



Development Of An Instrument For Evaluating Performance Of Teachers Of Electrical Installation And Maintenance Works And Enhancing Quality Education In Science And Technical Colleges In North-Eastern State Of Nigeria

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ABSTRACT

This study was designed to develop an Instrument for Evaluating Performance of Teachers of Electrical Installation and Maintenance Works in Science and Technical Colleges. Four research questions and four hypotheses were posed to guide the study. A descriptive survey research design was employed for the study. A population of 590 respondents, consisting of 50 administrators, 60 technical teachers and 480 National Technical Certificate students (NTC III 2007/2008) were used for the study in Science and Technical Colleges in North Eastern States of Nigeria. Sixty-seven items questionnaire was developed for the study. The reliability coefficient of 0.64, 0.70, 0.79 and 0.70 for sections A B C and D respectively were established. The findings of the study revealed that: (1) 67 items on the questionnaire were found appropriate and required for evaluating performance of teaches of EIMW, (2) The developed instrument was found reliable, it yielded a reliability coefficient of 0.71, (3) the result of the four null hypotheses revealed that there is no significant difference between the mean opinions of all the groups of respondents on appropriate and required items for evaluating performance of teachers of EIMW (4) the developed instrument will serve as a benchmark for evaluating performance of teachers of EIMW in Science and Technical colleges. The results of this study have implications for Management of Boards of science and Technical Colleges and other relevant bodies. There is the need to consider evaluating performance of teachers of EIMW using this newly developed instrument in order to determine their strengths and weaknesses in carrying out their professional duties. The researcher recommended that the result of this study be made available to Management of Boards of Science and Technical Colleges for their consideration as an alternative appraisal form.

Keywords: Instrument, Evaluation and Performance.

INTRODUCTION

Instrument is a term defined by various scholars in different ways. According to Sinclair (1992) an instrument is a tool or device that is used to do a particular task. Hornby (2006) defined an instrument as something that is used by people in order to achieve a purpose. Thus, an instrument could be defined as a device used for a particular task especially for scientific work. It is a thing that makes something to happen.

Uzoagulu (2006) described an instrument as the appliance which enables one to obtain set of numbers for some observations made in physical sciences and social sciences. Physical sciences involved using instruments to determine physical features or attribute of objects or materials. That is determining length, width, height, weight, volume of an object. Social sciences involved mental evaluation seeking to

determine behaviour attributes or changes or features of the individual in terms of how much learning has been acquired by a learner.

Instruments are developed and used in different fields such as engineering, military, physical science, medicine, education, and other fields, whose activities involve evaluation in order to make a decision. In making decisions on programme, personnel and performance, evaluation is vital. According to Okoro (1991) evaluation can be viewed as:

a process of collecting and processing data relating to an educational programme, on the basis of which decision can be made about the programme. The data may be objective description of goals, environment, personnel, methods and content and recorded personal judgements of the quality and appropriateness of the goals, inputs and outcomes. Evaluation can be defined as the appraisal of the worth and value of a thing, action, and the making of appropriate decision on the basis of such appraisal. Human beings are always faced with evaluation decisions. When teachers choose one method of teaching over another, they do so, on the basis of an evaluation of the factors involved and the objectives to achieve. Teachers do administered exams to students, marked, and scored the performance of students on basis of the scores of the students in an exam decision is made. Whether the students have passed or failed the examination (p.5).

Evaluation in education involves the collection of data and the use of such data to assess success and failure of a programme or performance. Success and failure could be assessed using an instrument. In the past evaluation was seen only in terms of evaluating students 'performance. In teaching and learning situation, before evaluating the performance of students, the learners have to be taught. During the process of teaching students skills, knowledge and attitudes, teachers perform activities such as lesson preparation and delivery, conduct practical in workshops, maintain equipment, tools evaluate students outcomes, provide guidance and career information to the students. According to Olaitan, Nwachukwu, Onyemachi, Igbo and Ekong (1999) performance is defined as an impact of groups of activities performed towards the achievement of learning outcome. Teaching involves performing a group of activities by the teacher, which can be viewed in terms of teacher's role. Teacher's performance is however, based on the teacher's role. Havighurst (1981) posits seven roles performed by the teachers in the school. These roles are:

- (i) Mediator of learning,
- (ii) Disciplinary and control of student behaviour,
- (iii) Parents substitute,
- (iv) Confidant to students,
- (v) Organizer of curriculum,
- (vi) Scholar and research specialist, and
- (vii) Member of teacher's organization.

