

Evaluation Methods Identification for the Practical Units of Building Technology of the Nigeria Certificate in Education (Technical) [NCE(T)] Curriculum.

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Abstract: *This study employed a survey design for identification of suitable methods of evaluation of learning outcomes of the practical units of the NCE (T) building technology curriculum. The study area is Nigeria and the population comprised 72 building technology teachers (Lecturers and Instructors). There was no sampling as the population size was manageable. A structured questionnaire with 13 items was used as data gathering instrument. Five experts validated the instrument for its face and content validity. The reliability coefficient stood at .81 using Cronbach Alpha reliability test. Frequency and percentage were employed to answer the guiding research question, while chi-square (X^2) was employed to test the null hypothesis at .05 probability level. The result of the study showed that respondents preferred Practical Test/demonstration (PT/D) for evaluating learning outcomes of the practical units of the NCE (T) building technology curriculum to other methods of evaluation. Teacher Made Test (TMT) was totally rejected as a method of evaluating practical units of NCE (T) building technology curriculum. The result of the tested hypothesis portrayed 61.54 percent agreement of the teachers on the evaluation methods investigated. The result of the study provided guide for evaluation methods to be used for the practical units of the NCE (T) building technology curriculum. Based on the findings, it was recommended among others that Standard Practical Test/Demonstration should constitute the method for evaluating learning outcomes of the practical unit of the NCE (T) building technology curriculum.*

Keywords: *Evaluation, Building Technology and Curriculum*

I. Introduction

In its broad definition Technical and Vocational Education and Training (TVET) refers to a range of learning experiences which are relevant to the world of work. "Technical and vocational education is used as a comprehensive term referring to those aspects of the educational process involving in addition to 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". It is worthy of note that TVET, VET and Career and Technical Education (CTE) are almost identical in meaning. What is most prominently used depends on what part of the world one is talking about. The USA used Vocational and Technical Education until a few years ago when it was changed to Career and Technical Education because it was believed to convey a better image, so these terms can be used interchangeably. TVET also refers to "deliberate interventions to bring about learning which will make people more productive (or simply adequately productive) in designated areas of economic activity (e.g. economic sector, occupations, specific work tasks). This is the distinctive purpose of TVET. In Nigeria Technical and Vocational Education (TVE) has been in use until recently when efforts are being geared towards using TVET.

The challenges of the 21st century characterized by globalization and its attendant demands underscore the importance of quality assurance in technical and vocational education and training at this point in time within nations and internationally. "Quality Assurances in Technical Vocational Education and Training (TVET)" showcases an introductory guide to best practice in education which is the knowledge that underpins examples of excellence. Nations can take this knowledge, share it and implement it through the educational process and or system. Whereas Quality Assurance (QA) consists of procedures to ensure that a company or organization is providing the best possible products or services. Quality assurance in TVET focuses on enhancing and improving the processes that are used to provide relevant, effective, efficient work-related instruction. It is the "systematic measurement, comparison with a standard, monitoring of processes and associated feedback loop that confers error prevention". Quality assurance systems are set up to ensure improvement and accountability of education and training. They aim at increasing the effectiveness and transparency of provision at all levels and thereby promoting mutual trust, recognition and mobility within and across countries.

Quality assurance and recognition include such objectives as:

1. Ensuring that qualifications are relevant to perceived social and economic needs;
2. Ensuring that education and training standards are defined by agreed learning outcomes and applied consistently;
3. Ensuring that education and training providers meet certain standards; and
4. Securing international recognition for national qualification.

Three important measures of quality assurance are validation of qualifications and or standards, accreditation and audit of education and training institutions; and quality assurance assessment leading to the award of qualifications. There is great deal of evidence to suggest that systems which over-emphasize central control tend to produce bureaucratic compliance and cynicism. A culture of quality improvement is only created when there is sense of responsibility for quality at the grassroots level. The aim of policy makers therefore should be to encourage institutions to take responsibility for quality in collaboration with stakeholders.

