DEVELOPMENT OF AN INSTRUMENT FOR QUALITY EVALUATION OK TECHNICAL PROJECTS IN SCHOOLS

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Abstract

In order to develop technology effectively, the assessment of the practical standard of technical project evaluators in evaluating students cannot be avoided. In most times, technical project evaluators in blocklaying and concreting, automechanic and electrical installation in technical colleges assess practical work of students by merely taking a cursory look at them and then assigning any grade they think the students deserve. Efforts appear not to have been made at seriously evaluating the quality or characteristics of individuals' practical work by at least preparing a definite procedure of evaluating or format. This is an identified problem which prompted the Development of an instrument for Quality Evaluation of Technical Projects in Schools (QETPS).

Introduction

The usefulness of technical education in the technological and economic development of a nation cannot be undermined. As Nigeria moves toward industrialization, many new jobs are created in the industry and commerce that require skills. Skills will be needed to operate and service new and sophisticated technical equipment for the production of goods and services. Therefore, training and retraining of people become imminent. This is where the role of technical education comes into play. It should equip individuals with the skills, knowledge and habits, which will enable them to improve themselves, their families, their communities and the larger societies.

The new National Policy on Education (FRN, 1998) pointed out that technical education is "that aspect of education which leads to the acquisition of practical and applied skills as well as basic scientific knowledge". Technical education institutions in Nigeria include pre-vocational and vocational schools at post-primary level, the technical colleges, polytechnics, colleges of technical teacher education at post-secondary level and the universities.

In these areas of educational institutions, technical college education will be highlighted in this paper. Graduates of technical colleges are the craftsmen at the lower level of manpower development. The technical colleges education requires the learners to produce technical projects. A project may be construction of water reservoir, surface wiring, casting of metallic pot, simple construction of wood joints, ceramic moulding etc. Ugonabo (1986) stressed that project is used to identify a wide variety of students learning experiences which emphasizes the application of skills and knowledge that result in some type of product. But in all these, assessment of the students[1] projects is absolutely necessary.

It is obvious, therefore, that the development of technology could hardly be advanced without quality evaluation of technology artifacts. The technological experts should judge their advancement at each level of operation through evaluation instruments. Acha (1981) observed that human beings have evolved over a time a culture of judgement. Hence, at most levels of human action, individuals, groups, institutions and government pass judgement about the prescriptions and proscriptions of events, decisions, performances, processes, objects, and situations. Assessment of the quality of technological products is essentially a basic factor in technological development.

Poor quality of technological products could imply poor processes, techniques, and methods of manufacture. Poor evaluation on methods will not only perpetuate low standard in technology

development but stifle initiative and kill productive efforts of both teachers and learners. Conversely, good evaluation pract encouraging high level of productivity and standard through good quality technology teaching. Practical projects must standard and excellence among students. In technical colleges, students' practical projects are cardinal aspects of the curricul which the evaluators must be interested in and whose aim is to develop appropriate skills on the part of the students.

Obi (1985) argued that Nigeria cannot attain parity with industrialized nations unless she makes significant c technology can be marred by poor evaluation practices or technologies and tools. Evaluation entails a teacher putting a va characteristics of behavior (Wokocha, 1993). It involves testing that is objective otherwise it would be erratic and variabl identified and assessed. This study, therefore, sought answers to the following research questions and hypothesis:

1. What are the essentials for quality evaluation of practical project?
2. What are the tools/equipment for the evaluation of practical project?
3. What are the competencies to be evaluated from practical project?
4. What are the measures to ensure objectivity in evaluation of practical project?

Hypothesis

Hoi: There is no significant difference in the rating of evaluators about the essentials of quality technical project assessment ($p< 0.05$)

Methodology

The study utilized an instrumentation research design. The reason for using this design is that it is appropriate for use when introducing new procedures, technologies or instruments for educational practices (Ali, 1990). A total of 50 technical project assessors comprised the population of the study. 27 technical project assessors (9 each from blocklaying and concreting, automechanic and electrical installation trades) were selected as sample from Delta State technical colleges using simple random sampling technique. A 57 item instruments which covered Essentials of Quality Technical Project Assessment (EQTPA); Tools/Equipment for the Evaluation of Practical Project (TEPP); Skills and Competencies to be evaluated during Practical Project (SCPP) and Measures of Ensuring Objectivity in Evaluation of Practical Projects (MOEPP). Cronbach's alpha (&) was used on the instrument to ensure its reliability, which yielded a coefficient of 0.68 for the entire items indicating that the instrument was reliable.