With reference to the teacher in formal education, Lassa (1993) stated that the teacher is the initiator of the learning process, the facilitator of the learning skills, the coordinator of the learning sequence, the assessor of the learning efficiency, and indeed the pivotal element in the entire educational development. The roles of teachers of electrical installation and maintenance works would be based on the electrical engineering trades that make up electrical installation and maintenance works (EIMW). The electrical engineering trades are: domestic and industrial installation, cable jointing and battery charging, and electrical machines.

An instrument for evaluating roles or performance of teachers of EIMW needs to be developed based on educational objectives. Educational objectives are based on the goals to teacher's education which is derived from the overall philosophy of Nigeria. According to Nigeria High Commission (Ottawa, 2008) the national policy on education was formulated in realization that education is the greatest force or instrument that can be used to bring about change. It is also the greatest investment that a nation can make for the development of its economic, political, sociological and human resources. National Policy on Education (Federal Republic of Nigeria, 2004, 2008, 2014) stated that the philosophy of Nigeria is to:

- (a) Live in unity and harmony as one indivisible, indissoluble, democratic and sovereign nation founded on the principles of freedom, equality and justice.
- (b) Promote inter-African solidarity and world peace through understanding (p.6)

The national philosophy is used to produce the goals of teacher education. The goals of teacher education are to:

- (a) Produce highly motivated, conscientious and efficient classroom teacher's for all levels of our educational system,
- (b) Encourage further the spirit of enquiry and creativity in teachers,
- (c) Help teachers fit into social life of the community and the society at large and enhance their commitment to national goals,
- (d) Provide teachers with the intellectual and professional background adequate for their assignment and make them adaptable to changing situation,
- (e) Enhance teacher's commitment to the teaching profession (FRN, 2004 P.39).

In order to realize or achieve goals of teacher education, tertiary institutions are set up by States and Federal Government to train teachers in different fields of specialization leading to the award of certificate. Aliyu (1992), National Commission for Colleges of Education (NCCE, 2003), and FRN (2004) stated that teachers are professionally trained in fields like general education, science, social science, vocation and technical education among others.

According to FRN (2004) the under listed institutions shall give the required professional training needed by teachers: Colleges of Education, Faculties of Education, Institutes of Education, National Teachers Institutes, Polytechnics, National institute for Nigerian language (NINLAN), National mathematics Centre (NMC).

Aliyu (1992) stated that teachers professionally trained in various fields of specialization on completion of their specified courses in the programme, are certificated with qualifications as Nigerian Certificate of Education (NCE), Bachelor degree, master's degree and Doctor of Philosophy Industrial technology education among others. Aliyu (1992) observed that teachers having been certificated are employed by the civil service at State and Federal level through the Federal Ministry of education and Science and technical schools boards.

Teachers employed with NCE Certificate are posted to schools to teach introductory technology at junior secondary school while technical teachers with bachelor degree in technology education are posted to teach at senior secondary schools and science and technical colleges.

Technical teachers of electrical installation and maintenance works (EIMW) performed certain activities, while teaching electrical engineering trades (EET) to student's in science and technical Colleges. Aliyu (1992) enumerated some of the activities performed by teachers as imparting skills, knowledge and attitudes of the subject matter, using various teaching methods to facilitate learning carrying out administrative activities as guidance, provide career information, welfare to students, manage instructional materials, keep school records, assess students and provide progress report and inculcate right attitudes and values (Psycho-social aspects) to the students.

Developing an instrument for evaluating performance of teachers of EIMW will need to be based on electrical engineering trade functions, administrative functions, pedagogical principles, attitudes and values (psycho-social aspects). Teachers teach students to acquire skills, knowledge and attitude in electrical engineering trades (EET). Performance of teachers will have an impact on students' outcome in electrical engineering trades (EET) among others. Therefore, teachers who teach students to acquire and apply skills, knowledge and attitudes in EET in science and technical colleges need to be evaluated. The teachers need to be evaluated so as to monitor their performance.

