortar and placing it on a hawk for easy application.	4.07	0.60	Appropriate
13.	Spreading mortar with trowel in an upward motion.	3.99	0.74	Appropriate
14.	Placing straight edges across the plaster to ensure a flat surface.	4.07	0.60	Appropriate
15.	Using steel smoother trowel to give a smoother surface finish.	4.17	0.48	Appropriate
16.	Curing walls by spraying water to prevent excessive dryness (evaporation) and cracks on the wall surface.	3.73	1.05	Appropriate

* Appropriate ** Not Appropriate

Analysis of Table 1 above shows the summary of teachers, experts and building construction practitioners' responses on the suitability of the lime plastering skills appropriate by students for self-employment. The result shows that out of 16 items, 14 have their mean responses above 3.00 while 2 have their mean responses below 3.00. Thus, the respondents agreed that 14 items are appropriate by students for self-employment. The standard deviation of the items ranges from 0.46–1.13 and the values are not too far from the mean.

Research Question 2

What are the cement plastering skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in the Southern Senatorial Zone of Cross River State?

Table 2: Summary of Mean and Standard Deviation of Responses on the Cement Plastering Skills (n=250)

	Finishing Skills in Cement Plastering			
1.	Allowing the newly erected wall to dry.	2.23	0.70	Inappropriate
2.	Brushing the walls to remove all dirt.	3.80	0.91	Appropriate
3.	Brushing the walls to remove algae growth.	2.11	0.79	Inappropriate
4.	Dusting off the remains of loose or powder cement materials. Destroying growths on walls by applying ammonia copper solution for old walls.	3.99 3.98	0.74 1.06	Appropriate Appropriate
5.	Destroying any growths that cannot be removed by applying ammonia with copper solution.	4.00	0.81	Appropriate

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

6.	Spraying water on the wall to take care of suction on the wall surface.	3.69	1.18	Appropriate
7.	Applying polyvinyl chloride (PVC) bonding agent to improve the adhesion of plaster mortar to the wall surface.	3.65	1.09	Appropriate
8.	Removing all lumps, stones or foreign objects from fine aggregate.	4.00	0.66	Appropriate
9.	Measuring cement and sand in the ratio of 1:6.	4.18	0.70	Appropriate
10.	Applying water and mixing the mortar to a workable state.	3.99	0.61	Appropriate
11.	Scooping the mortar and placing it on a hawk for easy application.	4.07	0.67	Appropriate
12.	Spreading mortar with trowel in an upward motion.	2.90	0.74	Inappropriate
13.	Placing straight edges across the plaster to ensure a flat surface.	4.07	0.60	Appropriate
14.	Using steel smoother trowel to give a smoother surface finish.	4.19	0.88	Appropriate
15.	Curing walls by spraying water to prevent excessive dryness (evaporation) and cracks on the wall surface.	3.84	1.05	Appropriate

* Appropriate ** Not Appropriate

Analysis of Table 2 above shows the summary of teachers, experts and building construction practitioners' responses on the suitability of the cement plastering skills appropriate by students for self-employment. The result shows that out of 15 items, 12 have their mean responses above 3.00 while 3 have their mean responses below 3.00. Thus, the respondents agreed that 12 items are appropriate by students for self-employment. The standard deviation of the items ranges from 0.60–1.18 and the values were not too far from the mean.

Research Hypothesis 1

H_{01}: There is no significant difference between mean response of technical teachers, building construction workers and building experts on the lime plastering skills appropriate for teaching lime plastering skills in Technical Colleges for self-employment in Southern Senatorial Zone of Cross River State.