At the instance of achieving quality assurance, the process of developing a framework of qualifications must take into account the need to foster trust among the various stakeholders so that they can have confidence in the integrity of the resultant framework .It is vital to identify the stakeholders and advance consensus – building mechanisms as framework development through dialogue .An important way to build trust and acceptance is to ensure that any top-down approach is fused with a bottom-up process . It is possible to design different ways to consult but, in general, the approach should be as transparent as possible.

A qualifications framework is an instrument for the development, classification and recognition of skills, knowledge and competencies along a continuum of agreed levels .It is a way of structuring existing and new qualifications, which are defined by learning outcomes, i.e. clear statements of what the learner must know or be able to do whether learned in a classroom, on-the-job, or less formally. The qualifications framework indicates the comparability of different qualifications and how one can progress from one level to another within and across occupations or industrial sectors (and even across vocational and academic fields if the National Qualifications Framework (NQF) is designed to include both vocational and academic qualifications in a single framework). Whatever the case may be, all qualifications frameworks, however, provide a basis for improving the quality, accessibility, linkages and public or labor market recognition of qualifications within a country and internationally.

It stands to reason why monitoring, research and evaluation is an important aspect of a nation's education development plan .In Nigeria, good polices are on ground, but these are never faithfully implemented. The main reason for this is the non-inclusion of plan for implementation studies as a major component of project/program proposal. Furthermore, these aspects of monitoring, research and evaluation in TVE are not usually budgeted for hence, they are never carried out as part of the TVE development process. There is also the death of specialists in these vital aspects, hence useful monitoring, research and evaluation exercise cannot be carried out (FME, 2001).

Given the vital objectives of monitoring, research and evaluation; which include but not limited to ascertaining the extent to which:

1. Implementation of the TVE is being carried out as planned, i.e. Checking the validity and accuracy of the implementation;
2. Performance objectives are being met for example, are the trainees suitably trained to cope with the world of work?
3. It is imperative that the colleges of education (T) system should evolve standardized evaluation methods for the practical units of the building technology curriculum of the Nigeria certificate in Education (Technical).

Presently, many are of the opinion that TVET is in a state of crisis, yet it is believed that “technical vocational education with its relevant practical components holds the key to Nigeria becoming technologically relevant and internationally competitive in the world market. It is also the most effective means of empowering the citizenry to stimulate a sustained national development, enhance employment, improve the quality of life, reduce poverty, limit the incidence of social violence due to joblessness and promote a culture of peace, freedom and democracy” (FME, 2001).

At the background of the master plan for Technical and Vocational Educational Development in Nigeria in the 21st century (FME,2001), it was stated that ; an important ingredient for success in the effort of government at alleviating poverty, eradicating corruption, attaining full security, achieving universal basic education, ensuring uninterrupted power supply, maintenance of oil refineries, assuring drastic reduction in violent crime and communal violence involving unemployed youth, among others, is the effective delivery of technical and vocational education. It is therefore the vision of the Nigerian Government beginning from the first decade of the 21st century, to have an emergence of a vibrant Nigeria catalyzed by virile technical and vocational education system, a system that is characterized by high public esteem and demand, and high internal efficiency. A democratic Nigeria, triumphant over poverty, corruption and victorious in its struggle for gainful

self-employment of its youth, through an enriched curriculum of its technical and vocational education delivery system. A peaceful Nigeria where the knowledge, skills and attitudes of its technical and vocational education trainees and graduates assures fulfillment for the individual prosperity for the nation as well as socio-economic sustainability.

The objectives of technical and vocational education in Nigeria in the 21st century are among others to:

1. Produce semi-skilled and technical manpower necessary to restore, revitalize, energize, operate and sustain the national economy and substantially reduce unemployment.
2. Reform the content of technical and vocational education to make it more responsive to the socio-economic needs of the country; and
3. Harmonize and inter-relate with industry and the labor market in terms of resources for training as well as occupational and production standards.