How are the performances of teachers of EIMW being evaluated? Aliyu (1992) and NCCE(2003), (2012) stated that teachers while undergoing professional training are evaluated using test, assignment, experiment, project among others. At present the performance of teachers teaching trade skills in science and technical colleges are evaluated using Annual Performance Evaluation Report (APER General, 1976). APER evaluate general performance of teachers irrespective of their area or field of specialization. This suggest that there is need to develop an instrument for evaluating performance of teachers based on their teaching subject, course and modules, in addition to APER. According to National Business and Technical Examination Board (NABTEB, 2007) a professional trained teacher of EIMW should possess skills, knowledge and attitudes in electrical engineering trades (EET) and other trade related courses like

building and engineering drawing. Olaitan (1996) stated that teachers need to possess impact and evaluate skills, knowledge and attitudes in EET and related trade courses using modules. Teachers of EIMW need to possess and apply pedagogical principles, administrative principles and theories in teaching students trade skills. The teachers need to possess personal attributes (or psycho-social aspects) that can be inculcated into the students in science and technical colleges.

Performances of teachers of EIMW as human resources are part of the input evaluation. Input evaluation is a sub-component of context, input process and product evaluation (CIPP) model. Okoro (1991) stated that input evaluation seeks to describe the human and material resources put into the educational programme in achieving the objectives of the programme. Teachers of EIMW are the human resources employed to teach students in science and technical colleges. The availability of teachers of EIMW will provide an opportunity to evaluate their performance. Developing an instrument for evaluating performance of teachers of EIMW in teaching electrical engineering trades is vital. The instrument when developed will assist in monitoring the performance of teachers. This study seeks to develop an instrument for evaluating performance of teachers of Electrical Installation and Maintenance Works (EIMW) in Science and Technical Colleges in North-Eastern States of Nigeria.

Statement of the Problem

Teachers teach students to acquire skills, knowledge and attitudes in Electrical Installation and Maintenance Works (EIMW) in Science and Technical Colleges. Science and technical colleges provide facilities and admit students. The interaction between facilities and students is brought to play through the performance of teachers. Wahala (2001) argued that the presence of facilities and students would hardly bring about acquisition of skills, knowledge and attitudes without teacher's performance.

Teachers remain influential in the teaching and learning process. Facilities assist in instructional process, while teachers provide primary sources of direction in the teaching and learning situation. There is need to evaluate performance of teachers using an instrument. Alake (1996) stated that performance of teachers could have a profound influence on students' outcome and services to be rendered by the students to the public in electrical engineering trades (EET). Thus, it raises the question; how are performances of teachers of EIMW in teaching students electrical engineering trades evaluated? Although performances of teachers are presently being evaluated based on general instrument called Annual Performance Evaluation Report (APER), the APER only deal with general performance of teachers irrespective of their area or field of specialization. This suggests that there is the need to develop an instrument for evaluating performance of teachers based on teaching subject, course, and modules in addition to APER.

This is because an instrument for evaluating performance of teachers of EIMW needs to be based on their knowledge and skills in electrical trades, pedagogical principles, administrative functions and psycho-social aspects in teaching students. The question the study intends to answer on completion is: what is the appropriate instrument for evaluating performance of teachers of EIMW in Science and Technical Colleges in North-Eastern States of Nigeria?

Purpose of the Study

The purpose of the study is to develop an instrument for evaluating performance of teachers of Electrical Installation and Maintenance Works (EIMW) in Science and Technical Colleges in North-Eastern States of Nigeria. The specific objectives of the study are to:

1. Develop an instrument for evaluating performance of teachers of EIMW in imparting electrical engineering trades (EET) skills to students in science and technical colleges.
2. Develop an instrument for evaluating performance of teachers of EIMW in using pedagogical principles in imparting EET trades to students in science and technical colleges.
3. Develop an instrument for evaluating performance of teachers of EIMW in their administrative functions in imparting EET trades to students in science and technical colleges.
4. Develop an instrument for evaluating performance of teachers of EIMW in the psycho-social aspects in imparting EET trades to students in science and technical colleges.

Research Questions

The study consciously set out to answer the following questions:

1. What are the appropriate items required for evaluating performance of teachers of EIMW in imparting EET to students in science and technical college?
2. What are the appropriate items required for evaluating performance of teachers of EIMW in using pedagogical principles in imparting EET to students in science and technical colleges?
3. What are the appropriate items required for evaluating performance of teachers of EIMW in administrative functions in imparting EET to students in science and technical colleges?
4. What are the appropriate items required for evaluating performance of teachers of EIMW in psycho-social factors in imparting EET to students in science and technical colleges?

