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DEVELOPMENT AND VALIDATION OF BUILDING SUB-STRUCTURE PRACTICAL SKILLS TEST FOR NIGERIAN SECONDARY SCHOOLS

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ABSTRACT

The study aimed at developing and validating an instrument for assessing students' practical skills in building sub-structure operation in Nigerian secondary schools. Five research questions guided the study and three null hypotheses were formulated and tested at 0.05 level of significance. The study adopted instrumentation design. The area of the study was Taraba State. The population for the study was 107 comprising 82 students, 18 teachers and Seven professional builders. The sample size for the study was 47 which comprised all the 22 students offering building construction subject at Government Technical Training School, Jalingo, All the 18 teachers and the seven professional builders. Content validation of the instrument used for data collection was carried out using a table of specifications based on Simpson's model of psychomotor domain. Factor Analysis and mean were used to determine the construct validity of and the specific performance objectives of the instrument respectively. t-Test was employed to test the hypotheses at 0.05 level of significance. Findings from the study indicated that 4 practical tasks items, 40 practical skill items, and five performance objectives were found to be appropriate for inclusion in the instrument. All the 4 practical task items and the 40 practical skill items were found to be valid. The internal consistency of the instrument was found to be 0.82 while the inter-rater reliability coefficient of the developed instrument was 0.74, indicating that there was a high degree of agreement among all the four raters used in the study. Based on the findings some recommendations were made.

Keywords: Development, Validation, building, Skill, Practical, Test

Introduction

Secondary education in Nigeria is the level of education undertaken after successful completion of basic education (primary and junior secondary education) and before tertiary education. This phase of education which usually last for three years is aimed at inspiring students and imparting in them appropriate knowledge for self-improvement and achievement of excellence through higher education pursuit obtainable in universities, polytechnics, colleges of education and other institutions of higher

learning in or out of the country. It also prepares students with entrepreneurial, technical and vocational job specific skills for self-reliance (Federal Republic of Nigeria, FRN 2013).

Building construction is one of the subjects taught under the technology cluster in secondary schools. The subject is concerned with equipping the students with both the theory and practical skills needed to undertake simple building construction work. It also prepares the students for further studies in the field of technology either in the polytechnic, universities or other institutions of higher learning. Building sub-structure operations is one of the major operations taught in building construction subject (NERDC, 2012). Building substructure operations is concerned with the tasks carried out below the structural ground level of a building including the ground floor. These include the setting out and fixing of levels, trench excavation, and foundation construction among others. It is therefore a critical component of the building where the rest of the structures rest on. Students are therefore expected to acquire adequate skills in executing this operation. In order to determine the level of skills acquired by the students in the course of their studies, there is a need for the students to be assessed using an assessment instrument.

Assessment instrument is a scheme used to determine the level at which the learner exhibits a behavior or the quality of that behavior particularly while is being observed by an assessor or a team of assessors. Instruments to be used for assessment of practical skills in building construction subject in Nigerian secondary schools and indeed all other subjects according to Uzoagulu (2011) must possess the following two key attributes for it to be useful in the assessment processes- validity and reliability. Validity of an instrument refers to the degree to which an instrument measures what it is supposed to measure. The validity of an instrument can be viewed from four different angles: Face, Contents, Predictive, Concurrent and Construct validity.

Face validity refers to the "face value' of the instrument. It shows how the instrument appears to measure what it is supposed to measure. Content validity on the other hand, refers to how the instrument covered the area under consideration. This is largely achieved through expert judgment as well as the effective use of Table of Specifications. With regards to the Predictive and Concurrent validity, when the two attributes enunciated earlier are achieved, it can be inferred that instrument can predict future performance of the testee. Construct validity is one that is difficult to come by, because certain constructs such as intelligence can be measured through the other means mentioned above. However, Nworgu (2015) suggested the use of factor analysis. Therefore, factor analysis was effectively utilized in the development of the instrument.

