

INSTRUMENT FOR ASSESSING UPHOLSTERY SKILLS AMONG TECHNICAL COLLEGE STUDENTS AS A SECURITY INTERVENTION STRATEGY FOR SUSTAINABLE DEVELOPMENT IN NIGER STATE, NIGERIA

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Abstract: The study developed and validated an Instrument for Assessing Upholstery Skills (IAUS) for TVET students using instrumentation research design. The study was conducted in Niger state, Nigeria. Four research questions and a null hypothesis guided the study. The population of the study was 87 final year students from six Technical Colleges in Niger state. One intact class was randomly selected and used for trial test. The draft IAUS was face validated by three experts, while content validation was carried out by six upholstery teachers using a table of specifications based on Padelford (1984) psychomotor skills acquisition model where 20 tasks with 115 items were retained. The 115 items were subjected to factorial analysis where 109 items were retained. A pilot test conducted on 10 students produced reliability coefficient of 0.84 using Cronbach Alpha statistics. The final IAUS was trial tested on the intact class of 17 students. Three research assistants observed and rated the students using IAUS, while carrying out an Upholstery Practical Test (UPT). Mean, Standard Deviations, Factorial Analysis and Spearman correlation technique (r_s) answered the research questions. The results found 20 tasks with 109 corresponding items and 14 observable skills valid for inclusion in the IAUS. The Instrument produced internal consistencies of 0.65 to 0.89 and an overall reliability coefficient of 0.82. The study recommended that NABTEB, NECO and WAEC should integrate IAUS items in their examination of upholstery students, and that seminars and workshops be organized for teachers and instructors on how to use the IAUS.

Keywords: Instrument Development, Upholstery Skills, Technical Education, Sustainable Development

Introduction

Upholstery is the work of providing furniture, especially seats, with padding, springs, webbing, and fabric or leather covers. The word upholstery comes from the Middle English word upholder, which referred to an artisan who held up their goods. Upholstery is one of the technical trades included in the National Technical Certificate (NTC) offered at the Technical Colleges, Vocational Enterprise Institutions And The National Vocational Qualifications Framework as Institutions that run the Technical Vocational Education and Training (TVET) curriculum (Federal Republic of Nigeria, 2014). The term is equally applicable to vehicle furniture which often differ significantly in design. NTC curriculum is a skill acquisition experience and training which provides competence for career and employment opportunity (Kagara, *et-al.*, 2020). Uwaifo (2010) defined TVET as the training of technically oriented personnel who are to be the initiators, facilitators and implementers of technological development of a nation by adequately training its citizenry on the need to be technologically literate, leading to self-reliance and sustainability. UNESCO (2001) defined TVET as a process of education, which involves general education, the study of technologies and related sciences, and the acquisition of practical skills, attitudes, understanding and knowledge relating to occupations in various sectors of economic and social life. TVET is concerned with skills acquisition, knowledge and attitudes needed for professional career development as security intervention strategy for sustainable development in Nigeria. Individuals are skillful if they are competent in performing given task(s). People are put in a position of being able to exercise competence if they know how to act to tackle a task, but also if they are in the condition to be willing to display the necessary efforts required by the situation and when the context permits and legitimized their possibility of action (Maccario, 2012). Similarly, Le Boterf (2010) and Calenda, and Tammaro (2015) gives the following attributes regarding competence:

- to know how to act;
- to want to act;
- to be able to act

UNESCO-UNIVOC (2020) recognizes technical vocational education and training (TVET) as a prerequisite for sustaining the complex structure of modern civilization and economic and social development. The goals of TVET in Nigeria as stated in the national policy on education are to:

- Provide trained manpower in the applied sciences, technology and business particularly at craft, advanced craft and technical levels;
- Provide the technical knowledge and vocational skills necessary for agricultural, commercial and economic development;
- Give training and impart necessary skills to individual who shall be self-reliant economically.