Table 3: Summary of Analysis of Variance (ANOVA) Test for Significant Difference in Mean Responses of Technical Teachers, Building Construction Workers and Building Experts on the Lime Plastering Skills Appropriate for Self-Employment

	Sum of Squares	Df	Mean Square	F-cal	F-crit.	Decision
Between Groups	19.067	2	9.534	2.896	0.796	**
Within Groups	9018.329	247	36.511			
Total	9037.396	249				

**not significant ** significant @2, 247 degrees of freedom and p < .05.*

Table 3 shows the summary of Analysis of Variance (ANOVA) test for significant difference in mean responses of technical teachers, building construction workers and building experts on

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

the lime plastering skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in Southern Senatorial Zone of Cross River State. The result of the analysis in Table 3 shows that the calculated F-value was 2.896 and the F-critical was 0.796. Since the calculated F-value was greater than F-critical at 2 and 247 degrees of freedom, the null hypothesis was rejected. Thus, there is significant difference in the mean response of technical teachers, building construction workers and building experts on the lime plastering skills appropriate for teaching building finishing skills in Technical Colleges for self-employment in Southern Senatorial Zone of Cross River State. This implies that technical teachers, building construction workers and building experts do not possess plastering skills

Table 5: Post Hoc Test for Significant Difference of Raters (Building Experts, Technical Teachers and Building Construction Workers) on Lime Plastering Tasks Appropriate by Building Construction Students for Self-Employment

					95% Confidence Interval	
(I) RATERS	(J) RATERS	Mean Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
Building Practitioners	Technical teachers	-7.6914*	2.17364	.003	-8.5074	-3.3126
	Building Experts	3.37310	3.50827	.173	-8.1047	1.4385
Technical teachers	Building Practitioners	5.44620*	1.72193	.006	1.6581	7.1971
	Building Experts	3.50310	1.84189	.060	-1.7235	4.9018
Building Experts	Building Practitioners	3.71400	3.52650	.173	-1.4373	5.0453
	Technical teachers	-1.86230	1.63354	.360	-4.18042	2.2764

*. The mean difference is significant at the 0.05 level.

Source*: Field Work (2019)*

Table 5 shows the summary of the post hoc test for direction of significance on plastering skills appropriate by students for self-employment by raters. The result shows that technical teachers differed significantly from experts and building practitioners, with positive mean differences between the two groups and significant values less than .05. Thus, the significance lies in the technical teachers group. Hence, it could be because experts and practitioners are constantly carrying out these tasks while teachers do not have such opportunities.

Content Validity of the Specific Lime Plastering Tasks Appropriate for Teaching Lime Plastering Skills to Technical College Students in Cross Rivers State

The content validity for lime plastering skills was qualitatively and quantitatively analyzed. In determining the qualitative content validity of the lime plastering task sheet in lime plastering skills, content experts reviewed the grammar, using appropriate technical words, review of

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

tasks identified as well as rating the skills in terms of levels of appropriateness using the rating options provided. However, in determining the quantitative content validity of the lime plastering skills appropriate, Lawshe's content validity ratio (CVR) method was employed.

Table 4.4: Summary of Lawshe's Content Validity Ratio (CVR) for Lime Plastering Tasks Appropriate for Teaching Lime Plastering Skills

S/N	**Finishing Skills in Lime Plastering**	Panellists							N	Mean (x)	CVR	Remarks
		1	2	3	4	5	6	7				
	Finishing Skills in plastering											
1	Brushing the walls to remove all dirts.	1	1	1	1	1	1	1	7	1	1	Appropriate
2	Dusting off the remains of loose or powdered cement materials.	1	1	1	1	1	1	1	7	1	1	Appropriate
3	Destroying growths on walls by applying ammonia copper solution for old walls.	1	1	1	1	1	1	1	7	1	1	Appropriate
4	Destroying any growths that cannot be removed by applying ammonia copper solution.	1	1	1	1	1	1	1	7	1	1	Appropriate
5	Spraying water on the wall to take care of suction on the wall surface.	1	1	1	1	1	1	1	7	1	1	Appropriate
6	Applying polyvinyl chloride (PVC) bonding agent to improve the adhesion of plaster mortar to the wall surface.	1	1	1	1	1	1	1	7	1	1	Appropriate
7	Removing all lumps, stones or foreign objects from fine aggregate.	1	1	1	1	1	1	1	7	1	1	Appropriate