Reliability on the other hand, refers to the degree to which an assessment tool produces stable and consistent results

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(Ombugus, 2014). There are several methods of determining the reliability of the instrument. These includes: Split half, test retest, alternative form, internal consistency, inter-rater reliability among others. The choice of these methods largely depends on the nature and its compliance with the underlying assumptions. Therefore, for an instrument to be considered as being adequate for any assessment exercise, it must possess the two vital attributes discuss above.

Despite the impressive objectives contained in the building sub-structure operations, several studies (Olaitan, 2014; Ombugus, 2014, Umanah, 2016, Okoye & Auta, 2020) indicated that the present ways of assessment of practical skills especially in technical and vocational subject related areas, including building construction subject in Nigerian secondary schools is marred by the inability of most of the teachers to develop good assessment instrument. They often assess practical through a cursory look at the completed task without due regards to the stages involved in arriving at the completed tasks. At the moment, even the instrument currently being used by the examination bodies- National Examination Council (NECO) and the West African Examination Council (WAEC) merely highlight the major skills to be rated in "Building Drawing" but lacking in the specific skills involved in carrying out the specific task (Okwelle & Okoye, 2012). These approaches to assessment can be prone to subjectivity since it was not robustly and comprehensively done. These situations necessitate this study to develop and validate instrument for assessing practical skills in building sub-structure operations in Nigerian secondary schools.

Research Questions

The following research questions guided the study:

1. What are the practical task contents appropriate for inclusion in the building sub-structure practical skills assessment instrument?
2. What are the practical skills appropriate for inclusion in the building sub-structure practical skills assessment instrument?
3. What are the specific performance objectives of the practical task contents of building sub-structure?
4. What is the validity of the developed instrument for assessing practical skills in building sub-structure in Nigerian secondary schools?
5. What is the reliability of the developed instrument for assessing practical skills in building sub-structure in Nigerian secondary schools?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

1. There is no significant difference in the mean responses of building construction teachers and registered builders on the practical task contents appropriate for inclusion in the assessment instrument.

2. There is no significant difference in the mean responses of building construction teachers and registered builders on the practical skills appropriate for inclusion in the assessment instrument.
3. There is no significant difference in the mean responses of building construction teachers and registered builders on the specific performance objectives of the practical task contents of building sub-structure.

Research Method

Research Design: The study adopted instrumentation design. This type of design is aimed at developing and authenticating the capability of an instrument for the purpose of measurement of a given behaviour. According to Creswell (2014), it is concerned with the processes and procedures of developing an instrument for gauging performance or for obtaining data for passing judgments on certain actions or behaviour. Instrumentation design is appropriate for this study because the study is aimed at developing and validating an instrument for assessing students' practical skills in building construction subject in senior secondary schools.

Area of the Study: The area of the study is Taraba State. The choice of Taraba state is based on the fact that, as a developing state, it has a large concentration of new building construction sites where the demand for competent skilled craftsmen in the area of building construction is very high. There were also reported cases of collapsed buildings in the state in recent time, and one of the causes was attributed to quackery on the part of the building operatives. In addition to that, the state has a relatively large number of senior secondary schools and its equivalents that offer building construction subject and being examined by WAEC and NECO. In Taraba State, there are 8 schools that offer building construction subject up to the final year of senior secondary school.

Population: The population for this study is 107, which consist of 82 building construction students in the final year of senior secondary school, 18 teachers teaching building construction subject in the 8 senior secondary schools offering building construction subject in Taraba State, and the seven professional builders employed by the Taraba state ministry of works. The selection of these three groups is based on the fact that the final year senior secondary students of building construction students had covered almost all the themes spelt out in the secondary school building construction curriculum and are almost ready for their external examination. The teachers on the other hand, having taught the subject over time participated in identifying the practical task and the skills required to perform each of the tasks for inclusion in the practical skills assessment instrument. They were also responsible for rating the students while they perform the tasks during the try-out of the instrument. The professional builders are the practitioners of the subject in the field and potential employers of the graduates, therefore, like the teachers, they

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also participated in identifying the practical task and skills appropriate for inclusion in the practical skills assessment instrument.