TVET thus equips people not only with vocational and technical skills, but also with a broad range of knowledge, skills and attitudes recognized as indispensable for meaningful participation in work and life (Chijioke, 2013). UNESCO's strategy for TVET (2016-2021) is aligned with the targets identified in Sustainable Development Goal (SDG) 4: to equip all youth and adults with the skills required for employment, decent work, entrepreneurship, life-skills and lifelong learning (UNESCO-UNIVOC, 2020). SDG 4 focuses on quality education and calls on Member States to ensure inclusive and equitable quality education that promote lifelong learning opportunities for all. Skill is an ability or expertise to perform a task (Mohammed, 2016; DEST, 2006). Skill was defined as the ability to use head, hand and mind balance to achieve intellectual, technical and moral development (Bakare, 2014). Put straight, skill is the competency expertly demonstrated by an individual in performing a task. Skill is required in the use of common implements used for laying-out, cutting, sewing, padding fixing, and upholstery covering among others. TVET systems and institutions are still struggling to anticipate changing skills requirements and to initiate the change processes required to stay connected to global developments (UNESCO-UNIVOC, 2020). Changes in modern times have been brought about by disruptions in terms of technology, new raw materials, changing work structures, migration and climate change, among others. As TVET adapts itself to the impacts of various disruptions, innovative practices have emerged with the potential to ensure that the provision of quality TVET for life-skills and lifelong learning remains relevant and accessible to all. The speed and scale of change in technological and other economic growth sectors calls for a new and radical shift in education and training.

The invention of the sewing machine in the 19th century and the rise of computerization in the 20th century led to mass production and export of sewn objects, but hand sewing is still being practiced around the world (Wikipedia, 2020). Fine hand sewing is a characteristic of high-quality upholstery. Skills comprise two components – the knowledge component and the activity component. The latter is made up of motor and perceptual skills. Motor and perceptual skills are the operational tasks identified from the jobs included in the upholstery curriculum. Like in any other construction trade, TVET students are required to attain competency in upholstery work using basic tools and materials. The National Business and Technical Examination Board (NABTEB) assesses the level of skill acquired for certification based on the school curriculum.

Developing effective school-based curriculum for the various levels of TVET delivery is based on psychomotor theoretical concepts (Chijioke, 2013), it is thus necessary that the instrument suitable for assessing students' skills for job security intervention strategy for sustainable development in Nigeria must be based on the psychomotor theoretical concepts. Hence, after careful analysis of the various psychomotor theories, this study developed the IAUS based on the psychomotor skills acquisition model proposed by Padelford, (1984). The model appears comprehensive in stating learning objectives because it conforms to the requirement of psychomotor behaviour in terms of diversities that include cognitive and affective (Chijioke, 2013).

In developing the Instrument for Assessing Upholstery Skills (IAUS), cursory attention was focused on the determination of its validity and reliability. Muhammad (2006) and Radhakrishna (2007) stated that the use a valid and reliable instrument reduce measurement errors. Validity of an instrument infers that the performance attributes used in measurement are relevant to the skill dispositions to be judged (Anikweze, 2005). Validity answers the question what content,

knowledge and skills should the activity be designed to assess? Bukar (2012) and Balogun and Mustapha (2014) stated that test items that have high factor loading above 0.50 and satisfy other psychometric properties are important for selection. Reliability, a major requirement of an assessment instrument, is the ability of an instrument to correctly measure the attributes that it is designed to measure (Moskal, 2003; Landis & Koch, 1977). Meaningful assessment can only be achieved with the use of a valid and reliable instrument (Mohammed, 2016; Bukar, 2006; & Yalams, 2001). However, current practice by upholstery teachers of assessing finished products alone indicates lack of valid and reliable instrument needed to assess upholstery skills possessed by students of TVET. Teachers often base their assessment on completed practical tasks and theory alone (Mohammed, 2016, 2019). This study produced an instrument for assessing competencies of TVET students in upholstery work. Specifically, the study:

- (i) Determined the relevant tasks required and performed by upholster for inclusion in the IAUS.
- (ii) Determined the relevance of upholstery skills for inclusion in the IAUS.
- (iii) Developed an Instrument for Assessing Upholstery Skills (IAUS).
- (iv) Determined the validity of the IAUS, and
- (v) Determined the reliability of the IAUS.

Statement of the problem

Assessments of skills require the use of a valid and reliable assessment instrument. Lack of valid and reliable instrument for assessing upholstery skills acquired during practical work has made the achievement of the objectives of TVET difficult (Mohammed, 2016; 2017 & 2019). The implications of using invalid and unreliable instruments for assessing students performances is that no meaningful and reliable inferences can be made from such assessment. There is need for valid and reliable instrument in order to improve the assessment of students' upholstery skills for job security intervention strategy for sustainable development in Nigeria at the technical college level. Hence, the problem of the study was what valid and reliable instrument could be used for assessing technical college students' upholstery skills at National Technical Certificate (NTC) level?

