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ASSESSMENT OF COMPETENCE IMPROVEMENT NEEDS OF TECHNOLOGY TEACHERS IN THE IMPLEMENTATION OF BASIC TECHNOLOGY CURRICULUM IN NIGER STATE, NIGERIA

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Abstract - The study was carried out to assess the competence improvement needs of technology teachers in the implementation of basic technology curriculum in Niger State, Nigeria. The study adopted survey research design. The population for the study was 84 teachers and supervisors of basic technology. Five research questions guided the study. The instrument used for data collection was structured questionnaire. Three experts validated the instrument. Cronbach alpha reliability method was used to determine the internal consistency of the instrument in which 0.82 and 0.77 reliability coefficients were obtained for the two set of instruments. Weighted Mean and Improvement Needed Index (INI) were employed to analyze data for answering research questions. The study found that teachers of introductory technology needed improvement in 15 competencies areas on instructional planning for the implementation of basic technology curriculum, in teaching fifty out of fifty-four contents of basic technology curriculum to students and classroom and laboratory management for the implementation of basic technology. Findings revealed that teachers of introductory technology needed improvement in applying varieties of teaching methods and techniques for the implementation of basic technology. Also teachers of introductory technology need improvement in evaluating the learning outcome in basic technology. Based on the findings, it was recommended that workshop and seminars should be organized for the teachers of introductory technology in order to build their capacity for the implementation of the basic technology curriculum in junior secondary schools in Niger State. It was also recommended that teachers of technology should be retrained based on areas of needs identified in the study.

Keywords: Competence Improvement, Technology Teachers, Basic Technology, Curriculum

I. INTRODUCTION

A good educational system is a strong base for technological development. It equips people with knowledge and skills for designing methods and process that will enable them to make maximum use of their natural resources for the benefit of the society. Development of any nation depend on the educational system of that country, the process of impartation inherited or invented and the ability to train her citizens to sustain the level of such technological education development will be of great importance. Miller, Bakare and Ikatule (2010) also described technology as the process by which humans modify nature to meet their needs and wants.

In years back, there is little or no attention in teaching of technology education (ICT in education) which has not been made a major focus at the lower level of Nigerian educational system most especially at secondary school level. To address this lapse, the Federal Ministry of Education brought about the former 6-3-3-4 system that introduced the teaching of basic technology as

a subject in junior secondary schools and physics in senior secondary schools in Nigeria. Due to the overwhelming desires of the world for technological development, the Nigerian government joined the force for introduction of the teaching of technology in Nigerian secondary school education system (Federal Government of Nigeria, 2004). The new system is called universal basic education (UBE/JSS), 9-3-4 year's system of education. Basic technology therefore is one of the essential pre-vocational and integrated subjects that is offered by students in junior secondary schools. It exposes students to basic ideas and concepts of technology and skill development in the various components that make up the subject (Miller, Bakare and Ikatule, 2010).

Basic technology is a foundation subject on which future technological development of students are built for those interested in vocational technical courses or engineering in higher institutions. According to the Report of Federal Ministry of Education (2007), basic technology is a compulsory subject in the 9-year basic education programme. Its purpose according to the report is to contribute to the achievement of the national education goals by inculcation of technology literacy, exposure of students to the world of work to match their talents and interests for wise vocational choice and inculcation of positive attitudes towards work as a source of human identity, livelihood and power. Basic technology gives opportunities to students to use tools and machines used in the industries.

This helps to develop good attitudes towards technology and the industry. The teaching of basic technology according to Report of Nigerian Educational Research and Development Council (NERDC 2007) became necessary due to technological development and increased national policy orientation towards vocational education development. The desired development in the Nigerian vocational education system can only be achieved through effective implementation of basic technology in junior secondary school level.

