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Adequacy of Plumbing and Pipe Fitting Teachers and Instructional Resources for Skill Acquisition in Yobe State Technical Colleges in Nigeria

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ABSTRACT
This paper determined the adequacy of plumbing and pipe fitting teachers and instructional resources for skill acquisition in plumbing and pipe fitting trade in Yobe State technical colleges. Two research questions were formulated based on the purpose of the study. A survey research design was chosen for the study with a population of 5 principals, 5 workshop assistants and 103 NTC III Students of plumbing and pipe fitting trade in Yobe state technical colleges. A checklist was used as instrument for data collection. Three experts from department of technology education school of science and technology education validated for both face and content validity of the instrument, and data collected were analyzed using mean and simple percentage. The findings of the study revealed that PPF teachers are adequate in three of the technical colleges; but there is inadequate in some of the technical colleges. Recommendations were also made that: Yobe State government should make fund available through Science and Technical School Board to provide adequate PPF teachers in some technical colleges. That Yobe State government should purchase adequate instructional resources for effective teaching and learning in plumbing and pipe fitting trade in the technical colleges.
Keywords: Adequacy, Plumbing and pipe Fitting, Instructional Resources and Skill

INTRODUCTION

Skills and knowledge are the driving forces of economic, social and technological development of any nation. In Nigeria, acquisition of these skills and knowledge formed the basic aim of technical education. Technical Education is that aspect of education which leads to the acquisition of practical skills, as well as basic and scientific knowledge. According to the Federal Republic of Nigeria (FRN 2004), Technical education is the form of education which is partly obtainable at the technical Colleges. This is equivalent to the senior secondary school education but designed to prepare individuals to acquire practical skills, basic and scientific knowledge and attitudes required as craftsmen in various trades. Trades offered at technical colleges are broadly grouped into four categories, in line with National Business and Technical Examination Board Syllabus (NABTEB, 2007). These are: construction trades, engineering trades, miscellaneous trades and Business trade. These trades or form of education are primarily meant to:

a. Provide trained man power in applied science, technology and commerce particularly at sub-professional level.
b. Provide people who can apply scientific knowledge to the improvement and solution of environmental problems for use and convenience of man
c. Provide technical knowledge and vocational skills, necessary in agriculture, commerce, economic development and others (FRN, 2004).

The acquisition of skill involves imitation, repetition and occupational participation. According to Lawan (2011), acquisition of skill cut across the three domains of educational objectives, namely:

affective, cognitive and psychomotor domains. Lawan also added that skill acquisition is through participation in carrying out practical work in the workshop. Resources for teaching and learning at technical colleges may be broadly divided into four, namely: human, infrastructures, equipment, tools and materials. Instructional resources for brick/block laying and concreting refer to teachers, classrooms, workshops, equipment, tools and materials. The organizational set-up in technical colleges should have adequate number of qualified teaching staff for technical courses, at least one technical teacher for every fifteen or twenty students in the workshop. According to National Board for Technical Education (NBTE, 1992) the following Teacher / Student ratio is recommended: for a practice oriented trade course like building the ideal ratio is 1:15 and 1:20 as the upper limit. The number of teachers varies according to trade and workload, which is for a trade section that can offer four different craft level modules, each module requiring twenty hours of workshop practice weekly will require four instructors/teachers (NBTE, 2001).Thus, the teacher is the first and foremost to think of when discussing issues relating to skill acquisition at Technical Colleges. The teachers are the ones saddled with the responsibilities of imparting knowledge, skill and attitude to the students using adequate instructional resources (Lawan, 2011).

Plumbing is a system of pipes and fixtures installed in a building for the distribution and use of potable (drinkable) water and the removal of waterborne wastes. It is usually distinguished from water and sewage systems that serve a group of buildings or a city.(Magwi 2011). The term plumbing fixture embraces not only showers, bathtubs, lavatory basins, and toilets but also such devices as washing machines, garbage-disposal units, hot-water heaters, dishwashers, and drinking fountains.(Gambo 2015) The water-carrying pipes and other materials used in a plumbing system must be strong, noncorrosive, and durable enough to equal or exceed the expected life of the building in which they are installed. Toilets, urinals, and lavatories usually are made of stable porcelain or vitreous china, although they are sometimes made of glazed cast iron, steel, or stainless steel. Ordinary water pipes usually are made of steel, copper, brass, plastic, or other nontoxic material; and the most common materials for sewage pipes are cast iron, steel, copper, and asbestos cement. Methods of water distribution vary. For towns and cities, municipally or privately owned water companies treat and purify water collected from wells, lakes, rivers, and ponds and distribute it to individual buildings. In rural areas water is commonly obtained directly from individual wells.(Otunga 2012).