Research questions

1. What are the relevant tasks performed by upholster for inclusion in the IAUS?
2. What are the relevant upholstery skills for inclusion in the IAUS?
3. What is the Instrument for Assessing Upholstery Skills?
4. How valid is the IAUS?
5. What is the reliable of the IAUS?

Procedure and method

An Instrument for Assessing Upholstery Skill (IAUS) was developed for TVET students based on psychomotor skills acquisition model proposed by Padelford, (1984) using instrumentation research design. The study was carried out in Niger state of Nigeria. The study was delimited to process measurement of the basic skills in design, planning, construction and finishing stages of upholstery work at NTC level, with major emphasis on the use of hand and machine tools, safety practices and maintenance of tools that include sewing machine, staple gun, Jigsaw, scissors, and others. Practical projects were not covered because of their diversity. The study was also delimited to 17 out of 87 students because of cost of administering the Upholstery Practical Test (UPT). Final year technical college students were used for the study because they have completed the upholstery modules included in the NBTE syllabus. The study did not cover the model of tools, equipment or machines used for carrying out upholstery tasks because changing technologies often affect the design of tools/machines. These might have constrained the study.

The following steps guided the development of IAUS:

- Isolating the objectives of assessment from the curriculum.
- Developed table of specifications based on Padelford (1984) psychomotor model (Table 5).
- Generated upholstery tasks and practical skills to be assessed in TVET students.
- Developed an Upholstery Practical Test (UPT).
- Validated the draft test Items and Work Sample. 20 task clusters, 115 task operations, 14 skills that should be observed in students when performing practical work and five-point rating scale were validated.
- Developed descriptive rating scale with criterion or performance level for each weighted score
- The instrument was pilot tested on 10 randomly selected TC III students of Government Technical College, Garki – Abuja, who are not part of this study. The test produced reliability coefficient of 0.84 using Cronbach Alpha statistics.
- The instrument was tried out on a sample of 17 TC III students to determine its validity and reliability. Three research assistants collected data for the research during a trial test.
- Carried out analyses and final assembly of the IAUS, which produce 20 task clusters, 109 task operations and 14 skills.

Data analysis

To answer research questions one and two, the mean (\bar{x}) was computed for every item. Items that produce a mean score of 2.50 or higher were accepted while items with scores below 2.50 were rejected and consequently not included in IAUS. To answer research question three, the data collected from trial test was subjected to factorial analysis on three components; where two of the three components agree and produced a factor loading of 0.50 and above, the item was considered valid and included in the instrument. The valid and reliable instrument obtained answered research question four. The assessment data obtained using IAUS during the trial test was correlated using Spearman Rank Correlation r_s to determine the reliability of the IAUS and provided answer to research question five. The values of the r_s were subjected to ANOVA to test the correlation of raters' scores on students' performance for significance at five percent level of probability using Statistical Package for Social Sciences (SPSS version 22.0).

Results

Table 1: Mean of Upholstery Teachers on the Relevant Tasks for Inclusion in the IAUS

S/N	Operational Tasks	\bar{x}	SD	Remarks
1.	Interpret drawing/specifications	4.13	0.59	Required
2.	Interpret Instructions and plan work	3.75	2.03	Required
3.	Laying out stock	4.10	1.41	Required
4.	Frame Construction	4.59	0.68	Required
5.	Tensioning and fixing webbing/spring	4.21	0.89	Required
6.	Tying the sinuous springs	3.89	1.91	Required
7.	Stitching the webbing	4.32	1.01	Required
8.	Cutting padding to size and shape	3.20	1.73	Required
9.	Finishing exposed parts	4.41	0.24	Required

S/N	Operational Tasks	\bar{x}	SD	Remarks
10.	Applying the padding material	4.69	0.44	Required
11.	Cutting fabric/leather cover to size and shape	4.67	0.43	Required
12.	Sewing the cover	4.89	0.39	Required
13.	Sewing the cord	3.43	1.09	Required
14.	Sewing the cord	3.57	1.12	Required
15.	Applying the cover	3.52	1.11	Required
16.	Applying and stitching furniture rope	4.89	0.78	Required
17.	Making a blind seam joint	4.78	0.69	Required
18.	Locating and fixing buttons	3.87	1.66	Required
19.	Stitching on back, lower front and arms	3.41	0.98	Required
20.	Maintenance of tools/equipment	3.10	0.63	Required
	Adopting safe practices			

N = six (Number of validates); \bar{x} = Mean; SD = Standard Deviations.

