



Perceived Influence of Design Procedures in Enhancing the Quality of Practical Projects of Pre-service Basic Technology Teachers at NCE (Technical) in North-Eastern Nigeria

Waziri, Ibrahim, Adamu, Abubakar Sadiq
Department of Vocational and Technology Education,
Faculty of Technology Education, Abubakar Tafawa Balewa University,
Bauchi, Bauchi State, Nigeria

ABSTRACT

The purpose of this study was to find out the perceived influence of design procedures in enhancing the quality of practical projects of Pre-service Basic Technology teachers at NCE (Technical) in North-Eastern Nigeria. The study used descriptive survey design. Specifically, the study addressed three research questions and three hypotheses which in both cases bordered on design procedures for enhancing the quality of practical projects of pre-service basic technology teachers. The population of the study was made up of 144 lecturers and 73 workshop instructors making a total of 217. Purposive random sampling technique was used. A validated structured questionnaire was used for data collection. A reliability coefficient of 0.82 was obtained. The findings of the study revealed that design procedures have influence in enhancing the quality of practical projects of Pre-service Basic Technology teachers at NCE (Technical) in North-Eastern Nigeria. All the hypotheses tested using T-tests at 0.05 level of significance revealed that, there was no significant difference between the responses of lecturers and that of workshop instructors on the perceived influence of design procedures in enhancing the quality of practical projects of Pre-service Basic Technology teachers at NCE (Technical) in North-Eastern Nigeria. Based on the findings therefore, it was recommended that, the responses of the respondents as trainers should be upheld and considered for inclusion in the technical education teacher training programme for enhancing the quality of practical projects at NCE (Technical) level. Furthermore, it was also suggested that, the trainers (lecturers and workshop instructors) should be undergoing some kinds of refresher courses regularly.

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INTRODUCTION

Education is an instrument per excellence for economic, social and political development of any nation. The pursuit of scientific and technological education is imperative for any nation of the world that aspires towards its independence, sovereignty to ensure sustainable industrial, economic, social and political development for recognition as a nation Mshelia (2013). In another development Igeradja (2015) observed that, Technical

Vocational Education is a means for satisfying most human requirements as it affords every individual the opportunity to acquire and develop skills, abilities, understanding, attitudes, work habits and appreciations that confer knowledge needed to enter and make progress in employment on a useful and productive basis.

The need for greater involvement of teachers and trainers in professional development decisions has become clear. Criteria for "good"



teachers that respond to increased expectations include strong knowledge bases and range of teaching competencies for enhanced teaching practice and learning outcomes. Technology teachers according to ILO (2010), if appropriately trained are the pivot on which the basis of all educational developments hang. Concerns about the quality of the nation's public education system have drawn attention to key elements of teacher effectiveness. While there is little consensus on what constitute high quality teacher; such consensus has emphasized two broad documentations of teacher effectiveness in terms of level of knowledge and skill the teachers bring to classroom as measured by teacher preparation and certification and secondly their classroom practices (Michael, 2013).

The Federal Government of Nigeria stated in its National policy on Education that Teacher Education shall continue to be given major emphasis in all educational planning and development and the minimum qualification for entry into the Teaching profession shall be the Nigeria Certificate in Education (NCE) (FRN, 2014).

Holders of this certificate are trained to teach in primary schools and junior secondary schools. Therefore, basic technology teachers are supposed to introduce vocational and technical knowledge at primary and secondary levels of education. These levels of education are critical stages for nurturance of technical knowledge and skills.

To ensure quality of NCE teacher preparation programmes, the National Commission for Colleges of Education (NCCE) (2013) established uniform minimum standards for admission and curriculum offering and graduation requirements for vocational and technical for NCE teacher education programme.