Implementation is a process of making something work. According to Patrica (2002), implementation is the carrying out, or the practice of a plan for doing something. It is the action that must have preliminary thinking in order for something to happen. Olaitan (2003) described implementation to be a process, technique or means of extending the content of what is planned for the learner. In this study, implementation means the process of carrying out series of planned activities towards achieving the stated objectives of basic technology at secondary school level. In Nigerian Secondary School education system, teachers play major roles in the implementation of subjects such as technology.

Basic technology is a skill-oriented and pragmatic field of study which aims at equipping the individuals with necessary technical skills. Uwameiye and Adiwa-Ogiegbaen (2006) described basic technology which as a core subject among the pre-vocational subjects in junior secondary school syllabus that involves the academic practical study of materials and sources of energy with the ultimate intention of applying knowledge from the study to provide a comfortable environment for man. Technology comprises topics such as woodwork, auto-mechanic, building technology, electrical, electronic and technical drawing. Basic skills and knowledge in these areas are taught by teachers of Basic technology.

According to Olaitan, Amusa and Nwobu (2009) a teacher is a person who imparts knowledge, skills and attitude to someone in a school. A technical teacher according to Miller, Bakare and Ikatule (2010) is an individual who is trained in pedagogy and technical area of a particular subject to impart knowledge, skill and attitudes to students in an institution. Teachers of technology in this study are individuals who have been trained professionally in the art of teaching technology curriculum to students in junior secondary schools. Teachers of technology are still set of individuals to implement new basic technology curriculum. For effective implementation of the basic technology curriculum in Junior Secondary Schools these teachers need to possess the required competency.

According to Olaitan (2003) competency is the knowledge, skills, attitude and judgment which one required in order to perform successfully at a specified proficiency in any given work. Krevisky and Jordan (1994) viewed competencies as ability to possess suitable and sufficient skills, knowledge and experience for carrying out a particular task. Competent teachers of technology are expected to possess the skills and knowledge required in the teaching of the subject matter to students; and where this is lacking, improvement of the teaching competency of the teachers is needed. Pearson (2007) described competency as ability to do something well measured against a standard especially ability acquired through experience or training. To be competent means having enough knowledge and skills to do something to a satisfactory standard. In the context of this study, competence is the capacity of a teacher of technology to effectively teach the content of basic technology curriculum in Junior Secondary Schools.

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Improvement as defined by Pearson (2007) is the process of making something better than before. In the view of Robinson (2000), improvement is the development of circumstances in which something is lacking to a better standard or quality. The need for improvement always arises when there is a gap to fill. Need in the opinion of Hornby (2003) is a circumstance that requires something to be done. When the target standard of the teachers is met, it will be to the benefit of the students through improved salable skills for employment on graduation. The teachers of technology handle the teaching of basic technology because of their trainings as technology teachers in colleges of education.

Observation revealed that fifty percent of the candidates scored a grade below credit. This could be attributed to incompetence of teachers of basic technology in equipping the students with knowledge, skills and attitudes that could assist them in passing their examinations. In addition, the inadequacy of required facilities in the schools also contributed to the weak implementation of basic technology in schools. Miller (2006) said that technical teachers lack effectiveness in managing technology workshop and preventing wastage of materials. Miller further stated that these teachers have shallow knowledge and skills in the subject matter. NERDC report (2004) stated that 50% of the teachers in Nigerian school system were found unqualified to teach. Also, World Bank report (2004) on Africa, revealed that most of the teachers (teachers of technology now basic technology in Niger State inclusive) recruited into teaching position in Nigeria do not meet the quality required for effective teaching. For proper implementation of basic technology in schools, there is need to determine the competency improvement needs of teachers of basic technology who are the chief implementers of basic technology in secondary schools. This will reveal the competencies needed by the teachers for effective implementation of basic technology when what is needed is subtracted from their performance to get need gap.