The data presented (Table 1) shows that the 20 tasks had mean values that ranged from 3.10 to 4.89 and are above 2.50 value for acceptance. Consequently, the 20 tasks are relevant for inclusion in IAUS. The standard deviations values for the 20 tasks ranged between 0.24 and 2.03. 19 tasks produced values less than 1.96 (95%) confidence limit, which implied that the responses of the respondents are close to one another and to the mean.

Table 2: Mean of Upholstery Teachers on Observable Skills Required for Inclusion in IAUS

S/N	Skill/Competency	\bar{x}	SD	Remarks
1.	Selecting appropriate tools	4.12	1.03	Required
2.	Promptness in starting a given task	4.13	1.47	Required
3.	Correct use/manipulation of tools	4.55	1.86	Required
4.	Care of tools during and after work	3.71	2.30	Required
5.	Composure when carrying out tasks	4.20	1.51	Required
6.	Body movement/skillfulness in carrying out task	4.89	1.07	Required
7.	Ability to complete task within a given time	3.97	2.87	Required
8.	Demonstrate safe work habit during work	4.09	2.04	Required
9.	Economy in the use of materials/supplies	4.22	1.94	Required
10.	Enthusiasm/hard work in performing a given task	3.90	2.01	Required
11.	Correct layout of shapes and sizes	4.90	0.15	Required
12.	Systematic approach to task execution	4.55	0.46	Required
13.	Correct handling of materials	4.55	0.45	Required
14.	Quality of finish	4.87	0.99	Required

N = six (Number of validates); \bar{x} = Mean of Validates, and SD = Standard Deviations.

Table 2 shows all 14 items produced high mean values ranging from 3.71 to 4.90. All the skill items were required and included in the IAUS. SD values ranged from 0.15 to 2.87, 10 skills are less than 1.96 at 95% confidence limit while four are beyond.

Table 3: Result of Factorial Analysis Conducted on Upholstery Tasks

S/N	Operational Tasks	No of Items Tested	No of Items Valid	Factor Loading at 0.50
1.	Interpret drawing/specifications	7	7	0.67
2.	Interpret Instructions and plan work	9	8	0.79
3.	Laying out stock	7	6	0.52
4.	Frame Construction	14	14	0.88
5.	Tensioning and fixing webbing/spring	6	5	0.56
6.	Tying the sinuous springs	3	3	0.71
7.	Stitching the webbing	5	5	0.66
8.	Cutting padding to size and shape	4	4	0.73
9.	Finishing exposed parts	5	5	0.76
10.	Applying the padding material	5	5	0.72
11.	Cutting fabric/leather cover to size and shape	5	3	0.65
12.	Sewing the cover	5	4	0.92
13.	Sewing the cord	4	4	0.87
14.	Applying the cover	5	5	0.67
15.	Applying and stitching furniture rope	5	5	0.66
16.	Making a blind seam joint	4	4	0.86
17.	Locating and fixing buttons	4	4	0.51
18.	Stitching on back, lower front and arms	4	4	0.63
19.	Maintenance of tools/equipment	6	6	0.64
20.	Adopting safe practices	8	8	0.88
	Total	115	109	

N = Number of validates (Joinery teachers); \bar{x} = Mean; SD = Standard Deviations.

Table 3 shows 20 tasks with 109 items produced factor loadings above 0.50 at 10% over-lapping variance with three components required for acceptance. Six items failed the test and were removed from the draft IAUS. The 20 tasks with their 109 items were used for the final IAUS.

Table 4: Result of Factorial Analysis Conducted on Upholstery Tasks

S/N	Operational Tasks	r_s	Remark
1.	Interpret drawing /specifications	0.65	Reliable
2.	Interpret Instructions and plan work	0.77	Reliable
3.	Laying out stock	0.89	Reliable
4.	Frame Construction	0.87	Reliable
5.	Tensioning and fixing webbing / spring	0.67	Reliable
6.	Tying the sinuous springs	0.66	Reliable
7.	Stitching the webbing	0.79	Reliable
8.	Cutting padding to size and shape	0.71	Reliable
9.	Finishing exposed parts	0.65	Reliable
10.	Applying the padding material	0.80	Reliable
11.	Cutting fabric /leather cover to size and shape	0.79	Reliable
12.	Sewing the cover	0.75	Reliable
13.	Sewing the cord	0.74	Reliable
14.	Applying the cover	0.86	Reliable
15.	Applying and stitching furniture rope	0.72	Reliable
16.	Making a blind seam joint	0.82	Reliable
17.	Locating and fixing buttons	0.68	Reliable
18.	Stitching on back, lower front and arms	0.65	Reliable
19.	Maintenance of tools /equipment	0.79	Reliable
20.	Adopting safe practices	0.81	Reliable
	Reliability of the LAUS (r_s)	0.82	Reliable

r_s = Spearman Correlation Coefficient

The LAUS have reliability coefficient that ranged from 0.65 to 0.89 for all the 20 tasks and 0.82 for the entire instrument (Table 4). Therefore, the IAUS is highly reliable.