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

8	Measuring cement and sand in the ratio of 1:6	1	1	1	1	1	1	1	7	1	1	Appropriate
9	Applying water and mixing mortar to a workable state.	1	1	1	1	1	1	1	7	1	1	Appropriate
10	Scooping the mortar and placing it on a hawk for easy application.	1	1	1	1	1	1	1	7	1	1	Appropriate
11	Spreading mortar with trowel in an upward motion.	1	1	1	1	1	1	1	7	1	1	Appropriate
12	Placing straight edges across the plaster to ensure a flat surface.	0	1	1	1	1	1	1	6	0.857143	0.714286	Revise
13	Using steel smoother trowel to give a smoother surface finish.	1	1	1	1	1	1	1	7	1	1	Appropriate
14	Curing wall by spraying water to prevent excessive dryness (evaporation) and cracks on the wall surface.	1	1	1	1	1	1	1	7	1	1	Appropriate
	Content Validity Ratio (CVR)										0.98	Appropriate

The process involved a panel of seven experts who rated the instrument. The summary of the result is presented in Table 4.4; the Content Validity Ratio (CVR) ranges from 0.71–1.0. Items with CVR between 0.71 and 0.79 should be revised while items with CVR of 0.80–1.00 are appropriate. Only one item had a CVR of 0.71 while 12 had CVR of 1.0. The CVR gave a value of 0.98, indicating a high content validity of the lime plastering skills items to be included in the instructional package.

Research Hypothesis 2

H_{02}: There is no significant difference between mean response of technical teachers, building construction workers and building experts on the cement plastering skills appropriate for teaching plastering skills in Technical Colleges for self-employment in Southern Senatorial Zone of Cross River State.

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

International Journal of Mechanical and Civil Engineering
ISSN: 2689-940X
Volume 7, Issue 1, 2024 (pp. 98-115)
www.abjournals.org

Table 4: Summary of Analysis of Variance (ANOVA) Test for Significant Difference in Mean Responses of Technical Teachers, Building Construction Workers and Building Experts on the Cement Plastering Skills Appropriate for Self-Employment

FT	Sum of Squares	Df	Mean Square	F-cal	F-crit	Decision
Between Groups	145.442	2	72.721	3.141	1.376	**
Within Groups	9754.958	247	39.494			
Total	9900.400	249				

*** significant @2, 247 degree of freedom and p> .05* **Source:** Field Work (2019)

Table 4 shows the summary of Analysis of Variance (ANOVA) test for significant difference in mean responses of technical teachers, building construction workers and building experts on the cement plastering tasks appropriate for teaching cement plastering skills in Technical Colleges for self-employment. The result of the analysis in Table 4 shows that the calculated F-value was 3.141 and the F-critical was 1.376. Since the calculated F-value was greater than the F-critical at 2 and 247 degrees of freedom, the null hypothesis was rejected. Thus, there is significant difference in the mean response of technical teachers, building construction workers and building experts on the cement plastering tasks appropriate for teaching cement plastering skills in Technical Colleges for self-employment in Southern Senatorial Zone of Cross River State.

Table 5: Post Hoc Test for Significant Difference of Raters (Building Experts, Technical Teachers and Building Construction Workers) on Cement Plastering Skills Appropriate by Building Construction Students for Self-Employment

(I) RATERS	(J) RATERS	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
Building Practitioners	Technical teachers	-6.81040*	2.17364	.003	-7.8373	-3.3126
	Building Experts	3.37310	3.50827	.173	-8.1047	1.4385
Technical teachers	Building Practitioners	5.44620*	1.72193	.006	1.6581	7.1971
	Building Experts	3.50310	1.84189	.060	-1.7235	4.9018
Building Experts	Building Practitioners	3.71400	3.52650	.173	-1.4373	5.0453
	Technical teachers	-1.86230	1.63354	.360	-4.18042	2.2764

*. The mean difference is significant at the 0.05 level.

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

Table 5 shows the summary of the post hoc test for direction of significance on cement plastering skills appropriate by students for self-employment by raters. The result shows that technical teachers differed significantly from experts and building practitioners, with positive mean differences between the two groups and significant values less than .05. Thus, the significance lies in the technical teachers group. Hence, it could be because experts and practitioners are constantly carrying out these tasks while teachers do not have such opportunities.