Equipment at technical colleges consist of furniture items such as benches, tables, hand and machine tools and instruments which are sometimes called "instructional resources" are required for the execution of practical work in the workshops, laboratories and classrooms. Uguru and Abdullahi (2007) opined that the goal of technical education is to prepare its beneficiaries with all it takes to adjust well in the societies, contribute meaningfully to the development of the society and as well live a fulfilled life. It was therefore stressed that the above is possible through adequate provision and effective utilisation of different resources employed in the running of technical education.

Plumbing and pipe fitting materials are those materials which are used for teaching purposes as well as for learning the practical aspect of the course. Feyola (2010) highlighted some materials which are used for practical teaching in plumbing and pipe fitting trade which includes: pvc pipes, galvanised pipes, steel pipes, asbestos cement pipes, socket joint, T-joint, elbow, reducers, yarn, tread, electrode, cement and other materials. Adekun (2012) opined that pipes are indispensable when conducting practical in almost all aspect of plumbing and pipe fitting work in technical colleges.. In Nigeria, various types of pipes are found in trade schools, technical colleges, and polytechnics where they are used for teaching purposes.

Yanunta (2013) identified some factors that are responsible for the poor learning outcome of plumbing and pipe fitting students in technical colleges. These include inappropriate planning of technical education programme, inadequacy of qualified plumbing and pipe fitting teachers, insufficient materials resources for training and inadequate utilisation of the resources. Supporting this view, Ibukun (2014) declared that "technical education in Nigeria is inadequately funded due to the rising cost of resources for learning, skyrocketing enrolment of students and the galloping inflation within the country."

Acquisition of skill in plumbing and pipe fitting trade requires the use of adequate instructional resources and precise instruction to enable learners to follow the process and thereafter repeat the

task. The skill is acquired in the workshop under the supervision of an instructor. The instructor guide the learners to practice correct handling of tools and equipment, clean working environment, the effective use of time, the consciousness of safety and judicious use of materials during practical activity. Johnson (20014) opined that the resources used by teachers and the techniques they employ determine learners activities in the classroom. The more the learners are actively involved in the learning process and the more this is determined by adequacy of the resources the better the skill acquisition.

Based on the foregoing it can be deduced that the acquisition of skills in plumbing and pipe fitting trade in technical colleges merely depend on the adequacy of resources and utilization of the resources as well.

Statement of the Problem

Technical Colleges are mainly established for the training of students to acquire practical skills, knowledge and attitudes essential for employment in a given occupation. The product of plumbing and pipe fitting trade from Yobe State Technical Colleges is not like his counterparts elsewhere. He/she is trained to cut pipe without correct pipe cutter, make thread without ratchet stock & dies, bend various types of pipes without proper bending machine, testing drain plug without proper testing equipment, connect different types of pipes for cold and hot water supply without suitable connector, carry out soldering operation without suitable soldering tools, carry out filling, wrenching, measuring, sawing, forging and staking without adequate tools and equipment required for the training; which result in non mastery of any of the subsections. If the situation is left as it is, more unqualified plumbing and pipe fitting graduate will be produced, year in year out. However, if the situation is addressed it will lead to production of skilled graduates that will contribute to the economic and technological development of the nation. It is upon this background that the researchers assesses the adequacy of plumbing teachers and instructional resources for skill acquisition in plumbing and pipe fitting trade in Yobe State Technical Colleges.

Purpose of the Study

The purpose of the study is to determine the adequacy of teachers and instructional resources for skill acquisition in plumbing and pipe fitting trade in Yobe State Technical Colleges. Specifically, the study will determine:

1. The adequacy of plumbing and pipe fitting teachers in Yobe State Technical Colleges.
2. The availability of plumbing and pipe fitting materials in Yobe State Technical Colleges.