II. OBJECTIVES OF THE STUDY

This study was to determine the competency improvement needs of technology teachers in the implementation of basic technology curriculum in Niger State. Specifically, the study identified:

1 Competency improvement needs of teachers of technology in planning instruction for the implementation of basic technology.
2 Competency improvement needs of teachers of technology in teaching the contents of basic technology curriculum (technology, workshop safety, scales and scale drawing, information and communication technology, energy based technological appliances and gears) to students in junior secondary schools.
3 Competency improvement needs of teachers of technology in classroom management for the implementation of basic technology.

III. RESEARCH QUESTIONS

The following research questions guided the study:

i. What are the competency improvement needs of teachers of technology in planning instruction for the implementation of basic technology?
ii. What are the competency improvement needs of teachers of technology in teaching the content of basic technology curriculum (technology, workshop safety, scales and scale drawing, information and communication technology, energy based technological appliances and gears) to students in Junior Secondary Schools?
iii. What are the competency improvement needs of teachers of technology in classroom/workshop management for the implementation of basic technology?

IV. METHODOLOGY

The study adopted descriptive survey research design. The population for this study consists of all the secondary schools' teachers in Niger state. The targeted population consists of all the basic technology teachers and supervisors of basic technology. The study was carried out in secondary schools in Niger state where basic technology is taught as a subject. The sample size consists of 84 teachers of basic technology teachers and supervisor of basic technology. A multi-stage sampling technique was employed in selecting respondents for this study. The instrument for data collection was a structured questionnaire developed by the researcher titled: Competency Needs of Teachers Questionnaire (CNTQ). The instrument was content-validated by experts in the Department of Technical Teacher Education, Niger State College of Education Minna. The internal consistency of the instrument was determined using Cronbach Alpha coefficient method. Cronbach Alpha reliability coefficients of 0.82 and 0.77 were obtained and based on the coefficients obtained, the instrument was considered valid. The questionnaires were administered on the respondents by the researcher through personal

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contact and with the help of three research assistants trained by the researcher. A return visit was made by the researcher and the research assistants to collect the completed questionnaire after some weeks of the administration. The completed copies of the questionnaire were collected from the respondents for further analysis. Weighted Mean (WM) and Improvement Needed Index (INI) was employed to analyze data from the competency cluster questionnaire item in order to identify areas where teachers of technology need improvement in implementing or teaching basic technology to students in junior secondary schools in Niger State. The Statistical Package for Social Science (SPSS) versions 23 was used for the analysis.

V. RESULTS AND DISCUSSION

Research Question 1: What are the competency improvement needs of teachers of technology in planning instruction for the implementation of basic technology?

Table 4.1: Performance Gap Analysis of the Mean Ratings of the Responses of Respondents on the Competency Improvement Needs of Teachers of Technology in Planning Instruction for the Implementation of Basic Technology

S/N	Competency items	X_r	X_p	(PG) $X_r - X_p$	Remarks
A	**Planning Instruction in Basic Technology**				
1	Stating the behavioral objectives	3.64	3.57	0.07	Needed
2.	Stating the previous knowledge	3.66	2.63	1.03	Needed
3.	Determining instructional materials	3.66	3.08	0.58	Needed
4.	Organizing instructional materials	3.76	2.48	1.28	Needed
B.	**Implementing Instructions in Basic Technology**				
5.	Introduce the lesson through the use of any appropriate teaching methods	3.67	2.14	1.53	Needed
6.	Organizing sequentially the instructional Materials	3.90	3.80	0.10	Needed
7.	Use of relevant teaching aids	3.25	3.67	-0.42	Not Needed
8.	Reinforcing learning activities	3.66	2.18	1.48	Needed
9.	Directing classroom instruction	3.72	3.54	0.18	Needed
10.	Employing varieties of teaching method	3.81	2.20	1.61	Needed
11.	Involving ICT in teaching basic technology	3.92	2.82	1.10	Needed
C.	**Evaluating Instructional process**				
12	Evaluating the quality of instruction	3.75	2.55	1.20	Needed
13	Evaluating performance of students through demonstration of test	3.59	3.05	0.54	Needed
14	Applying appropriate evaluation techniques	3.64	2.01	1.63	Needed
15	Involving students in evaluating one another	3.02	3.50	-0.48	NotNeeded
16	Developing test and rating sheet	3.50	2.89	0.61	Needed
17	Administering and analyzing test	3.62	2.91	0.71	Needed