One of the most important aspect of vocational and technical education teacher training is practical. Students are giving task to construct items as their practical projects and sometimes students at the end of their studies are expected to have a practical project. Onele (2014) stated that, on a visit to some technical teacher training institutions in Nigeria, it was disheartening to note that constructed practical projects by the technical teacher-trainees were poor. He added

that, this would adversely affect their delivery after training. Abdullahi & Ali (2012) posited that, students' practical projects were poor because the assessment lacks uniform criteria, lacks experienced and qualified teachers/instructors, there was poor infrastructural and instructional facilities, use of cognitive tests in assessing practical projects, lacks combination of both process and product assessments, and acceptance of ready-made products/projects for final assessment. In a similar vein, Makarfi (2014) pointed out that, the root cause of poor quality in technical teacher-trainees' practical projects might be due to weak practical background at pre-entry level as well as inadequate practical orientation by the trainers at present NCE training level. Ogwa, (2013) also pointed out that, successful Basic Technology curriculum implementations depend on the availability of qualified teachers, equipment, teaching materials and opportunities for excursion.

In line with above, Makarfi (2014) viewed practical project as the art of working to produce useful items. He noted that practical project is a method to be employed by both Science and Technology teachers to achieve a satisfactory level of skill acquisition by learners. It involves the use of practical materials, tools/equipment by students under the supervision of the teachers/lecturers and workshop instructors. The purpose of practical projects according to (Faudel, 2008) is to develop and test the learners' practical skills within the normal range covered by theory lessons. In addition, science and Basic technology practical projects improve the students' knowledge of tools/equipment and materials, and help in developing positive attitudes towards work. Therefore, Makarfi pointed out that, for the achievement of curricula objectives, the student-teacher for basic technology should be trained in general professional skills and attitudes similar to any professional requirements in practice to produce enhanced quality practical projects for his/her students to emulate.

Duro (2010) defined quality as something special about an object that makes it what it is. It is a distinguishing mark or characteristic of a thing. (Onele, 2014) stated that, for the attainment of quality in students' practical



projects, there is the need for proper training of student-teachers on the theory relating to design, construction and supervision of the students' practical work as well as enforcing safety standard measures in the science and Basic Technology laboratories and workshops respectively. Furthermore there is the need for effective management of equipment and materials needed in the laboratories and workshops.

Umunadi (2010) considers the theory relating to design procedure and construction in practical projects as principles relating to the art of creating, inventing, researching and developing functional items under close supervision. The influence of design procedure in ensuring and enhancing quality of practical project cannot be overemphasized.

Purpose of Study

The main purpose of the study is to determine the Perceived Influence of Design Procedures in Enhancing the Quality of Practical Projects of Pre-service Basic Technology Teachers at NCE (Technical) in North-Eastern Nigeria.

1. Determine the mean responses of lecturers on the perceived influence of design procedures in enhancing the quality of practical projects of pre-service Basic Technology Teachers at NCE (Technical) in North-Eastern Nigeria.
2. Determine the mean responses of workshop instructors on the perceived influence of design procedures in enhancing the quality of practical projects of pre-service Basic Technology Teachers at NCE (Technical) in North-Eastern Nigeria.

Research Questions

The following research questions were formulated to guide the study.

1. What is the mean responses of lecturers on the perceived influence of design procedures in enhancing the quality of practical projects of pre-service Basic Technology Teachers at NCE (Technical) in North-Eastern Nigeria?
2. What is the mean responses of workshop instructors on the perceived influence of design procedures in enhancing the quality of practical projects of pre-service Basic

Technology Teachers at NCE (Technical) in North-Eastern Nigeria?

Hypotheses

The following null hypotheses were formulated to guide the study.

- H₀₁**- There is no significant difference in the mean responses between lecturers and that of workshop instructors on the perceived influence of design procedures in enhancing the quality of practical projects of Pre-service Basic Technology teachers at NCE (Technical) in North Eastern Nigeria.

Scope of the Study

The study is delimited to enhancing the quality of practical projects through design procedure. The study covers all tertiary institutions offering technical teacher education programmes at Nigeria Certificate in Education (Technical) level in the North–Eastern States of Nigeria. The institutions include Colleges of Education (Technical) and Polytechnics in the six States involved in the study which were Bauchi, Gombe, Borno, Yobe, Taraba, and Adamawa. Basic Technology teacher-trainees' practical project is a requirement for graduation at Nigeria Certificate in Education (Technical) level.