Sample and Sampling Technique: The sample size for this study is 47. There was no sampling in the selection of teachers and professional builders, therefore, all the 18 teachers and the seven professional builders formed part of the sample size. However, for the students, only the 22 final year senior secondary school student offering building construction subject in Government Technical Training School, Jalingo were purposively selected for the study. The choice of Government Technical Training School, Jalingo, Taraba State out of the 8 schools offering building construction subject up to SS3 in the state for the try-out of the instrument is based on the fact that the school has a building construction workshop that is well-equipped with almost all the instructional facilities required for effective teaching and learning of the subject. In addition to that, all the teachers responsible for the teaching of the subject in the purposively sampled school possess the requisite qualification and have field experience when compared with their counterparts in other schools offering similar subject in the state. Considering its location, the school, in relation to others, was more easily reachable for the practical test administration.In order to determine the adequacy of the sample size and the suitability of the data for Factor Analysis, the data obtained was subject to Kaiser-Mayer-Olkin (KMO) Test and a value of 0.61 was obtained. According to Keiser as reported by IBM Knowledge Center (2019), a value ≥0.50 is an indication that the sample size and the data obtained can be used for Factor Analysis. Therefore, the sample size and the data obtained were found to be appropriate for the factor analysis exercise.

Procedure for Development of the Instrument: The following stages which usually characterized instrumentation design for assessment of psychomotor outcomes was adopted:

Step I: Students who offer Building Construction subject at the Senior Secondary School are expected to, at the end of their studies have a clear understanding of the processes, materials, tools and equipment used in building construction, inculcate safe working habits in building construction, enhance their ability to construct a building project in order to earn a living through participation in building construction work. It is also expected that the building construction subject will lay a solid foundation for technological development and further studies in building construction and other engineering programmes.

Step II: Accordingly, the practical skills assessment instrument was developed to assess these objectives. The NERDC (2012) had already transformed these objectives into themes; these themes were transformed into practical tasks and skill items by the researcher through the application of job and task analysis respectively. Building construction and other related textbooks

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(Obande, 2004; Emmitt & Gorse, 2005; Shetty, 2009) were utilized at this stage of the exercise. The tasks and skills identified were further analyzed in order to generate the corresponding performance objectives.

Step III: A table of specifications was developed based on the curriculum content and in line with the six out of the seven levels of Simpson's model of psychomotor domain. The objective is to ensure effective distribution of the practical skill items across the six levels of the domain. The draft practical skills assessment instrument developed from the building construction curriculum for senior secondary schools was submitted for validation to three experts: one of the experts who specialized in building construction is a teacher at Government Science and Technical College, Potiskum; one expert is a professional builder in the employment of Taraba State University, Jalingo, while the remaining one is an expert in measurement and evaluation at Nnamdi Azikiwe University, Awka. These seasoned professionals assessed the instrument for proper wording, consistency, and representativeness. Suggestions and corrections made by them were utilized to improve the instrument. To determine the practical task and skill items for inclusion in the final instrument, the practical tasks and skill items were subjected to factor analysis, using 0.35 in factor loading as a benchmark for acceptance (Abonyi, 2003)

Step IV: The selected practical skill items were arranged and grouped according to the first six levels of psychomotor domain identified by Simpson- perception, set, guided response, mechanism, complex overt response and adaptation. The seventh level- origination, was not considered because it is beyond what a senior secondary schools building construction student could do based on the contents of the subject curriculum. This exercise helped in sharing the test items based on the following domain levels in the table of specifications as recommended by Simpson:

1. Perception: 5 – 10%
2. Set: 5-10%
3. Guided response: 20 – 30%
4. Mechanism: 20 – 30%
5. Complex overt response: 25-30%
6. Adaptation: 5 –10%