Research Hypotheses

The following hypotheses were tested at 0.05 level of significance:

1. There is no significant difference between the mean opinions of administrators and technical teachers on the appropriate items required for evaluating performance of teachers of EIMW in imparting EET to students in science and technical colleges.
2. There is no significant difference between the mean opinions of administrators and technical teachers on the appropriate items required for evaluating performance of teachers of EIMW in using pedagogical principles in imparting EET to students in science and technical colleges.
3. There is no significant difference between the mean opinions of administrators and technical teachers on the appropriate items required for evaluating performance of teachers of EIMW in administrative functions in imparting EET to students in science and technical colleges.
4. There is no significant difference in the mean opinions of administrators, technical teachers and students on the appropriate items required for evaluating performance of teachers of EIMW in psycho-social factors in imparting EET to students in science and technical colleges.

Literature Review

Related literature reviewed was based on electrical engineering trade functions of teachers of EIMW in science and Technical Colleges. Electrical engineering trade functions in this study mean activities performed by teachers of electrical installation and maintenance works (EIMW) in teaching students component trades. The component trades are called electrical engineering trades (EET). According to National Business and Technical examination Syllabus (NABTEB, 2007:p.26) electrical engineering trade functions are:

Draw electrical installation from a given house plan. Wire an installation of two lighting point controlled by independent switches. Wire a lighting point is controlled by two (2) way switches. Identify symbols used in electrical drawing plan. Interpret distribution system from drawing plan. State advantages and disadvantages of conduit. List and explain types of conduit. Teach students IEE regulations and protective devices i.e circuit breakers. State types of installation tests, i.e. polarity test. Discuss electrical lamps. Demonstrate the wiring system for industrial installation. State the use of MICC cable. State I.E.E. safety regulations on industrial installation. Cable joining forms part of electrical engineering trades. Some of the electrical engineering trade functions of teachers are: Identify tools and materials used for cable joining, state the use of tools like blow lamp. Describe the methods of cable joining. State advantages and disadvantage of conducting materials. Demonstrate how to make a cable joint, state the application of solder to cable joints. Apply I.E.E. regulations on cable joints (NABTEB Syllabus, 2007: 269).

Battery charging is another aspect of electrical engineering trades. A battery is that which stores chemical energy and converts it into electrical energy. Thus, teachers teach students skills and knowledge in battery charging. An instrument would be developed on the electrical engineering trade functions of teachers in battery charging. The trade functions of teachers are: identify types of cells, explain the working principles of primary and secondary cells, identify features of secondary cells, construct a simple cell or battery, use charger to demonstrate how to charge a secondary cell. Apply I.E.E. regulations in charging

situations like room, laboratory and workshop. Explain use of control gears like switches, fuses and circuit breakers in charging conditions (NABTEB, 2007:272).

Another vital component of electrical engineering trades is electrical machines. Electrical machines are devices that develop force of attraction and of alignment (Thornes, 1995). According to Wilson (1997) and Bird (2001) electrical machines are classified into generator and motors. Generator converts mechanical energy into electrical energy while electric motor converts electrical energy into mechanical energy.

Electrical machines such as generators and motors have windings (Matt, 1980; Morley and Huges, 1985). The windings are made from copper materials capable of conducting current. Donnelly (1980) and Thompson (1983) stated that the importance of windings is viewed on the basis of their application in electrical machines. The windings are also called coils, and are used for main fields and for armature fields. Technical teachers teach students skills, knowledge and attitudes in electrical machines in science and technical colleges. Literature focused on pedagogical and psycho-social function of teachers of EIMW. Works of Okoro (1993), Garba (1993), Yalams (2001) were useful in the review. Rating scales and procedures in works of Bichi (2007), Diraso and Ndomi (2007) were employed in the study.

RESEARCH METHODS

Research Design

This study employed descriptive survey research design. According to Best and Kahn (2002) survey design is used in a situation where the study employs questionnaire to determine opinions, preferences, attitudes and perception of people about an issue.