Content Validity of the Specific Cement Plastering Tasks for Teaching Cement Plastering Skills to Technical College Students in Cross Rivers State

The content validity for cement plastering skills was qualitatively and quantitatively analyzed. In determining the qualitative content validity of the cement plastering task sheet in cement plastering, content experts reviewed the items on the instrument, checking to ensure that there is sequence of tasks, review of tasks identified as well as rating the skills in terms of levels of appropriateness, using the rating options provided. In determining the quantitative content validity of the cement plastering skills in the task sheet, Lawshe's content validity ratio (CVR) method was employed.

Table 4.5: Summary of Lawshe's Content Validity Ratio (CVR) for Cement Plastering Tasks Appropriate for Teaching Cement Plastering Skills

S/N	**Finishing Skills in Cement Plastering**	Panellists							N	Mean (x)	CVR	Remarks
		1	2	3	4	5	6	7				
	Finishing Skills in Plastering											
1	Brushing the walls to remove all dirt.	0	1	1	1	1	1	1	6	0.857143	0.714286	Revise
2	Dusting off the remains of loose or powdered cement materials.	1	1	1	1	1	1	1	7	1	1	Appropriate
3	Destroying growths on walls by applying ammonia copper solution for old walls.	1	1	1	1	1	1	1	7	1	1	Appropriate
3	Destroying any growths that cannot be removed by applying ammonia copper solution.	1	1	1	1	1	1	1	7	1	1	Appropriate
4	Spraying water on the wall to take	1	1	1	1	1	1	1	7	1	1	Appropriate

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

	care of suction on the wall surface.											
5	Applying polyvinyl chloride (PVC) bonding agent to improve the adhesion of plaster mortar to the wall surface.	1	1	1	1	1	1	1	7	1	1	Appropriate
6	Removing all lumps, stones or foreign objects from fine aggregate.	1	1	1	1	1	1	1	7	1	1	Appropriate
7	Measuring cement and sand in the ratio of 1:6	1	1	1	1	1	1	1	7	1	1	Appropriate
8	Applying water and mixing mortar to a workable state.	1	1	1	1	1	1	1	7	1	1	Appropriate
9	Scooping the mortar and placing it on a hawk for easy application.	1	1	1	1	1	1	1	7	1	1	Appropriate
10	Spreading mortar with trowel in an upward motion.	1	1	1	1	1	1	1	7	1	1	Appropriate
11	Placing straight edges across the plaster to ensure a flat surface.	0	1	1	1	1	1	1	6	0.857143	0.714286	Revise
12	Using steel smoother trowel to give a smoother surface finish.	1	1	1	1	1	1	1	7	1	1	Appropriate
13	Curing wall by spraying water to prevent excessive dryness (evaporation) and cracks on the wall surface.	1	1	1	1	1	1	1	7	1	1	Appropriate
	Content Validity Ratio (CVR)										0.98	Appropriate

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

The process involved a panel of seven experts who rated the instrument. The summary of the result is presented in Table 4.4; the Content Validity Ratio (CVR) ranges from 0.71–1.0. Items with CVR between 0.71 and 0.79 should be revised while items with CVR of 0.80–1.00 are appropriate. Only one item has a CVR of 0.71 while 12 had CVR of 1.0. The CVR gave a value of 0.98, indicating a high content validity of the cement plastering skills items appropriate.

FINDINGS OF THE STUDY

The findings are summarized as follows:

1. Out of the 16 items, 14 items relating to lime plastering skills had mean responses above 3.00 while 2 had mean value below 3.00. Thus, 14 items were found by technical teachers, building experts and building construction as appropriate by building construction students for self-employment in Technical Colleges in Southern Senatorial District of Cross River State.

2. Out of the 15 items, 13 items relating to cement plastering skills had mean responses above 3.00 while 2 had mean value below 3.00. Thus, 13 items were found by technical teachers, building experts and building construction as appropriate by building construction students for self-employment in Technical Colleges in Southern Senatorial District of Cross River State.