The practical tasks, skill items and performance objectives were written as statements. A five point scale of Very High (VH), High (H), Moderately High (MH), Low (L) and Very Low (VL) were written against each statement to enable the teachers and the professional builders identify the level of appropriateness of each item for inclusion in the instrument

Step V: To determine the initial internal consistency of the building construction practical skills assessment instrument, six building construction teachers from Government Technical College, Numan, Adamawa State and five professional builders from the Adamawa State Ministry of Works were selected to take part in the

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pilot testing of the instrument. The selection of Adamawa State is based on the fact that the two sister states made up the old Gongola State, therefore, they share common attributes. From the data obtained, Cronbach alpha was utilized to establish the reliability of the instrument. The reliability coefficient obtained for the practical tasks, practical skills, and the performance objective clusters ranges from 0.77-0.85, and for the entire instrument was found to be 0.82.

Step VI: The instrument was administered on the building construction teachers by the researcher and his assistants in their respective schools during the 2019/2020 session. The professional builders who are employees of the Taraba state ministry of Works had the instrument administered on them in their respective offices. At the end of the exercise, only 15 and 6 copies of the instrument were properly filled and retrieved from the building construction teachers and professional builders respectively. This represents 84% rate of return. The data obtained from this exercise was used to further refine the BSPSAI.

Step VII: At the try-out stage, the instrument was administered on the 22 SS 3 building construction students in Government Technical Training School, Jalingo, Taraba State under examination condition. However, only 18 students made themselves available throughout the duration of the exercise. Therefore, only the data obtained from the practical activities of the 18 students was used for the study. The four teachers who also serve as research assistants were trained by the researcher to enable them understand the general requirements of the study and the modalities for using the instrument to rate the students. One of the teachers was appointed by the researcher to serve as the team leader while the researcher facilitates the smooth operation of the entire exercise by supplying all the materials required for administering the BSPSAI. The four research assistants used the developed Building construction practical skills assessment instrument (BCPSAI) to assess the performance of the students while they carry out the practical exercise. The students were briefed on how to undergo the assessment, and thereafter, each student was assigned a portion within and outside the workshop depending on the nature of the job to be carried out under a particular task starting with task one. A minimum of one and maximum of three tasks were assessed within each contact. Each task was given a specific duration of between 30 minutes and 1 hour depending on its complexity. The raters rated the students while they performed the task, and at the end of each day's session submit the rated instrument to their team leader. The results obtained from the rating of the students were used as the data analyzed for answering a research question.

Method of Data Analysis: To answer research questions 1 and 2, the identified practical tasks and practical skill items were subjected to factor analysis using 0.35 factor

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loading as a benchmark for acceptance (Abonyi, 2003). This implies that tasks and practical skill items with factor loading of 0.35 and above were regarded as being appropriate for inclusion in the instrument, while tasks and practical skill item with factor loading less than 0.35 were considered as factorially impure, therefore, not appropriate for inclusion in the instrument. Mean was used to analyze data to answer research question 3 which seeks to determine the specific performance objectives of the practical task contents of building construction subject. That is, any item with a mean rating ≥3.50 which is the lower limit of "High" on a five-point Likert type scale was considered as appropriate for inclusion.

In answering research question 4, table of specifications was used to ensure the content validity of the instrument in line with Simpson's taxonomy of the psychomotor domain. This is in addition to the valuable comments of experts in building construction, and measurement and evaluation which were also used to ensure face and content validity of the instrument. Data for research question 5, which seeks to determine the reliability of the building construction practical skills assessment instrument was analyzed using Cronbach alpha and Spearman Rank Order Correlation. The former was used to determine internal consistency, while the later was utilized to determine the degree of agreement in the raters scores obtained during the try-out. Therefore, any item or rating between two assessors with correlation coefficient (r) ≥ 0.70 was considered to be highly reliable, anyone with reliability coefficient (r) < 0.70 was regarded as lowly reliable (Uzoagulu, 2011).