METHODOLOGY

The Survey research design was adopted and employed for the study. Nworgu (2009) defined a survey design as one in which a group of people or items are studied by collecting and analyzing the data from some few members who are considered as representative of the entire population. It involved the use of questionnaire in eliciting information from the respondents with respect to the variables that were appropriate to the design for the study. The area of the study is North-Eastern States of Nigeria. It is made up of Adamawa, Bauchi, Borno, Gombe, Taraba, and Yobe states in which the institutions selected for the study were located. The population of this study consists of 144 lecturers and 73 instructors of Vocational and Technical Education in the six NCE (Technical) awarding institutions in the North Eastern States of Nigeria making a total population of 217 respondents.



The research adopted Total Population Sampling hence, the entire population was used for the study. A structured questionnaire was used for data collection. The instrument was face validated and a reliability coefficient of 0.82 was obtained. The data was analyzed in three stages using Statistical Package of Social Science (SPSS) version 21. The package was used to run table of frequencies and percentage which was used to analyze the bio-data of the respondents, Mean scores, and standard deviation was employed to answer the research questions using interval scale for decision making. Independent t-test was used to test the null hypotheses.

RESULTS AND DISCUSSIONS

Research Question One: What is the mean responses of lecturers on the perceived influence of design procedures in enhancing the quality of practical projects of pre-service Basic Technology Teachers at NCE (Technical) in North-Eastern Nigeria?

The result in table one indicated the mean of 3.08 for Lecturers which were found to be within the index mean score of moderately agreed. The result indicated application of design procedures in the training of Basic Technology teachers across the technical teacher education programmes will enhance the quality of practical projects of pre-service basic technology teachers at NCE (Technical) level.

Table 1: Mean response of Lecturers (LE) and Workshop Instructors (WI) used to answer research question one

S/N.	Questionnaire Items	μ LE	Rmk
1	Demonstrate the geometrical construction of the plane figures e.g. circles and polygons and their practical applications on project designs	3.25	MA
2	Demonstrate and drill the students in automobile, electrical/electronic related designs and specific applications to these technology areas.	2.90	MA
3	Review the areas of inadequacies in designs and introduce innovations in design.	3.10	MA
4	Design should aim at durability and beauty of end products.	3.00	MA
5	Selection, organization and utilization of materials and tools/equipment should be designers' professional ability.	3.55	MA
6	Knowledge of Electrical/electronic circuits diagram design is important to technicians in qualitative locating and rectifying of faults.	3.05	MA
7	All practical projects must be based on a design as a guide.	3.45	MA
8	There are adequate and qualified technical drawing lecturers in this institution.	3.05	MA
9	The student-teachers ratio for technical drawing is adequate.	3.10	MA
10	The students should sometimes be taken to the Audio-Visual Aids unit of the college to see displays of project designs.	3.50	MA
11	The students should be trained on the selection, organization and utilization of tools and materials in building models design.	2.80	MA
12	A design fair is sometimes organized to encourage competition for growth.	2.95	MA
13	Students are trained on orthographic projection.	2.65	MA
14	When giving a drawing the students should be able to identify material symbols e.g. glass, wood sections, concrete, block work etc.	3.25	MA
15	Students should be able to identify different types of drawing equipment and materials and their uses.	2.85	MA
16	Scale reading and transfer of measurements are taught to students.	3.20	MA
17	Students are being encouraged on free hand sketching as design practice in all areas of Basic Technology.	3.00	MA
18	Demonstrate the geometrical construction of the plane figures e.g. circles and polygons and their practical applications on project designs	2.85	MA
19	Demonstrate and drill the students in automobile, electrical/electronic related designs and specific applications to these technology areas.	3.25	MA



20	Review the areas of inadequacies in designs and introduce innovations in design.	2.85	MA
GRAND MEAN		3.08	MA

Research Question Two: What is the mean responses of workshop instructors on the perceived influence of design procedures in enhancing the quality of practical projects of pre-service Basic Technology Teachers at NCE (Technical) in North-Eastern Nigeria?