Population of the Study

The population of the study was 590. It consisted of 50 administrators, 60 technical teachers and 480 National Technical Certificate (NTC III 2007/08 Session). Furthermore, the entire population of 590 was used for the study. Uzoagulu (1998) maintained that in a study using the whole subjects or objects, sample and sampling technique are not employed, because total population was used, there was no need for sampling. Consequently, in this study, the whole population was employed.

Instrument for Data Collection

Instrument for data collection was a questionnaire named, Format for Eliciting Information on Appropriate Items required for Evaluating Performance of Teachers Rating Scale (FEPTRS) for teachers of Electrical Installation and Maintenance Works. The format was structured on a five-point rating scale. The response categories were: Very Highly Required (VHR) 5 points, Highly Required (HR) 4 points, Moderately Required (MR) 3 points, Low Required (LR) 2 points and Least Required (LR) 1 point.

Method of Data Collection

The format as a questionnaire was administered to the respondents with the help of six research assistants. The direct administration enabled the researcher and the co-researchers to interpret the items in the format to the students at National Technical Certificate III for them to respond to items in section D.

Method of Data Analysis

Data obtained from the respondents was analysed using mean (\bar{X}) to answer research questions. Z-test and one-way analysis of variance (ANOVA) was used to test the four null hypotheses for the study at 0.05 level of significance. The data for the study will be analysed using Excel Solver Software Package Result (ESSP).

PRESENTATION OF RESULTS

The results of the study are presented based on the research questions and hypotheses.

Research Question 1: *What are the appropriate items required for evaluating performance of teachers of EIMW in teaching electrical engineering trades (EET) to students?*

Table 1: Mean opinions of Administrators and Technical Teachers on Items Required for Evaluating Performance of Teachers in EET.

| S/N | Items on Electrical Engineering Trades | \bar{X}_1 | \bar{X}_2 | \bar{X}_3 | Remarks |
|-----|---|-------------|-------------|-------------|---------|
| | | N = 50 | N = 60 | | |
| 1 | Interpret symbols in electrical drawing | 4.18 | 3.98 | 4.08 | R |
| 2 | Indicate position of accessories in electrical drawing | 3.66 | 3.50 | 3.58 | R |
| 3 | Teach students safety precaution in electrical w/shop | 3.56 | 3.80 | 3.68 | R |
| 4 | Identify sizes of different cable | 3.64 | 3.90 | 3.77 | R |
| 5 | State functions of wiring accessories e.g switches | 3.50 | 3.78 | 3.64 | R |
| 6 | Apply I.E.E. regulation to protect surface wiring | 3.56 | 3.88 | 3.72 | R |
| 7 | Identify types and sizes of conduit | 3.72 | 3.50 | 3.61 | R |
| 8 | State advantage and disadvantages of conduit Wiring system | 3.62 | 3.65 | 3.63 | R |
| 9 | Terminate conduit at metal box | 3.83 | 3.87 | 3.85 | R |
| 10 | Carry out installation of simple protective device like fuse | 3.30 | 3.57 | 3.44 | R |
| 11 | Describe features of protective devices | 4.04 | 3.83 | 3.94 | R |
| 12 | Use megger meter to carry out test like polarity | 3.48 | 3.68 | 3.58 | R |
| 13 | Terminate MICC cable using appropriate | 4.04 | 3.72 | 3.88 | R |
| 14 | State advantages and disadvantages of MICC cable | 3.40 | 3.88 | 3.64 | R |
| 15 | Describe trunking wiring system | 3.92 | 3.92 | 3.92 | R |
| 16 | State advantages and disadvantages of trunking Wiring system | 3.66 | 3.97 | 3.69 | R |
| 17 | Apply I.E.E. regulation trunking wiring System should be protected from corrosion | 3.72 | 3.97 | 3.85 | R |
| 18 | Dram diagram of cable joints | 3.66 | 3.72 | 3.69 | R |
| 19 | Carry out simple cable joint | 3.28 | 3.73 | 3.51 | R |
| 20 | Use tin-man solder on cable joint | 3.70 | 3.73 | 3.72 | R |
| 21 | Dram diagram of armoured cable | 3.50 | 3.77 | 3.64 | R |
| 22 | Terminate armoured cable | 3.60 | 3.50 | 3.55 | R |
| 23 | Draw construction features of secondary cells | 4.08 | 3.65 | 3.87 | R |
| 24 | Describe the principles of operation of a secondary cell | 3.78 | 4.12 | 3.95 | R |
| 25 | Able to charge secondary cells | 3.96 | 3.40 | 3.68 | R |
| 26 | Apply I.E.E. regulation in a charging room | 3.78 | 4.12 | 3.95 | R |
| 27 | Sketch diagram of construction feature of an Electrical machine | 3.94 | 3.80 | 3.87 | R |
| 28 | State basic principles of operation of an electrical machine | 3.72 | 3.85 | 3.79 | R |
| 29 | Carry out maintenance of electrical tools | 4.00 | 3.92 | 3.56 | R |
| 30 | Use fire extinguisher in case of fire outbreak | 3.64 | 3.80 | 3.72 | R |
| 31 | Apply first Aid in case of accident in electrical Workshop | 3.90 | 3.78 | 3.84 | R |