Data in Table 1 revealed that 15 out of 17 items had performance gap values ranged from 0.07 to 1.63 and were positive indicating that the teachers of technology needed 15 competencies in planning instruction for the implementation of basic technology in junior secondary schools. Two out of 17 items had their performance gap as follow (-0.42, -0.48) and were all negative indicating that teachers did not need the competencies 7 and 15 for planning instruction on basic technology. Generally, teachers of technology needed all the 17 competencies in planning instruction for the implementation of basic technology but less emphasizes on the two items with negative performance gap values.

Research Question 2: What are the competency improvement needs of teachers of technology in teaching the contents of basic technology curriculum to students in junior secondary schools?

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Table 4.2: Performance Gap Analysis of the Mean Ratings of the Responses of Respondents on the Competency Improvement Needs of Teachers of Basic technology in Teaching the Contents of Basic Technology Curriculum to Students in Junior Secondary Schools

S/N	Competency items	X_r	X_P	(PG) $X_r - X_P$	Remarks
1.	Concept of technology	3.52	3.01	0.51	Needed
2.	Technology and society	3.64	3.57	0.07	Needed
3.	Technology and its applications	3.66	2.63	1.03	Needed
4.	Workshop safety rules and regulation	3.66	3.08	0.58	Needed
5.	Properties of materials	3.76	2.48	1.28	Needed
6.	Drawing instruments and materials	3.64	2.34	1.30	Needed
7.	Board practice	3.67	2.14	1.53	Needed
8.	Free hand sketching	2.80	3.80	-1.00	Not Needed
9.	Scale and scale drawing	3.95	2.02	1.93	Needed
10.	Woodwork hand tools	3.66	2.18	1.48	Needed
11.	Concept of energy and power	3.72	3.54	0.18	Needed
12.	Basic electronic devices	3.81	2.20	1.61	Needed
13.	Types of building and material	3.92	2.82	1.10	Needed
14.	Simple blueprint reading	3.74	2.81	0.93	Needed
15	Concepts of maintenance	3.75	2.55	1.20	Needed
16	Information and communication technology	3.59	3.05	0.54	Needed
17	Teaching of first aid	3.64	2.01	1.63	Needed
18	First aid materials	3.72	3.54	0.18	Needed
19	Uses of materials	3.81	2.20	1.61	Needed
20	Geometrical construction	3.92	2.82	1.10	Needed
21	Metalwork hand tools	2.88	3.01	-0.13	Not Needed
22	Energy based technological appliances	3.75	2.55	1.20	Needed
23	Transmission of electricity	3.59	3.05	0.54	Needed
24	Site preparation	3.64	2.01	1.63	Needed
25	Setting out	3.02	3.50	-0.48	Not Needed
26	Simple maintenance	3.50	2.89	0.61	Needed
27	Career prospects and opportunities in technology	3.62	2.91	0.71	Needed
28	Production of materials	3.72	3.54	0.18	Needed
29	Teaching the concept of wood	3.81	2.20	1.61	Needed
30	Teaching the concept of metal	3.92	2.82	1.10	Needed
31	Clay, ceramic and glass	2.66	3.18	-0.52	Not Needed
32	Plastics and rubbers	3.46	2.78	0.68	Needed
33	Isometric drawing	3.64	2.84	0.80	Needed
34	Oblique drawing	3.60	2.24	1.36	Needed
35	Orthographic project	3.42	2.99	0.43	Needed
36	One –point perspective drawing	3.75	2.72	1.03	Needed
37	Woodwork machines	3.66	2.18	1.48	Needed
38	Simple woodwork project	3.82	3.60	0.22	Needed
39	Metalwork machine	3.51	2.40	1.11	Needed
40	Simple metalwork projects	3.72	2.62	1.10	Needed
41	Soldering and brazing	2.66	1.18	1.48	Needed
42	Mechanical energy transmission systems	3.46	2.78	0.68	Needed
43	Teaching of friction	3.64	3.84	-0.20	Not Needed
44	Belt drives	3.60	2.24	1.36	Needed
45	Gear and gearing	3.61	1.80	1.81	Needed