The result in table two answered research question two indicated the mean of 3.02 for workshop instructors which were found to be

within the index mean score of moderately agreed. The result indicated application of design procedures in the training of Basic Technology teachers across the technical teacher education programmes will enhance the quality of practical projects of pre-service basic technology teachers at NCE (Technical) level.

Table 2: Mean response of Workshop Instructors (WI) used to answer research question one

S/N	Questionnaire Items	μ WI	Rmk
1	Demonstrate the geometrical construction of the plane figures e.g. circles and polygons and their practical applications on project designs	3.30	MA
2	Demonstrate and drill the students in automobile, electrical/electronic related designs and specific applications to these technology areas.	3.05	MA
3	Review the areas of inadequacies in designs and introduce innovations in design.	2.85	MA
4	Design should aim at durability and beauty of end products.	2.80	MA
5	Selection, organization and utilization of materials and tools/equipment should be designers' professional ability.	2.95	MA
6	Knowledge of Electrical/electronic circuits diagram design is important to technicians in qualitative locating and rectifying of faults.	3.20	MA
7	All practical projects must be based on a design as a guide.	3.10	MA
8	There are adequate and qualified drawing lecturers in this institution.	3.15	MA
9	The student-teachers ratio for technical drawing is adequate.	2.85	MA
10	The students should sometimes be taken to the Audio-Visual Aids unit of the college to see displays of project designs.	3.05	MA
11	The students should be trained on the selection, organization and utilization of tools and materials in building models design.	2.85	MA
12	A design fair is sometimes organized to encourage competition for growth.	2.80	MA
13	Students are trained on orthographic projection.	3.00	MA
14	When giving a drawing the students should be able to identify material symbols e.g. glass, wood sections, concrete, block work etc.	2.80	MA
15	Students should be able to identify different types of drawing equipment and materials and their uses.	3.00	MA
16	Scale reading and transfer of measurements are taught to students.	3.25	MA
17	Students are being encouraged on free hand sketching as design practice in all areas of Basic Technology.	3.00	MA
18	Demonstrate the geometrical construction of the plane figures e.g. circles and polygons and their practical applications on project designs	3.25	MA
19	Demonstrate and drill the students in automobile, electrical/electronic related designs and specific applications to these technology areas.	2.85	MA
20	Review the areas of inadequacies in designs and introduce innovations in design.	3.20	MA
GRAND MEAN		3.02	MA



RESULTS OF NULL HYPOTHESIS

H₀₁: There is no significant difference in the mean responses of lecturers and workshop instructors on the design procedures for enhancing the quality of practical projects of pre-service Basic Technology teachers at NCE (Technical) level.

Table three presents the results of the computation of significant difference between mean responses of Lecturers Design Procedures

(LDP) and Workshop Instructors Design Procedures (WIDP) in enhancing quality of practical projects of pre-service basic technology teachers at NCE (T) Level. From the table, the observed t-value of 0.98, at df = 215, with a p-value of 0.33 ($p > 0.05$) was obtained. The p-value of 0.33 was greater than 0.05. Therefore, the null hypothesis was accepted.

Table 12: t-test Analysis on difference between LDP and WIDP in Enhancing Quality of Practical Projects at NCE (T) Level

Variables	N	Mean	SD	SE	Df	t-value	p-value	Decision
LDP	144	3.08	0.24					
WIDP	73	3.02	0.17	0.07	215	0.98	0.33	Accepted

Source: SPSS Version 21.

Where N=number of

SD=standard deviation

SE=standard error

Df = degree of freedom

FINDINGS

The following are the findings of the study based on the analysis of data, which addressed the research questions and the hypothesis. In the study, respondents moderately agreed and agreed respectively with all the items below starting with that of the research questions:

1. The result of research question one which was further affirmed by test of corresponding null hypothesis one revealed that employed design procedures will enhance the quality of practical projects of pre-service basic technology teachers at NCE (Technical) level.
2. The results of research question two and test of corresponding null hypothesis two shows that the two groups of respondents agreed that the adoption of construction procedures will enhance the Quality Practical Projects of Pre-service Basic Technology Teachers at NCE (Technical) in North Eastern Nigeria.