The t-Test statistic was used to test the three null hypotheses formulated for the study at 0.05 level of significance. This is because, according to Uzoagulu (2011), the t-Test should be used to test the hypothesis about the difference between means of two groups when the sample size is less than 30. Accordingly, and in line with the suggestions of Dallal (2012) where the p-value is greater than the level of significance (0.05), the H_o was accepted; however, where the p-value is ≤ 0.05, the H_o was rejected.

Presentation of Results

Research Question 1: What are the practical task contents appropriate for inclusion in the building sub-structure practical skills assessment instrument?

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Table 1: Practical task contents

S/N	Operations/Practical Tasks	Factor Loading	Remarks
	Building Sub-Structure Operations		
1	Setting Out	0.80	Appropriate
2	Trench Excavation	0.83	Appropriate
3	Foundation Construction	0.82	Appropriate
4	Ground floor Construction	0.81	Appropriate

In Table 1, data revealed that the four practical tasks presented had their factor loading above the minimum threshold of 0.35. Based on this, it can be concluded that the four practical tasks were found to be appropriate for inclusion in the building sub-structure practical skills assessment instrument.

Research Question 2: What are the practical skills appropriate for inclusion in the building sub-structure practical skills assessment instrument?

Table 2: Practical skills Contents

S/N	Practical Skills	Factor Loading	Remarks
	A student should be able to:		
	Task 1: Setting out		
1	Establish the building line	0.90	Appropriate
2	Determine the orientation of the building	0.95	Appropriate
3	Measure and mark out the required set back	0.64	Appropriate
4	Measure the overall length of the building and mark A & B	0.57	Appropriate
5	Establish point C at right angle to point B using either 3,4,5 method or builder square method	0.84	Appropriate
6	Establish point D at right angle to point C	0.74	Appropriate
7	Measure the two diagonals i.e point A to C and B to D to ensure correctness	0.65	Appropriate
8	Measure the required length away from the pegs outward and establish the profile board	0.85	Appropriate
9	Transfer the overall length to the profile board	0.49	Appropriate
10	Measure the individual spaces on the profile board	0.56	Appropriate
11	Measure and marking out the positions of walls and trenches on the profile board	0.73	Appropriate
12	Transfer the marked position to the ground	0.94	Appropriate
13	Mark out the positions on the ground	0.66	Appropriate
14	Establish the column positions on the ground	0.64	Appropriate
15	Mark out the column positions on the ground	0.82	Appropriate
	Task 2: Trench Excavation		
16	Determine the depth of the excavation	0.90	Appropriate
17	Excavate the trench as marked out	0.87	Appropriate
18	Measure the depth to ensure correctness	0.74	Appropriate

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19	Level the trench to receive concrete	0.87	Appropriate
	Task 3: Foundation		
20	Select suitable materials	0.89	Appropriate
21	Batch the materials to correct specification	0.89	Appropriate
22	Mix the material	0.92	Appropriate
23	Apply the right quantity of water	0.78	Appropriate
24	Place the concrete as per the established level	0.88	Appropriate
25	Compact the concrete	0.91	Appropriate
26	Cure it until it gained enough strength	0.94	Appropriate
	Task 4: Ground floor		
27	Backfill the foundation with laterite	0.88	Appropriate
28	Compact the laterite	0.89	Appropriate
29	Place hardcore in place	0.92	Appropriate
30	Blind the hardcore	0.87	Appropriate
31	Establish level for the oversite concrete	0.89	Appropriate
32	Board the side as per the established level	0.47	Appropriate
33	Batch the concrete materials as per the specifications	0.87	Appropriate
34	Mix the materials	0.78	Appropriate
35	Place the Damp proof membrane in position	0.99	Appropriate
36	Place the reinforcement in place	0.90	Appropriate
37	Place the concrete in accordance with the established level	0.89	Appropriate
38	Compact the concrete	0.98	Appropriate
39	Ensure correctness of the level by crossing lines over the concreting area	0.89	Appropriate
40	Cure the concrete by keeping it damp	0.97	Appropriate

Data presented in Table 2 indicated that all the 40 practical skill items presented had their factor loading above the minimum threshold of 0.35. Based on this, it can be concluded that 40 practical skill items were found to be appropriate for inclusion in the building sub-structure practical skill assessment instrument.