DISCUSSION OF FINDINGS

Lime Plastering Skills

Result of analysis of the related research question 1 shows that out of the 16 items, 14 items relating to lime plastering skills had mean responses above 3.00 while 2 had mean value below 3.00. The teachers, experts and building practitioners all agreed that the items are appropriate for lime plastering skill for self-employment. Thus, 14 items were found by technical teachers, building experts and building construction as appropriate by building construction students for self-employment in Technical Colleges in Southern Senatorial District of Cross River State. The corresponding hypothesis test shows that there is significant difference in the mean response of technical teachers, building experts and building construction practitioners on the lime plastering skills appropriate by building construction students for self-employment in Technical College of Cross River State. This study is in line with Lemo (2014) who developed and validated 163 items from 8 sections for self-instructional manual for automobile technology craftsmen in South Western Nigeria and the result of the study shows that the developed manual was tried out, and it was found out that the use of the manual facilitated skill acquisition among the automobile technology craftsmen in south western Nigeria. This implies that the identified skills in lime plastering are useful and appropriate by building construction students for self-employment.

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

Cement Plastering Skills

Result of analysis of the related research question 1 shows that out of the 15 items, 13 items relating to cement plastering skills had mean responses above 3.00 while 2 had mean value below 3.00. The teachers, experts and building practitioners all agreed that the items are appropriate for lime plastering skill for self-employment. Thus, 13 items were found by technical teachers, building experts and building construction as appropriate by building construction students for self-employment in Technical Colleges in Southern Senatorial District of Cross River State. The corresponding hypothesis test shows that there is significant difference in the mean response of technical teachers, building experts and building construction practitioners on the cement plastering skills appropriate by building construction students for self-employment in Technical College of Cross River State. The result of the post hoc test for significant difference of raters shows that technical teachers differed significantly from experts and building practitioners, with positive mean differences between the two groups and significant values less than .05. Thus, the significance lies in the technical teachers group. This study is in line with Lemo (2014) who developed and validated 163 items from 8 sections for self-instructional manual for automobile technology craftsmen in South Western Nigeria and the result of the study shows that the developed manual was tried out, and it was found out that the use of the manual facilitated skill acquisition among the automobile technology craftsmen in southwestern Nigeria. This implies that the identified skills in lime plastering are useful and appropriate by building construction students for self-employment.

CONCLUSION

Based on the findings of the study, it is concluded that the developed lime and cement plastering tasks are valid and reliable to be used by technical teachers for teaching plastering skills to students in technical education programmes.

RECOMMENDATIONS

On the basis of the findings, discussion and conclusions of this study, the following recommendations were proffered:

i. Teachers should adopt the developed lime plastering skills for teaching lime plastering in Technical College.

ii. Teachers should adopt the developed cement plastering skills for teaching lime plastering in Technical College.

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

REFERENCES

Abanyam, F. E., Edeh, N. I and Abanyam, V. A (2016). Repositioning Technical Vocational Education and Training (TVET) and entrepreneurship education for self-reliant in Nigeria. *Journal of Association of Vocational and technical Education of Nigeria*, 21(2): 265-273.

Adamu, G. G, Dawha, J.M. and Kamar, T.S. (2015). Development and validation of mechanical engineering trade skills assessment instrument for sustainable job security in Yobe State. *Journal of Education and Practice*, 6(16): 1-9.

Adenle, S. O. and Olukoyade, S. I. (2007). Technical vocational education for productivity and sustainable development in Nigeria. *A paper presentedat the 20th annual conference of National Association of Teachers of Technology (NATT)* at Kaduna Polytechnic, 5th - 9th, November 2007.

Alpha, A. A. (2013). *Development of self-instructional manual for sand casting technology in the Polytechnics in North Central State of Nigeria.* Ph.D Thesis University of Nigeria, Nsukka, Nigeria.

Barry, R. (2000). Construction of Buildings. Granada Publishing Limited, London. 209p.