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46	Linear motion	3.06	2.13	0.93	Needed
47	Rotary motion	2.66	1.18	1.48	Needed
48	Air flow	3.46	2.78	0.68	Needed
49	Pneumatics	3.64	2.84	0.80	Needed
50	Simple electrical wiring	3.61	1.80	1.81	Needed
51	Foundation	3.06	2.13	0.93	Needed
52	Wall	2.66	1.18	1.48	Needed
53	Floors	3.46	2.78	0.68	Needed
54	Doors	3.84	3.64	0.20	Needed

Data in Table 2 revealed that 49 out of 54 items had performance gap values ranged from 0.10 to 1.93 and were positive indicating that the teachers of technology needed 50 competencies in teaching the contents of basic technology curriculum to students in junior secondary schools. Five out of 54 items had their performance gap as follow (-1.00, -0.13, -0.48, 0.52, -0.20) and were all negative indicating that teachers did not need the competencies 8, 21, 25, 31 and 43 for teaching the contents of basic technology curriculum to students. Generally, teachers of technology needed all the 54 competencies in teaching contents of basic technology to students in junior secondary schools but less emphasizes on the four items with negative performance gap values.

Research Question 3: What are the competency improvement needs of teachers of technology in classroom management for the implementation of basic technology?

Table 4.3: Performance Gap Analysis of the Mean Ratings of the Responses of Respondents on the Competency Improvement Needs of Teachers of Technology in Classroom Management for the Implementation of Basic Technology

S/N	Competency items	X_r	X_P	(PG) $X_r - X_P$	Remarks
1.	Make available tools and equipment to be used	3.61	1.80	1.81	Needed
2.	Make the tools and equipment in good condition	3.06	2.13	0.93	Needed
3.	Arrange facilities in order of the needs for instruction	2.66	1.18	1.48	Needed
4.	Arrange classroom setting to accommodate various instructional activities	3.46	2.78	0.68	Needed
5.	Provide safety poster in the laboratory to encourage correct safety habit in sequence and logical order	3.64	2.84	0.80	Needed
6.	Arrange benches and machines properly to facilitate learning	3.60	2.24	1.36	Needed
B	**Coordinating**				
7.	Check attendance for each student daily	3.75	2.72	1.03	Needed
8.	Supervise students activities in classroom/ laboratory	3.95	2.02	1.93	Needed
9.	Organize routine cleaning procedure for the laboratory facilities	3.66	2.18	1.48	Needed
10.	Assign leaders among students to coordinate activities among themselves	3.51	2.40	1.11	Needed
C	**Evaluation**				
11.	Check for the appropriateness of workshop facilities	3.86	2.91	0.95	Needed
12.	Assess the effectiveness of instruction in the workshop through students' practical test	3.68	2.96	0.72	Needed
13	Check laboratory tools and equipment after use	2.66	3.65	-0.99	Not Needed

Data in Table 3 revealed that 12 out of 13 items had performance gap values ranged from 0.68 to 1.81 and were positive indicating that the teachers of technology needed competencies in classroom management. One out of 13 items had their performance gap as follow (-0.99) and was negative indicating that teachers of technology did not need the competencies for class management. Generally, teachers of technology need all the 13 competencies items in classroom management but less emphasizes on the one item with negative performance gap value.