Research Question 3: What are the specific performance objectives of the practical task contents of building sub-structure?

Table 3: Specific performance objectives

S/N	Performance Objectives	Mean	Remarks
1	Identify appropriate tools for the task accomplishment	4.38	Appropriate
2	Use working tools appropriately	4.48	Appropriate
3	Read and interpreted blue-prints	2.57	Inappropriate
4	Conserve materials and supplies	3.48	Inappropriate
5	Consider safety measures	4.00	Appropriate
6	Execute task Independently	4.14	Appropriate
7	Ensure quality of the completed task	4.33	Appropriate

In Table 3, the respondents rated the specific performance objectives of the practical task contents of building sub-structure. The mean rating ranges from 2.57 to 4.48. Items 3 and

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4 had mean rating of 2.57 and 3.48 respectively which is less than the minimum threshold of 3.50. The other five items had their mean ratings above 3.50. Based on this, it can be concluded that five specific performance objectives were considered by the respondents as appropriate for inclusion in assessing students' practical task in building sub-structure.

Research Question 4: What is the validity of the developed instrument for assessing practical skills in building sub-structure in Nigerian Secondary Schools?

Table 4: Distribution of Skill Items based on Simpson's Levels of Psychomotor Domain

S/N	Simpson's Levels of Psychomotor Domain	No. of Skill Items retained	No. of Skill Items discarded	% of skill items retained
1	Perception	4	0	10
2	Set	4	0	10
3	Guided Response	9	0	22.50
4	Mechanism	11	0	27.50
5	Complex Overt Response	9	0	22.50
6	Adaptation	3	0	7.50
	Total	40	0	100

Table 5: Validated Practical Tasks and Skill Items

S/N	Tasks	No. of Skills Items	Remarks
1	Setting Out	15	Valid
2	Trench Excavation	4	Valid
3	Foundation Construction	7	Valid
4	Ground floor Construction	14	Valid
	Total	40	Valid

The data in Table 4 revealed the content validity of the instrument. The data shows the summary of the distribution of practical skill items as contained in the Table of Specifications in accordance with six out of the seven levels of Simpson's model of psychomotor domain. The data revealed that, 4 items (10%) each were assessing the level of perception and set; 9 items (22.50%) were assessing the level of guided response; 11 items (27.50%) were assessing the level of mechanism; 9 items (22.50%) were assessing the level of complex overt response; while 3 items (7.50%) were assessing the level of adaptation. For the face validity, comments of three experts (Building Construction Teacher in a Secondary School, Registered Builder who practiced in the field, and an Expert in Measurement and evaluation who is a Lecturer in a Nigerian University) who examined the instrument for proper wording, consistency, and representativeness were utilized to improve the instrument. For the construct validity, Factor Analysis was used and a factor loading of 0.35 and above was considered as an index for acceptance. The data as presented in Table 5 also revealed

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that, at the end of the exercise, 4 practical tasks and 40 practical skill items were found to be valid thereby appropriate for inclusion in the building sub-structure practical skills assessment instrument.

Research Question 5: What is the Reliability of the developed instrument for assessing practical skills in building sub-structure in Nigerian Secondary Schools?