Adequacy of Plumbing and Pipe Fitting Teachers in Technical Colleges

The organizational set-up in technical colleges should have adequate number of qualified teaching staff for technical courses; at least one technical teacher per every 15 or 20 students in the workshop (Lawan, 2011). The following teacher: student ratio is recommended for a practical oriented trade course like building. The ideal ratio is 1:15 and 1:20 as the upper limit. The number of teachers varies according to trade and workload that is for a trade section that can offer four different craft level modules, each module requiring twenty hours of workshop practice, weekly will require four instructors/teachers (NBTE, 2001). Thus the teacher is the first and foremost to think of when discussing issues relating to skill acquisition in technical colleges.

Ike (2002) stated that the availability of adequate technical colleges' teachers in number and quality will influence the extent of technical education programme implementation. Without adequate number and quality of technical college teachers the expected objectives of skill acquisition may hardly be achieved in spite of the quantity and quality of textbooks, fund, equipment etc. Also Adeyemi and Aviomoh (2004), expressed that academic staff are the most important element of any institutions and their number and quality affect the efficiency of teaching and learning process. Technical Education programme in Nigeria evolved in response to technological and industrial needs of the people and the training of individuals to acquire practical skills, knowledge and attitudes essential for employment in a given occupation. This is why governments, institutions, and managements emphasize the need for practically oriented technical education curriculum and the need also to provide effective teaching of technical subjects in Nigerian colleges (Nkweke, 2007). The teacher is the greatest single factor in the teaching and learning process. No technique, method, device

or gadget can guarantee success without a qualified teacher. The more qualified and better trained the teachers are, the easier it is to impact the knowledge and train students (Miller 2011).

Availability of Plumbing and Pipe Fitting Materials

Apart from the human, a key factor in the effective delivery of teaching and learning is the availability and adequacy of material resources. Garba (2013) stated that material resources are those materials that help teachers to carry out his task of imparting knowledge effectively. Nwandu (2004) sees instructional resources as materials, gadgets or equipments that can be used for teaching and learning to make lesson clear and meaningful to the learner. Instructional materials can be classified in many different ways as used in plumbing and pipe fitting trade. They are classified into projectable and non projectable materials. Visual instructional materials illustrate visual stimuli and are easily available in an environment. Projectable visual include slides, filmstrips and overhead projector. Non-projectable visual include drawing, sketches, diagram, charts, lesson plan, model and life spacemen. In brick/block laying and concreting trade, many naturally occurring substance such as clay, sand, gravel, timber, limestone, slate, stone, thatch and straw etc, are often used as instructional materials. For effective selection of appropriate instructional material, Gana, as reported in Garba (2013) outlined the following criteria to be followed in selection of instructional materials:

1. The material should reflect same scholarship and should retain vital original ideas.
2. The material should cover the topic and extensively as appropriate to the class to promote well-developed concept and adequacy of information.
3. The material should be relevant to the objectives of the course content and prescribed curriculum.
4. The selection should consider individual differences and build up sequentially in line with principles of simple to complex, known to unknown. (pp. 45). Selection should therefore be based on valid teaching purposes and uniqueness of the group of learners. Darling-Hammand (2000) reports that adequate and sound instructional equipment is one of the pre-requisition for effective practical instruction.

RESEARCH METHODOLOGY

A survey research design was chosen for the study. Two research questions were formulated based on the purpose of the study. The population of study consisted of 5 principals, 5 workshop assistants and 103 NTC III Students of plumbing and pipe fitting trade in Yobe State technical colleges. A checklist was used as instrument for data collection. Three experts from department of technology education school of science and technology education validated for both face and content validity of the instrument, and data collected were analyzed using mean and simple percentage.

RESULTS AND DISCUSSION

The results of the study are presented in tables, based on the research questions.