Table 1 shows that 5 items were rated 4.00 and above. The rest of the items were rated 3.30. This shows that all respondents agreed that all items in table 1 are appropriate and required of an instrument for evaluating performance of teachers of EIMW in EET). Thus, all items in table 5 should be included in the instrument.

Research Question 2

What are the appropriate items required for evaluating performance of teachers of EIMW in using pedagogical principles to teach students EET?

Table 2: Mean opinions of Administrators and Technical Teachers on items required for Evaluating Performance of Teachers of EIMW in their use of Pedagogical Principles

| S/N | Items on Electrical Engineering Trades | X ₁ N = 50 | X ₂ N = 60 | X ₃ | Remarks |
|-----|---|--------------------------|--------------------------|----------------|---------|
| 32 | Use lecture method to clarify laws, concepts, etc | 4.12 | 3.97 | 4.05 | R |
| 33 | Apply demonstration method to impart skills to students | 4.04 | 3.87 | 3.96 | R |
| 34 | Take students to field trip | 3.66 | 3.77 | 3.72 | R |
| 35 | Give students assignment in theory and practical lessons | 3.04 | 3.86 | 3.45 | R |
| 36 | Employ questioning technique to allow students participation in lessons | 3.92 | 3.70 | 3.81 | R |
| 37 | Employ teaching aids to facilitate learning among students | 3.48 | 3.82 | 3.65 | R |
| 38 | Use project method for skills acquisition by students | 4.12 | 4.00 | 4.06 | R |
| 39 | Use tutorials to reinforce learning among students | 3.78 | 3.72 | 3.75 | R |
| 40 | Assess students through tests, etc | 3.52 | 3.67 | 3.60 | R |
| 41 | Provide feedback to students, school and parents | 3.32 | 4.07 | 3.70 | R |

Table 2 revealed that the mean responses of the groups are from 3.04 and above. This signifies that all the items in Table 2 have been rated as appropriate and required by both groups of respondents. Thus all the 10 items are to use for evaluating performance of teachers of EIMW in their use of pedagogical principles.

Research Question 3: What are the appropriate items required for evaluating performance of teachers of EIMW in administrative functions in teaching EET to students?

Table 3: Mean opinions of Administrators and Technical Teachers on Items Required for Evaluating Performance of Teachers of EIMW in their Administrative Functions

| S/N | Items on Electrical Engineering Trades | X ₁ N = 50 | X ₂ N = 60 | X ₃ | Remarks |
|-----|---|--------------------------|--------------------------|----------------|---------|
| 42 | Manage class | 3.92 | 3.70 | 3.81 | R |
| 43 | Manage instructional materials | 3.18 | 3.85 | 3.52 | R |
| 44 | Supervise students inn learning activities | 3.70 | 3.97 | 3.84 | R |
| 45 | Liaise with parents on students matters | 3.54 | 3.95 | 3.75 | R |
| 46 | Provide good leadership to students | 3.96 | 3.73 | 3.76 | R |
| 47 | Prepare statement of behavioural objectives of a lesson | 3.60 | 3.92 | 4.32 | R |
| 48 | Develop lesson based on subject matter | 4.12 | 4.52 | 4.13 | R |
| 49 | Present lesson sequentially to students | 4.13 | 4.12 | 3.80 | R |
| 50 | Keep students performance records | 3.86 | 3.73 | 3.22 | R |
| 51 | Provide career information to students | 3.96 | 3.68 | 3.82 | R |

Table 3 showed that the mean responses of all the groups are above 3.00. This indicates that all the items in Table 3 are rated appropriate and required by both groups of respondents; thus all the items are to be used for evaluating performance of teachers of EIMW in their administrative functions.