Standard evaluation methods for the psychomotor domain especially for the NCE (T) Building Technology Curriculum, has become imperative. Suffice it to say that evaluating students' attainment in vocational and technical education subject with respect to psychomotor domain is a serious challenge to institutions at the Nigeria Certificate of Education (Technical) level in Nigeria. Evaluation is an integral part of the curriculum. It involves the measurement and assessment of the entire curriculum to determine the extent to which learners have achieved the intended outcomes. It must be noted that the word evaluation could be seen from diverse perspectives. As defined by Wikipedia (2013), evaluation is a systematic determination of a subject's merit, worth and significance, using criteria governed by a set of standards. It can assist an organization to assess any aim, realizable concept/proposal, or any alternative, to help in decision-making; or ascertain the degree of achievement or value in regard to the objectives and results of any such action that has been completed. The primary purpose of evaluation, in addition to gaining insight into prior or existing initiatives, is to enable reflection and assist in the identification of future change.

Evaluation could be further seen as the structural interpretation and giving of meaning to predict or actual impacts of proposals or results. It looks at original objectives and at what are either predicted or what was accomplished and how it was accomplished. According to Oranu (1982) cited in Onweh (2004), evaluation is an essential aspect of any instructional program. It includes testing but involves more than the conventional testing and examination techniques. Evaluation is designed to indicate whether the teacher has taught and whether the learner has learned. Other reasons adduced for evaluating students' progress are:

1. Approval of academic achievement of individual students.
2. Diagnosis of learning difficulties of an individual student or entire class
3. Motivation of the learning process and
4. Measurement of teaching efficiency.

The reason for evaluation emphasizes the importance of establishing functional and behavioral objectives, which are clearly defined, understood and attainable. In the field of education, particularly in vocational education, evaluation is a tedious task. It is relatively easier to evaluate students' progress in some other disciplines, than it is in vocational education. Evaluation in vocational and technical education involves making value judgment on intangibles. These intangibles are human factors which are not easily observable, and therefore must be evaluated by reference to overt behavior of the students. These human factors which include such behavioral traits as interest, work habit, attitude, skills, qualities of leadership and human relations of students, cannot be evaluated using traditional methods of written, oral and performance tests (achievement test), are evaluated using observation. In other to obtain clearer pictures of students' development in vocational and technical education, it is necessary to observe the students as they work in the school laboratory or workshop. This is meant to be in consonance with one of the theories of vocational education as posited by Prosser in the 1940s i.e. the effective establishment of process habit in any learner will be secured in proportion as the training is given on actual jobs, not on exercises or pseudo jobs. The observation must be controlled and directed if they are to have maximum value in the total evaluation program. By using such evaluation devices as check-list, rating scales, progress charts, and anecdotal records, to mention a few, the grading of manipulative work and student behavioral changes can be made more objectives, comprehensive and reliable. This is necessary because as opined by Prosser in the 40s, for every occupation there is a minimum of learners (producer) ability which an individual must possess in order to secure or retain employment in the occupation. If vocational education is not carried out to that point with the individual (learner) it is neither personally or socially effective. Okoro (1993), contended that though the ability to perform complex psychomotor skills can be determined through a written cognitive test, but a practical performance test is the most direct and effective methods of assessing practical skills acquisition. Hence, Okoro (1993) advocates that in most situations it will be best to combine process and product system of measurement in order to obtain maximum information for evaluating the level of skill possessed by students. The identification of standard performance appraisal methods becomes a necessity for the practical units of building technology curriculum of the Nigeria Certificate in Education (Technical). Performance appraisal method is a systematic evaluation of an

individual with respect to performance on the jobs and individual potentials for development (<http://wzus1.ask.com/r?t=p&d>).

Statement of the Problem

There are no standard methods specified for evaluating students' attainment in TVE courses especially with respect to psychomotor domain presently. Hence, the practical aspects for the NCE (T) program are evaluated differently in Colleges by different lecturers. If learning outcomes of students in building technology practices must be uniform with respect to specific and defined behavioral objectives, the need to identify suitable methods of evaluation cannot be over looked. The problem of this study therefore is to identifying methods of evaluating learning outcomes of the practical units of the NCE (T) building technology curriculum.