In order to quantify and effectively analyses responses, normal values were assigned to the response category in the scale and computation carried out for mean as follows.

$$X = \frac{£fx}{N}$$

Where X = Mean of their responses
Fx = Sum of the responses multiplied
by frequency F = Frequency of the
responses E = Summation (Sigma) N
= Number of respondents

X~ 4 x K *Important + 3 x Important + 2 x*
Not Much <u>*Important* j- *IXnotljnpQrtaiil*</u>
N

A minimum mean of 2.50 was specified as the value an item will score in order to reach response acceptance level. This is because the class boundary between 2.00 (lower limit) and 3.00 (upper limit) is 2.50. A mean of 3.50 - 4.00 was regarded as very important, a mean of 2.50 - 3.49 was regarded as important, a mean of 1 .50 - 2.49 was regarded as Not Much Important while a mean of 1.49 and below was regarded as Not Important. This scale was used throughout the four sections of the study to enable the researcher determine the degree of importance attached to each item.

As a follow - up to questionnaire administration, occasional personal interviews were used to collect and update responses from evaluators. Data collected were analyzed using mean. Chi-square (X^2) at 0.05 level of significance was used to test the null hypothesis.

Result and Discussion

The results and analysis of data collected are presented in this section. Four research questions were answered while one hypothesis was tested at 0.05 level of significance. Tables were used to simplify the interpretation and analysis of data.

Research Question 1

What are the essential for quality evaluation of practical project? The result of the analysis is shown in Table 1.

Table 1
Essentials for Quality Evaluation of Practical Project

S/N	ITEM	MEAN	REMARK
1	Workability/Functionality	3.62	V. important
2	Utility Value of the project	3.58	V. Important
3	Relevant Project drawings	3.56	V. Important
4.	Working under safe condition	3.56	V. Important
5	Accuracy of dimension on the project constructed	3.44	Important
6.	Shape, layout and proportionality of	3.33	Important
7.	Use of tools/equipment during practical	3.22	Important
8	Finishing/aesthetic standard	3.44	Important
9.	Neatness of Project	3.11	Important
10	Design nature and creativity	3.33	important
11.	Interpretation of drawings	3.33	Important
12.	Written report of project	3.11	Important
13	Oral defence of project	2.78	Important
14.	Type of material used	3.22	Important
15.	Time frame for the project	1.40	Important

Item by item analysis of the responses of the questionnaire in Table 1 shows that items one, two, three and four are very important Quality Evaluation Essentials for practical project. Having means of 3.50 and above. The means of items five to 15 which are 2.78 to 3.44 also indicate that the items are Important. It was only item 15 with a mean of 1.40, that is "time frame for the project" that was rated as not important.

Research Question 2
What are the tools/equipment for the evaluation of practical project?
The result of the analysis is shown in Table 2.

Table 2.
Tools/Equipment for the Evaluation of Practical Projects

S/N	ITEM	MEAN	REMARK
	BLOCKLAYING AND CONCRETING TOOLS		
1	Trowel	3.67	V. Important
2	Spirit level	3.61	V. Important
3	Steel tape/rule	3.56	V. Important
4.	Shovel	3.50	V. Important
5	Range (Straight edge)	3.42	Important
6.	Builders' square	3.11	Important
7.	Head pan	3.02	Important
8	Slump test apparatus	2.36	Not Important
	AUTOMECHANIC TOOLS		
1	Venier caliper	3.78	V. Important
2	Set Allen Key	3.74	V. Important
3	Torque Wrench	3.70	V. Important
4	Micrometer	3.44	Important
5	Head pan	3.02	Important
6	Socket Spanner	2.89	Important
7	Hack saw	2.33	Not Important
8	Manometer	2.11	Not Important
	ELECTRICAL INSTALLATION TOOLS		
1.	Avometer	3.89	V. Important
2.	Tester	3.78	V. Important
3.	Tester screw driver	3.56	V. Important
4.	Hammer	3.11	Important
5.	Screw driver	3.00	Important
6.	Cutter pliers	2.78	Important
7.	Digital meter	2.78	Important