Table 6: Internal Consistency of Practical Tasks and Skill Items

S/N	Practical Tasks	No. of Skill Items	Internal Consistency	Remarks
1	Setting Out	15	0.86	Highly Reliable
2	Trench Excavation	4	0.80	Highly Reliable
3	Foundation Construction	7	0.77	Highly Reliable
4	Ground floor Construction	14	0.85	Highly Reliable
	Reliability Coefficient	40	0.82	Highly Reliable

Table 7: Inter Rater Reliability of Skills assessment Instrument

S/N	Raters	Reliability Coefficient	Remarks
1	Rater 1 & Rater 2	0.73	Highly Reliable
2	Rater 1 & Rater 3	0.82	Highly Reliable
3	Rater 1 & Rater 4	0.84	Highly Reliable
4	Rater 2 & Rater 3	0.71	Highly Reliable
5	Rater 2 & Rater 4	0.61	Highly Reliable
6	Rater 3 & Rater 4	0.71	Highly Reliable
	Reliability coefficient	0.74	Highly Reliable

The data presented in Table 6 indicated that, the reliability coefficient with regards to the internal consistency of all the 40 practical skill items across the 4 task clusters ranges from 0.77 to 0.86 with the overall reliability coefficient of the instrument at 0.82. The summary of the inter-rater reliability is presented in Table 7, the reliability coefficient of the four raters ranges from 0.61 to 0.84 with the overall reliability coefficient for the four raters was found to be 0.74. Based on this, it can be concluded that, the instrument is highly reliable for assessing students' practical skills in building sub-structure in Nigerian Secondary Schools.

Hypothesis 1: There is no significant difference in the mean responses of building construction teachers and registered builders on the practical task contents appropriate for inclusion in the assessment instrument.

Table 8: t-test Analysis on the practical task contents

Position	N	Mean	SD	Df	t-value	p-value	Remarks
Teachers	15	4.69	0.33	19	0.68	0.51	Accept H_o
Builders	6	4.79	0.21				

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Analysis on Table 4 revealed the mean response of Teachers (4.69) and professional Builders (4.79); the data indicated that both the teachers and the registered builders agreed on the practical task contents appropriate for inclusion in the assessment instrument. The data from the table also revealed that there is no significant difference between mean response of teachers and the registered builders (t = 0.68, df = 19, p = 0.51 > 0.05) on the practical task contents appropriate for inclusion in the assessment instrument.

Hypothesis 2: There is no significant difference in the mean responses of building construction teachers and registered builders on the practical skill contents appropriate for inclusion in the assessment instrument.

Table 9: t-test Analysis on the practical skill contents

Position	N	Mean	SD	Df	t-value	p-value	Remarks
Teachers	15	4.18	0.47	19	-0.59	0.40	Accept H_o
Builders	6	3.90	0.36				

Data presented on Table 9 revealed the mean response of Teachers (4.18) and professional Builders (3.90); the data shows that both the teachers and the registered builders agreed on the practical skill contents appropriate for inclusion in the assessment instrument. The table also revealed that there is no significant difference between mean response of teachers and the registered builders (t = -0.59, df = 19, p = 0.40 > 0.05) on the practical skill contents appropriate for inclusion in the assessment instrument.

Hypothesis 3: There is no significant difference in the mean responses of building construction teachers and registered builders on the specific performance objectives of the practical task contents of building construction subject

Table 10: t-test Analysis between on the specific performance objectives

Position	N	Mean	SD	Df	t-value	p-value	Remarks
Teachers	15	4.36	0.27	19	0.59	0.19	Accept H_o
Builders	6	4.30	0.45				

Table 10 revealed the mean response of Teachers (4.36) and professional Builders (4.30); the data revealed that both the teachers and the registered builders agreed on the specific performance objectives of the practical task contents of building construction subject. The data from the table also shows that there is no significant difference between mean response of teachers and the registered builders (t = 0.59, df = 19, p = 0.19 > 0.05) on the specific performance objectives of the

practical task contents of building construction subject.