Purpose of the Study

The purpose of the study is to identify suitable methods of evaluating learning outcomes of the practical units of NCE (T) building technology curriculum.

Research Question

What are the suitable methods of evaluating learning outcomes of the practical units of the NCE (T) building technology curriculum?

Hypothesis

Ho₁: There is no significant difference between the means of responses of building lectures and building instructors on the suitability of the methods of evaluating learning outcomes of the practical units of the NCE (T) building technology curriculum.

II. Methodology

The study area is Nigeria. All the Colleges of Education (Technical) that offer Building Technology at NCE (T) level were used. There were 13 states involved. They include; Abia, Anambra, Benue, Borno, Delta, Kano, Lagos, Niger, Oyo, Rivers, Yobe, and Zamfara.

The population for the study was 72, comprising two groups of people (lecturers and instructors) in the area of building technology education. They were from 16 Colleges of Education (Technical) both state and Federal from the 13 states named that offer Building Technology Education.

Instrument

Questionnaire was used for data collection. It was developed through extensive literature review and based on the purpose of the study. Thirteen items were involved. The respondents were asked to check using codes provided, the method(s) they considered suitable for evaluating learning outcomes of the NCE (T) Building technology practical. Five experts validated the instrument for its face and content validity. Three of the validates were experts in Building Technology, while the other two were, one in Measurement and Evaluation and the other in Educational Technology. The reliability coefficient of the instrument stood at 81.

Data collection and Analysis

Seventy-two copies of the questionnaire were distributed to respondents by hand with the help of research assistants. The same process was adopted in the collection. Sixty-one of the questionnaire representing 84.72 per-cent were duly completed and returned for analysis.

Frequency and percentage were used for analysis, while chi-square(X^2) was used to test the hypothesis at .05 probability level. To consider an evaluation method acceptable, the frequency must be 25% and above and this was decided before going to the field. In respect of the hypothesis (Ho₁), if $X^2_{cal.} > X^2_{crit}$. It means there is a significant difference in the choice of lecturers and instructors over evaluation method(s) and thus, Ho₁ will be rejected; otherwise it will be accepted.

Findings

Table

Findings on methods for evaluating practical units learning outcomes investigated

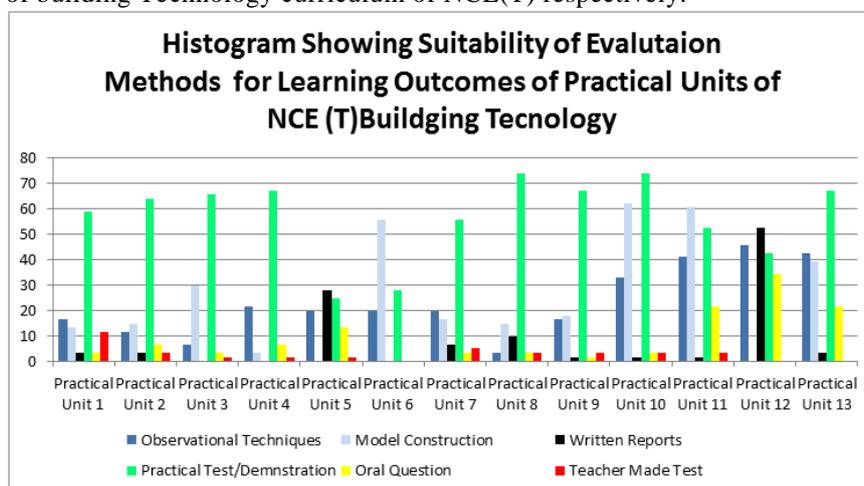
S/N	Items	Evaluation Method(s)											
		OT		MC		WR		PT/D		OO		TMT	
		F	%	F	%	F	%	F	%	F	%	F	%
1.	Use building drawings to identify specific architectural features.	10	16.39	8	13.12	2	3.28	36	59.02*	2	3.28	7	11.48
2.	Clear and level simple building site.	7	11.48	9	14.75	2	3.28	39	63.94*	4	6.56	2	3.28
3.	Set out simple building on sheet of plywood/field	4	6.56	18	29.51*	0	0	40	65.57*	2	3.28	1	1.64
4.	Set and level simple building site	12	19.67	2	3.28	17	27.87*	41	67.21*	4	6.56	1	1.64
5.	Visit construction site and observe site activities	12	19.67	0	0	0	0	17	27.87*	0	0	0	0
6.	Make models of building	12	19.67	34	55.74*	0	0	17	27.87*	0	0	0	0
7.	Make scaled drawings of features and principles of constructing walls.	12	19.67	10	16.39	4	6.56	34	55.74*	2	3.28	3	4.92
8.	Prepare and finish walls by, plastering	2	3.28	9	14.75	6	9.84	45	73.77*	2	3.20	2	3.28
9.	Lay tiles on walls and floor with	10	16.39	11	18.03	1	1.64	41	67.21*	1	1.64	0	3.28
10.	Construct models of ceiling showing methods of sound and thermal	20	32.79*	38	62.29*	1	1.64	45	71.77*	2	3.28	2	3.28
11.	Prepare models of various types of	25	40.98*	37	60.66*	1	1.64	32	52.46*	13	21.31	2	3.28
12.	Go on industrial attachment in	28	45.90*	0	0	32	52.46*	26	42.62*	21	34.43"	0	0
13.	Carry out projects on arch	26	42.62*	24	39.34*	2	3.28	41	67.21*	13	21.31	0	0