The analysis of the items in Table 2 shows that items one to four under Blocklaying and Concreting are very important tools/equipment for the evaluation of practical projects having means of 3.50 and above. The means of items five to seven which are 3.42, 3.11 and 3.02 also indicate that the items are Important while item eight, slump test apparatus has a mean of 2.36 showing that it is not important.

For auto mechanic tools, items one to three have means of 3.70 to 3.78 showing that they are very important while items seven and eight have means of 2.33 and 2.11 respectively showing that they are not important.

Items one to three under electrical installation tools have means ranging from 3.56 to 3.89, showing that they are all very important while items four to seven have means ranging from 2.78 to 3.11 indicating that they are all important.

Research Question 3

What are the competencies to be evaluated from practical project? The result of the analysis is shown in Table 3.

Table 3.

Competencies to be Evaluated from Practical Project

S/N	ITEM	MEAN	REMARK
1	Ability to use tools and equipment correctly	3.33	Important
2	Ability to operate relevant machine	3.22	Important
3	Ability to repair and maintain a given project	3.22	Important
4	Ability to exhibit correct wiring skills	3.04	Important
5	Ability to construct objects using metals	3.02	Important
6	Ability to exhibit correct measurement and cutting skill	3.00	Important
7	Ability to assemble components	3.00	Important
8	Ability to construct structure using blocks and bricks	2.91	Important
9	Ability to create joints or join parts	2.89	Important
10	Ability to layout, set out and organize properly	2.89	Important
J1__	Ability to draw to dimension and shape	2.78	Important
12	Ability to interpret drawings	2.67	Important

The analysis of the items in Table 3 shows that all the terms under competencies to be evaluated from practical project were rated important by the raters.

Research Question 4

What are the measures to ensure objectivity in evaluation of practical project? The result of the analysis is shown in Table 4.

Table 4.

Measures of Ensuring Objectivity in Evaluation of Practical Projects

S/N	ITEM	MEAN	REMARK
1	Sticking to performance objective of projects during assessment	3.67	V. Important
2	Increasing the personal competence of the evaluators through training and practice	3.56	V. Important
3	Relying and ensuring accurate measurements for evaluation	3.44	Important
4	Slicking to the marking scheme	3.33	Important
5	Use of group evaluators and taking average judgement	2.67	Important
6	Evaluators relying on equal interest of students for their assessment	2.22	Not Important

Table 4 indicates that items one and two were rated Very Important while items two to five were rated Important. It was only item six that was rated not Important.

Table 5

The 3x3 Contingency Table for the Instrument for Quality Evaluation of Technical Projects in Schools

Instrument for Quality Evaluation of Technical Projects in schools

Field of specialization/ Evaluators	Very Important	Important	Not Important	Total
Block laying and concreting Evaluators	1060(1059.80)	321 (324.58)	18(14.62)	1399
Automechanic Evaluators	768 (690.32	213(282.76)	8(15.92)	989
Electrical installation Evaluators	680(752.75)	240(169.80)	10(7.45)	930
Total	2508	774	36	3318

Df=(r-l)(c-l) where R= row of the contingency table C= column of the contingency table Df= (3-l)(3-l) - (2) (2) =4

Since the obtained chi-square (x2) of 68.9 is greater than the given critical value of 9.49 at 0.05 level of significance, the null hypothesis was then rejected. There was therefore, significant difference among the three professional groups of project evaluators regarding the essentials needed to achieve quality evaluation in technical projects.