Discussion

The 20 tasks and 109 items produced factor loadings above 0.50 at 10% over-lapping variance with three components. Bakare (2014), Bukar (2012) and Balogun and Mustapha (2014) posited that test items that have high factor loading and satisfy other psychometric properties are important for selection. All the 14 observable skill items were required and included in the IAUS. The 20 tasks, 109 items and 14 observable skills were assembled as the IAUS. Bukar (2006), Muhammad (2006), Mohammed (2017; 2019) noted that items that satisfied all psychometric properties are relevant for inclusion in an assessing instrument. Inclusion of appropriate skill items in assessment instrument assist in measuring the learning objectives adequately. Landis & Koch (1977) posited that reliability of a test or agreement of raters on students' tests in education that ranged from 0.41 to 1.00 is acceptable. Similarly, Mohammed (2017; 2019), Ombugus (2013), Yalams (2001) and Zhang and Lam (2008) obtained a reliability coefficient values of 0.71, 0.68, 0.86, and $w = 0.97$ respectively using Cronbach alpha statistics, which gives credence to the findings of this study.

Table 1: Table of Specifications Based on the Psychomotor Skills Acquisition Model Proposed by Padelford (1984).

Stage	Activity	Performance Objectives	Perceptual	Affective	Cognitive	Psychomotor	Total
Perceiving	Sensing symbols; cue selections; translating and internalizing.	1) Interpret Instructions and plan work; 6) Laying out material; 11) Sewing and 13) Applying the cover.	5	X	9	x	14
Motivation	The resolve or enthusiasm to learn: externally and internally directed satisfaction	2) plan work, promptness in starting work; 4) Construction; Systematic approach and timing.	5	5	x	x	10
Imitating	Mental manipulation & mimicking of procedures, forms and patterns	3) Laying out; 5) Fixing webbing & spring; 5) Stitching the webbing; 6) Tying the sinuous springs; 9) Finishing exposed parts; 14) Applying the cover; 17) Locating and fixing buttons; 19) Maintenance of tools/equipment.	8	4	7	x	19
Performing	Skill Practice- (involves body movement as visualized by the mind)	4) Construction; 15) Applying and stitching furniture rope; 17) Locating and fixing buttons; 15, 18) Blind seam stitching on back, lower front and arms; 19) Maintenance of tools & equipment.	6	4	4	10	24
Adapting	Creativity in adapting new motor skills to new situations: Diagnosing, reacting, adjusting and problem solving	3) Laying out stock; 8) Cutting; 4) Construction; 12, 13) Sewing the cover & Cord; 14) Applying the cover; 16) Making a blind seam joint and 20) Adopting safe practices.	X	5	6	10	21
Innovating	Ability to experiment and create new skills: Diagnosing, reacting, adjusting and problem solving	4) Construction; 18) Locating and fixing buttons; 19) Maintenance of tools/equipment; 20) Adopting safe practices.	X	5	8	8	21
TOTAL			24	23	34	28	109

Conclusion

From the findings and discussions of results, the 20 tasks, 109 task operations and 14 skills that should be assessed in students' upholstery practice in TVET for job security intervention strategy and sustainable development in Nigeria have met all the requirements of an assessment instrument. Upholstery teachers now have a reliable instrument for assessing upholstery skills. Consequently, the IAUS can be used to assess the upholstery skills of TVET and secondary school students in Nigeria. Upholstery teachers can henceforth, confidently carry out students' assessment and infer to results in making decision.

Recommendations

1. The study recommended that NABTEB, NECO and WAEC should integrate IAUS items in their assessment of practical examination of upholstery students.
2. The examination body should organize seminars and workshops for examiners (teachers and instructors) on how to use the IAUS.
3. Further research should be conducted to determine the usability and skills required in the use of local materials and processes in carrying out upholstery work.

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