Discussions

The findings of this study revealed that teachers of technology required improvement in the planning of instructions for the implementation of basic technology in Niger State. The competencies needed include: stating the behavioral objectives**,** stating the previous knowledge**,** determining instructional materials**,** organizing instructional materials**,** introducing the lesson through the use of any appropriate teaching methods**,** organizing sequentially the instructional materials and reinforcing of learning activities. The findings of the study were in agreement with that of Miller, Bakare and Ikatule (2010) that appropriate and achievable behavioral objectives must be stated for a particular lesson.

The findings of this study in respect to competency improvement needs of teachers in teaching the contents of basic technology revealed that technology teachers need improvement in the following competencies: concept of technology, technology and society, technology and its applications, workshop safety rules and regulation, properties of materials, drawing instruments and materials, board practice, free hand sketching, scale and scale drawing, woodwork hand tools, concept of energy and power, basic electronic devices, types of building and material, simple blueprint reading, concepts of maintenance, information and communication technology, teaching of first aid, first aid materials, uses of materials, geometrical construction, energy based technological appliance and transmission of electricity.

The findings of the study as regards improvement needs of teachers in classroom management revealed the competency improvement needs of teachers of technology in classroom management for the implementation of basic technology. The competencies include make the tools and equipment in good condition, arrange facilities in order of the needs for instruction, arrange classroom setting to accommodate various instructional activities, provide safety poster in the workshop to encourage correct safety habit in sequence and logical order, arrange benches and machines properly to facilitate learning, supervise students activities in classroom/ workshop, apply corrective measures to enhance discipline in the classroom / workshop, organize routine cleaning procedure for the workshop facilities and assign leaders among students to coordinate activities among themselves..

The findings of the study in respect to improvement needs of teachers of technology in using teaching methods and techniques revealed eight competency improvement needs of teachers of technology in applying teaching methods and techniques for the implementation of basic technology. The competencies include present information with projector**,** present concepts and skills before demonstration commence**,** involve the students in all activities during learning process**,** use appropriate teaching methods as demonstration method**,** perform the learning process during demonstration before the students**,** employ team teaching during demonstration and make demonstration work and activities to be meaningful to the learners.

The findings of the study as regards improvement needs of teachers of technology in applying evaluation techniques revealed ten competency improvement needs of teachers of technology in evaluating outcome of learning in basic technology. The competencies include evaluate students affective domain, assess students psychomotor performance, construct reliable test to evaluate students' progress, assess the effectiveness of the teaching strategy, make record about students' academic ability, make use of information procedure like observation for collection of information about students, use varieties of evaluation techniques and procedures such as test, assessment and project, give test periodically to monitor learning process during instruction and evaluate the students learning difficulties during instruction. These findings were in agreement with that James (2002) who found that assessment of the effectiveness of the teaching strategy ensures the achievement of the objectives.

VI. CONCLUSION AND RECOMMENDATIONS

From the findings of the study it was revealed that basic technology is an integrated subject in the curriculum of junior secondary schools where students are supposed to acquire basic knowledge, skills and attitudes about technologies. In order to improve the achievement of students in basic technology, teachers are expected to be competent in teaching the content areas of the basic technology curriculum. The failure of students in basic technology has been attributed to incompetence of teachers of basic technology now implementing the new basic technology curriculum. It is in this direction that the study now set up to determine competency improvement needs of basic technology teachers to enhance the implementation of basic technology in Niger State. It was then revealed that teachers of technology need improvement for effective implementation of basic technology in junior secondary schools in Niger State. Based on the findings of the study, the following recommendations were made: Workshop

and seminars should be organized for the teachers of technology in order to build their capacity for the implementation of the basic technology curriculum in junior secondary schools in Niger State. Teachers of technology should be train and retrained based on areas of needs identified in the study in order to improve their competence and mastery of the subject matter. Relevant facilities for effective implementation of the basic technology should be provided by government and other enabling bodies.

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