Majority of the evaluators, felt that the items were "important to very important" except an item "time frame for the project"

Findings

The study revealed that majority of the raters[1] ratings hinged around the categories of "very important" and "Important" except the item captioned "time frame for the project. This showed that from the views of the evaluators, the Instruments for Quality Evaluators, of Technical Projects in Schools (IQETPS) are important instruments for evaluating students' practical work. According to the ranking, tools like slump test apparatus, Hacksaw and Manometer which have means of 2.36, 2.33 and 2.1 1 respectively shows that project evaluators do not generally use them as tools for evaluation. The other items were found relevant for evaluation practices.

Findings got as constraints in the developed instrument for Quality Evaluation of Technical Projects in Schools due to Oral interview with evalualors were. 1. Lack of consumable materials for practical projects.

2. Lack of cash (money) for petty purchases to meet urgent workshop contingencies.
3. Poor motivation among technical teacher.
4. Poor students interest' in practical projects.
5. Poor environment or condition for practical.
6. Principals' negative attitude towards evaluation
7. Teachers' poor knowledge of evaluation principles and methods.
8. Evaluation of practical projects perceived as tedious or cumbersome by project evaluators

Discussion

This study has implications for students, teachers, examining bodies and curriculum planners. According to Acha (1981) learners are given specific tasks perform, to find out what they can do and the results of their performance are scored and interpreted for a purpose. This purpose is often to ensure that positive changes occur in the learner. The indication from the forgoing analysis is that practical projects, skills and competencies possessed by learners, in blocklaying and concreting, automechanic and electrical installation are required by the evaluators and at least 14 essentials of quality project assessment are required. Among these criteria, workability/functionality ranked first. Also, at least 20 tools or instruments are needed to evaluate effectively the technical project constructed by learners. Twelve skills and competencies are expected to be effectively evaluated and at least four measures or precautions should be taken by project evaluators (with one measure to be restructured or refined).

The QEPP scale showed a clear evidence that all the evaluators were in general agreement that the 57 items (except one) are important for the quality evaluation of practical projects in technical colleges. Respondents felt that time for constructing a project was not important.

In addition to accepting the QEPP scale as a necessary guide for evaluators the respondents also agreed (from oral interview) that some constraints still exist generally in the quality evaluation of technical projects in technical colleges. Among the constraints ranked in order of importance were:

1. Lack of adequate tools and equipment.
2. Lack of materials for practical projects and.
3. Lack of funds for petty purchases for some workshop contingencies.

It was found that similar constraints also exist in teaching technical subjects (Agbo, 1990; Chukwuani, 1989; Udofia, 1990). Odu (2002) also supports the above view that lack of tools! equipment and training materials hamper the technical training of technical college students. Usually, what affects the teaching of a subject may invariably affect proper evaluation of that subject.

The result also showed that there was significant difference in the opinions of the evaluators regarding the essentials for quality evaluation of students' technical projects. The results simply point out that while the three occupational areas (Blocklaying and concreting, Automechanic and Electrical Installation) have a lot in common in terms of skills, competencies, tools, instruments and environment, there exists some distinct differences when operational activities are considered.

Quality of evaluation of technical projects by evaluators will make both the students and their teachers to improve on the various techniques of constructing technical projects. This will give more room for national development as the country forges ahead technologically and economically. The per capita income of the country will improve.

Conclusion

The significant support given to the QEPP scale was an indication of the evaluators' willingness to provide a guide for qualitative evaluation of technical projects in technical colleges. The evaluators can use the QEPP scale as a working guide compass for quality evaluation rather than the unprocedural evaluation practices often done by some teachers to satisfy themselves. By so doing, the state and stage in technological development would have been objectively described and monitored.

Recommendations

The following recommendations are made:

1. Evaluators of practical projects in technical colleges should use the Quality Evaluation of Practical Project (QEPP) scale as a work guide for quality evaluation.
2. The government or the appropriate authorities should address the identified constraints to quality evaluation especially lack of training materials; lack of adequate tools and equipment; lack of finance to run the workshops.
3. Workshops, seminars and conferences should be organized for evaluators to avoid future variation in rating of students' technical projects.

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