Bukar, B. (2006). *Development and validation of laboratory-base test of assessing practical skills of HND students in electronics maintenance and repairs.* Unpublished PhD Thesis. University of Nigeria, Nsukka, Nigeria.

Chiejile, L.C. (2006). *Development and validation of a test instrument for assessing students practical performance in electrical installations* PhD Thesis. Nnamdi Azikiwe. University of Awka, Nigeria.

Cyril, M. U.; Enock, E.; Tahir, E. and Adamu, G. G. (2014). Development and validation of an instrument for assessing mechanical engineering trade skills for Sustainable job security in Adamawa State. *Nigeria Vocational Association Journal,* 19(2): 105-116.

Dangana, D. M. (2010). Effects of practical skills instructional guide on student's performance in lathe machine operations in technical colleges. Unpublished Ph.D. Thesis University of Nigeria, Nsukka, Nigeria.

Emmitt, S. and Gorse, C. A. (2010). Barry's introduction to construction of buildings. John Wiley and Sons Ltd, Publication, United Kingdom. 232p.

Gimba, D. (2011). *Employability skills required by Polytechnic graduates Building Technology in Nigeria.* MSc (Ed) Dissertation. University of Nigeria, Nsukka, Nigeria.

Ingwu, E. U. (2003). Community development. In: Ingwu, E. U. (Editor) *Adult education: An introductory text*. Index Educational Foundation Publishers, Calabar. 78p.

Lemo, O. O. (2014). *Development and validation of self-instructional manual for automobile technology craftmen in South West Nigeria.* Ph.D Thesis. University of Nigeria, Nsukka, Nigeria.

Moses, D. Ezugu, I. C.; Apagu, V. V. and Okoye, K. R. E. (2014). Skills acquire and job performance of graduates of electrical installation and maintenance works tradeof technical college in domestic installation for sustainable job security and development in North Eastern Nigeria. *Nigeria vocational Association Journal,* 19 (2): 136-150.

National Broad for Technical Education (2003). *Mechanical engineering craft curriculum and module specification: National Technical certificate (NTC) and Advanced.* National Technical Certificate. (ANT).UNESCO Nigeria project. Retrieved August 1 9, 2017 from http://www.unesdo.unesco.org/images/0016/001613/161353e.pdf.

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT

Ogbuzuru, R. (2011). *Strategies for improving skills acquisition for building Technology students in technical colleges in Ebonyi State.* MSc (Ed) Dissertation. University of Nigeria, Nsukka, Nigeria.

Okeke, B. C. (2004). Standardization of an instrument for assessing practical work technology in technical colleges. *Journal of Vocational and Adult Education,* 3 (1): 42-52.

Okwelle, P. C. and Okoye, K. R. E. (2012). Developments and validation of instrument for assessing practical skills in building electronics systems in Nigerian Technical Colleges. *Journal of Emerging Trends in Engineering and Applied Science (JETEAS),* 3 (5): 779-785.

Ombugus, D. A. and Ogbuanya, T. C. (2014). Development and validation of workshop-based process practical test in metal fitting for improving students' skill in technical colleges for work. *Journal of Education and Practice*, 5(23): 1-10.

Otu, E. B. and Usoro, A. D. (2017). Parameters for rejuvenation of technical vocational education and training programme for students quality service in post oil economy. *Journal of Association of Vocational and Technical Educators of Nigeria*, 22(1): 28-40.

Robert, A. M. (2018). *Development and validation of competency-based assessment instrument in motor vehicle mechanics work for assessing students in Technical College in Akwa Ibom State.* PhD Thesis. University of Nigeria, Nsukka, Nigeria.

Whitacre, A. (2018). *Different types of plastering for construction work.* Retrieved May 2, 2018 from https://www.quora.com/Which-are-different-types-of-plastering-for-construction-work.

Yalams, S.M. (2005). *Development and validation of metal work process evaluation scheme.* Ph.D Thesis. University of Nigeria, Nsukka, Nigeria.

Article DOI: 10.52589/IJMCE-24AFX7FT
DOI URL: https://doi.org/10.52589/IJMCE-24AFX7FT