Discussion of Findings

The finding on research question 1 shows that, 4 Practical tasks were found to be appropriate for inclusion in the building sub-structure practical skills assessment instrument. This finding is in agreement with the works of Ibrahim (2012), and Okeme (2011) who opined that only items that satisfied all psychometric properties in addition to possessing high factor loading should be considered as appropriate for inclusion in practical skills assessment instrument. Surprisingly, findings from the study also indicated that there was no significant difference between mean response of teachers and the registered builders on the practical task contents appropriate for inclusion in the assessment instrument. This is in disparity with the long held believe by the industry practitioners that what is taught and assess in schools is not relevant to what is needed in the industry.

Findings from research question 2 revealed that 40 Practical skill items were found to be appropriate for inclusion in the building sub-structure practical skills assessment instrument. This finding is in disagreement with the study of Effiong (2006) who carried out a study on development and validation of alternative to practical test for measuring skills in electronics device and circuit in technical colleges. According to the instrument developed by Effiong, students must not necessarily to go to the shop to conduct practical for the practical skills in their possession can be measured, instead, an instrument with alternative to shop practice items can be develop to measure same construct. However, the findings is in agreement with Yalams (2001) and Garba (1993) who emphasized that only items that satisfied all the relevant psychometric properties should be considered as appropriate for inclusion in a practical skill assessment instrument. The study also revealed that both the teachers and the registered builders did not differ significantly in their mean response on the practical skill contents appropriate for inclusion in the assessment instrument.

For research question 3, findings revealed that five specific performance objectives were found to be appropriate for inclusion in assessing students' practical task in building sub-structure. This finding is supported by Enya (1995) who conducted a study on development and preliminary validation of an electricity achievement test for technical colleges. According to Enya, an instrument must be developed to measure the specific objectives of the instructional contents under consideration so that whatever the outcome of the assessment may be, it will not be far from what the examiner set to achieve. The finding is also consistent with Achusi (1997) and Okoye and Auta (2020) who emphasized that in assessing practical skills, performance objectives must be clearly identified and be stated in a measurable term so that the assessor can be properly guided

on areas to observe while the examinee execute the assigned task.

The findings for research question 4 shows that the 4 practical tasks and 40 practical skills were found to be valid and appropriate for inclusion in the building sub-structure practical skills assessment instrument. This finding is in line with Umanah (2016) who opined that validity of an instrument for assessing practical skills is a basic requirement for the instrument to fulfill its obligation. According to the author, the instrument must be subjected to face, contents, and construct validation, when that is done, the instrument will naturally appear to possess the ability to fulfill the predictive validity requirements.

Findings from research question 5 indicated that the developed instrument having attained an internal consistency of 0.82 and inter-rater reliability of 0.74; the 4 practical tasks and 40 practical skill items were found to be reliable for assessing students' practical skills in Building sub-structure in Nigeria secondary Schools. This finding varied with the study conducted by Olaitan (2014) on development and validation of test for assessing technical college students on motor vehicle mechanic works. While the internal consistency of the instrument developed by Olaitan ranges from 0.84 to 0.96, the internal consistency of this instrument ranges from 0.70 to 0.87. With respect to inter-rater reliability, the study conducted by Olaitan had its inter-rater reliability coefficient ranging from 0.55 to 0.84 which is an indication of the level of variation existing between the two findings.

Conclusion

The study identified the practical task, practical skills, and the specific performance objectives that are appropriate for inclusion in the building sub-structure practical skills assessment instrument. It is expected that when the instrument is effectively put into use in assessing secondary school students in sub-structure operations of building construction subject, it will bring to the fore the amount of skills the students acquired in the course of their studies. This will assist greatly in passing a valid judgment about the level of competence the students might have attained in handling practical task component of the subject which will form the basis for their certification.

Recommendations

Based on the findings of this study, it is recommended as follows:

1. WAEC and NECO should strive to see that practical tasks and skill items that constitute building sub-structure operations are included in their building construction practical skill assessment instrument.
2. Secondary schools building construction teachers should ensure that only valid and reliable instruments are used in evaluation of students in building construction practical classes.
3. Government and private school owners offering building

construction should organized workshops to building construction teachers on methods of assessing practical skills in the subject.

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