DISCUSSION OF THE FINDINGS

The discussion of findings of this study was carried out according to the purpose of the study and the analysis of data that followed based on the research questions and hypotheses that guided the study. The Study considered specifically the strategies to be employed for

enhancing the quality of practical projects in the training of pre-service basic technology teachers at NCE (Technical) level.

The findings of research question one and test of corresponding null hypothesis one revealed that, respondents moderately agreed with all items in practical project design procedure as psychomotor skills moderately required by pre-service basic technology teachers in teaching at the required level of students effectively. This showed that competent basic technology teachers must possess this skill in order to teach the course/subject effectively. This finding is in line with that of Olaniyan & Babatunde (2012), who found out that design is the process of applying various techniques and scientific principles for the purpose of defining a device, a process or a system in sufficient detail to permit its physical realization /production. Basic technology teacher could perform very well in teaching practicals in the workshops if trained on such specific skill areas related to production. Similarly, Aladetan (2014) reported that human beings are all used to solving problems when confronted by a need or desire. According to Aladetan through design, humans can interpret the process of problem solution thus: establish need or realize there is a problem to be solved; understand the problem; generate potential solution for it and evaluate the

Corresponding author: Waziri, I. ibrahimwaziri006@gmail.com Department of Vocational and Technology Education, Abubakar Tafawa Balewa University Bauchi. © 2021, Faculty of Technology Education, ATBU Bauchi. All rights reserved



solutions by comparing the potential solutions and deciding on the best. Design, being the product of technical drawing and engineering drawing is viewed as an effective means of communication between engineers and technicians or technologists. It is not an overstatement to say that some basic technology teachers especially those inherited from the former introductory technology training classes are not good in ordinary freehand practical sketching when conducting a technical session. That is to say they are found without or with deficiency in some of these essential communication skill areas. It is obvious that a teacher cannot teach what he/she doesn't know. Therefore, educational institutions should put emphasis on the training of pre-service basic technology teachers and re-training of serving basic technology teachers who are not very good in practical aspects as well as the theoretical components. On the other hand, the teacher-trainees should be encouraged to put extra efforts to learn from their professional colleagues so that their students in turn can learn from them to maintain the skill standard in the training of basic technology teachers who are not very good in practical exercises. In the light of the foregoing, it means that respondents perceived all the necessary skills required in project design as being very important and as those that can therefore help impact the knowledge and skills effectively to their students.

CONCLUSION

Basic technology is one of the teaching subjects offered at Junior Secondary Schools where students learn relevant skills, knowledge and attitude. The acquisition of these skills by the students depends on the competence of their teachers. The basic technology teachers determine the quality and quantity of the skills to be acquired by the students for onward schooling after graduation. All the identified skills in basic technology subjects such as Automobile, Building, Electrical/Electronics, Metalwork, Tech/drawing and Woodwork are psychomotor skills that are highly required by the pre-service basic technology teachers to enable him/her prepare the lower level students. Therefore, all basic technology teachers that pass through this type of programme should be able to possess these skills

and effectively transfer them to their students in the Junior Secondary Schools provided the teacher received the right training. Therefore, to do this, all the items listed and endorsed by teachers-trainers as strategies required for enhancing the quality practical projects of pre-service basic technology teachers in this noble profession need not be ignored.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were proffered by the study.

1. Basic Technology teacher-trainers should be retrained in the skill deficiency areas as may be revealed from time to time in order to get the pre-service teachers competent for the teaching job as professionals.
2. The current methods of basic technology teacher preparation in which VTE courses were taught theoretically as liberal arts should give way to a modern practical result oriented strategy with adequate instructional and infrastructural facilities.
3. All the identified and agreed strategies should be packaged and integrated into technical teacher training programme in education.

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