* = Accepted methods of evaluation for respective items - (for frequency per cent above 25)

- Key:
- OT = Observation Techniques
 - MC = Model construction
 - WR = Written Reports
 - PT/D = Practical Test / Demonstration
 - OQ = Oral Question
 - TMT = Teacher Made Test (Cognitive)
 - F = Frequency

Table 1 above indicates that respondents preferred Practical Test / Demonstration (PT/D) for evaluating learning outcomes of the NCE (T) Building Technology practical to other methods of evaluation as shown by the frequency percentage responses. The table also shows that respondents did not approve Teacher Made Test (TMT) for any of the 13 items constituting practical works.

Oral Question / Answer (OQ) were approved for evaluating students learning outcomes on industrial attachment. Whereas Written Report (WR) was only approved for two items, items 4 and 12 having 27.87 per cent and 52.46 per cent respectively; Observational Techniques (OT) was favored for the evaluation of four practical units; while Model Construction (MC) were favored for evaluating five out of the 13 practical units of building Technology curriculum of NCE(T) respectively.



Key
Practical Units

- 1- use building drawings to identify specific architectural features
- 2- clear and level sample building site
- 3- set out simple building on sheet of plywood/field

- 4- set and use dumpy level
- 5- visit construction site and observe site activities
- 6- make models of building components
- 7- make scaled drawing s of features and principles of constructing walls
- 8- prepare and finish walls by rendering
- 9- lay tiles on walls and floor with mortar and adhesives
- 10- construct models of ceiling showing methods of sound ad thermal insulation
- 11- prepare models of various types of staircases
- 12- go on industrial attachments in building construction sites
- 13- carry out projects on arch construction

Test of Hypothesis

Table 2

Chi-Square values on the suitability of method(s) of evaluating learning outcomes of the NCE (T) Building Technology Practices.