Research question 1: *What is the adequacy of plumbing and pipe fitting teachers in Yobe State Technical Colleges?*

Table 1 presents participants' responses on adequacy of plumbing and pipe fitting teachers in Yobe State Technical Colleges. The percentage of the teachers in Technical Colleges B, C, and E are 100% adequate. This is termed adequate because it meets the National Board for Technical Education (NBTE) Standard of one plumbing and pipe fitting (PPF) teacher for every 20 PPF students. Unlike in Technical Colleges A and D, where they have 60 and 50 % respectively, showing the in adequacy level of the teachers.

Research question 2: *What is the availability of plumbing and pipe fitting materials in Yobe State Technical Colleges?*

Table 2 presents the mean responses of PPF III Students and Workshop assistants on the availability of PPF materials in Yobe State Technical Colleges. The table revealed that materials (PVC pipe, galvanized pipe, cement, rubber) with mean value of 4.50 and above shows that they were always available in the Technical Colleges.

Table 1: The Adequacy of Plumbing and Pipe Fitting Teachers in Yobe State Technical Colleges

S/n	GSTC	NBTE bench mark of teachers for 20 students	PPF students enrolment in the school	Number of PPF teachers in the school	Percentage available in the school.	Remark
1.	GSTC A	1	100	3	60	Inadequate
2.	GSTC B	1	76	5	100	Adequate
3.	GSTC C	1	28	5	100	Adequate
4.	GSTC D	1	21	2	50	Inadequate
5.	GSTC E	1	25	2	100	Adequate

Table 2: Mean Responses of Plumbing and Pipe Fitting Trade NTC III Students and Workshop Assistants on the Availability of Plumbing and Pipe Fitting Materials in Yobe State Technical Colleges

S/n	Material	$\bar{X}$	Remark
1	Slides	1.40	not available
2	Filmstrips	1.68	not available
3	Drawing	4.10	available
4	Diagram	4.26	available
5	Charts	3.89	available
6	Models	3.78	available
7	Poster	3.73	available
8	PCV pipe	3.6	available
9	S. pipe	4.94	available
10	G.Pipe	4.94	available
11	Cement	4.94	available
12	Hose	4.48	available
13	Rubber	3.73	available
14	Tube	4.62	available
15	Wood (2x2)	3.31	available
16	Cast IP	3.32	available
17	Nail	4.73	available
18	Sand	3.00	available
19	Purtin	3.31	available
20	Tiles	2.84	not available
21	Eng. bricks	2.47	not available
22	Block	3.63	available
23	Water storage tank	3.73	available
24	Buckets	4.47	available

DISCUSSIONS OF THE FINDINGS

The percentages of Plumbing and pipe Fitting teachers in B,C and E Technical Colleges in Yobe State were 100% adequate, in relation to NBTE benchmark. This shows the adequacy level of PPF teachers in some Technical Colleges. This is in agreement with Azuka (2003) who posited that the success of any educational programme depends to a large extent on the availability and adequacy of teachers and instructional materials. Supporting this view, Maduke (2007) opined that since teachers are the pillars of any educational programme, there quality and adequacy cannot be under estimated.

The findings of this study revealed that PPF materials such as gravel, sand, laterite, cement, limestone, , wood, ceiling, charts, planks, nails, diagram, drawing, posters, purling, water storage tank, buckets and blocks are available in all the Technical Colleges, while materials such as : slides,

firm strips, , tiles and engineering bricks, are not available in the technical colleges. This is in agreement with Jaji (2011), who asserted that availability of instructional resources promote effective teaching and learning activities in schools, while their inadequacy and / or unavailability may affect the academic performance of the learners negatively.

The findings of this study have some educational implications. It reveals that Technical colleges have PPF instructional resources but they are inadequate when compared to the population of the students. Moreover, the PPF equipment is not frequently used by the teachers in their classroom instructions. These findings have important implication for NBTE, Technical Colleges' management, teachers, students in Technical colleges.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made:

- That PPF teachers should be made adequate in GSTC A, and GSTC D respectively
- The Yobe State Government through Science and Technical School Board should make fund available to the colleges for equipping the PPF workshops with adequate PPF materials, tools and equipment.
- To the NBTE, improved funding to Technical colleges for the procurement of adequate PPF instructional resources will lead to the increase in the number of PPF instructional resources available in Technical Colleges.

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