S/N	Methods	X ² -cal	X ² -crit	Decision
1.	Using building drawings to identify specific architectural features.	12.125 *	III	Ho ₁ -rejected
2.	clear and level simple building site	10.011	III	Ho ₁ -rejected
3.	Setout simple building on sheet of ply-wood/field.	3.73	III	Ho ₁ -rejected
4.	Set and use dumpy level.	4.36	III	Ho ₁ -rejected
5.	Visit construction site and observe activities.	13.582 *	III	Ho ₁ -rejected
6.	Make models of building components.	4.064	III	Ho ₁ -accepted
7.	Make scale drawing of features and principles of constructing Walls	12.655 *	III	Ho ₁ -rejected
8.	Prepare and finish wall by rendering.	9.406	III	Ho ₁ -accepted
9.	Lay tiles on walls and floors with mortar and adhesives	10.648	III	Ho ₁ -accepted
10.	Construct models of ceiling showing method of sound and thermal insulation.	11.753 *	III	Ho ₁ -rejected
11.	Prepare models of various types of staircases.	18.447 *	III	Ho ₁ -rejected
12.	Industrial Attachment in building construction sites.	7.12	III	Ho ₁ -accepted
.13.	Carryout projects on arch- construction.	9.24	III	Ho ₁ -accepted

P = 05, df = 5, * = Rejected.

Table 2 indicates the chi-square values of the null hypothesis postulated to guide the study - for the 13 items on evaluation choice of teachers (lecturers and instructors) on learning outcomes of the NCE (T) Building Technology Practical. The postulated null hypothesis that guided the study was accepted for eight items i.e. items 2,3,4,6,8,9,12 and 13; and rejected for items specifically, items 1,5,7,10 and 11.

Discussion

The findings from table 1 revealed that respondents preferred Practical Test / Demonstrations (PT/D) to other evaluation methods for evaluating learning outcomes of the NCE (T) Building Technology Practical. Teacher Made Test (TMT) was completely unaccepted. This result corroborates the views of Bake O, Neil (1978), and Okoro (1993) when they contended that the ability to perform complex psychomotor skills though can be determined through a written cognitive test, but that practical test is the most direct and effective method of evaluating practical skills acquisition. Practical Test / Demonstration are also good because it is through it that students can articulate their growing knowledge and also receive corrections if needed from their teacher. Teachers can also learn how effective they have facilitated learning for their students and can use the information to revise their instructional practice.

NCE (T) students need practical test / demonstration as evaluation method, especially in studying building technology. Otherwise graduates of NCE (T) building technology program shall only parade with certificates qualifying them for the knowledge, skills and attributes they do not possess. A well developed instructional design, specifying standard evaluation method such as PT/D, is the solution to check crises in curriculum implementation.

The findings from Table 2 in respect of the chi-square (X²) values of null hypothesis postulated for the 13 items on evaluation choice of teachers on learning outcomes of the NCE(T) building technology practical indicate that the teachers agreed on eight of the 13 items representing 61.54 per cent agreement. This confirms the opinions of the panel of experts' high validity and reliability coefficient (.81) of the instrument used.

III. Conclusion

It is important to note that good evaluation/assessment depends more on hard thinking and good analysis than on empirical solutions. Measurement for the assessment of instructional technology outcomes is difficult and must proceed beyond the often mindless way in which most people implement it at present. Evaluation of technology outcomes of technology-based instruction is different from that of instructional assessment and so, special attentions to the attributes of the assessment are very essential.

In all, evaluation results should be utilized in finding out what the student has learned; should help the student to learn; should reveal to the student his/her weaknesses and strengths; should provide incentive for improvement; and should help the teacher evaluate his/her teaching and serve as a basis for improvement. It stands to reason then why one of the most important aspects of a successful learning experience is the opportunity for learner to play back to teachers their growing understanding of the information or process they are teaching (assessing students, performance). It could be said that based on the results of this study, suitable evaluation method(s) of learning outcomes of the practical units of the NCE (T) Building Technology curriculum have been found.

Recommendations

1. Standard Practical Test / Demonstration should constitute one of the major methods for evaluating learning outcomes of the practical units of the NCE (T) Building Technology curriculum. Any other method(s) found relevant should also be made standard.
2. Evaluation method(s) of learning outcomes of the practical units of the NCE(T) Building Technology curriculum should be made the same in all the College of education (Technical) for uniform quality of certificate and also uniform basic quality of NCE(T) graduates of Building Technology in terms of practical skill acquisition.
3. Similar study should be carried out in other NCE (T) program for better curriculum implementation.

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