Research Question 4

What are the appropriate items required for evaluating performance of teachers of EIMW in their psycho-social factors in teaching EET to students?

Table 4: Mean opinions of Administrator, Technical Teachers and Students and Items Required for Evaluating Performance of Teachers of EIMW in their Psycho -Social factors.

| Remarks | | \bar{X}_1 | \bar{X}_2 | \bar{X}_3 | \bar{X}_4 | |
|---------|---|-------------|-------------|-------------|-------------|---|
| S/N | Items on Electrical Engineering Trades | N = 50 | N =60 | N=480 | | |
| 52 | Patience | 3.90 | 4.05 | 3.52 | 3.82 | R |
| 53 | Punctuality | 3.72 | 3.88 | 3.58 | 3.73 | R |
| 54 | Neat in appearance | 3.76 | 3.92 | 3.78 | 3.78 | R |
| 55 | Self-Control | 3.98 | 3.60 | 3.57 | 3.72 | R |
| 56 | Friendliness | 3.68 | 3.85 | 3.43 | 3.65 | R |
| 57 | Respect for others | 3.96 | 3.52 | 3.57 | 3.66 | R |
| 58 | Allow students to ask or answer questions | 3.74 | 3.82 | 3.42 | 3.66 | R |
| 59 | Creativity | 3.42 | 3.49 | 3.50 | 3.47 | R |
| 60 | Competence | 3.98 | 3.70 | 3.45 | 3.70 | R |
| 61 | Firmness | 3.72 | 3.43 | 3.38 | 3.51 | R |
| 62 | Numerical ability | 3.42 | 3.70 | 3.65 | 3.59 | R |
| 63 | Accept duty | 4.06 | 3.67 | 3.48 | 3.74 | R |
| 64 | Oral expression | 3.78 | 3.50 | 3.60 | 3.63 | R |
| 65 | Honest | 3.70 | 4.03 | 3.68 | 3.80 | R |
| 66 | Good judgment | 4.02 | 3.75 | 3.64 | 3.80 | R |
| 67 | Respect others' opinion | 3.96 | 3.52 | 3.51 | 3.66 | R |

Table 4 reveals that all the items have been rated appropriate and required by both groups of respondents, since calculated means are above 3.00. This indicated that all the items in Table 4 are to be used for evaluating performance of teaching electrical engineering trade to students, in science and technical colleges.

Hypothesis 1

There will be no significant difference between the mean opinions of administrators and technical teachers on the appropriate items required for evaluating performance of teachers of EIMW in electrical engineering trades functions.

Table 5: z-Test Result Comparing Mean Opinions of Administrators and Technical Teachers on Items Required for Evaluating Performance of Teachers in EET Functions.

| Group | N | \bar{X} | σ | Standard Error | z-cal | z-crit | Decision |
|--------------------|----|-----------|----------|----------------|-------|--------|----------|
| Administration | 50 | 3.67 | 1.08 | 1.09 | 0.08 | 1.96 | Accept |
| Technical Teachers | 60 | 3.76 | 8.41 | | | | |

Table 5 shows that z-calculated value of 0.08 at 0.05 level of significance is less than the critical value of 1.96. Therefore, the null hypothesis is accepted. This indicates that there is no significant difference between the opinions of administrators and technical teachers on items of EET to be used for evaluating performance of teachers of EIMW in science and technical colleges.

Hypothesis 2

There will be no significant difference between the mean opinions of administrators and technical teachers on the appropriate items required for evaluating performance of teachers of EIMW in their use of pedagogical principles.

Table 6: z-Test Result Comparing Mean Opinions of Administrators and Technical Teachers on Items Required for Evaluating Performance of Teachers of EIMW in their use of Pedagogical Principles.

| Group | N | \bar{X} | σ | Standard Error | z-cal | z-crit | Decision |
|--------------------|----|-----------|----------|----------------|-------|--------|----------|
| Administration | 50 | 3.67 | 0.88 | 0.18 | 0.39 | 1.96 | Accept |
| Technical Teachers | 60 | 3.83 | 1.02 | | | | |

Table 6 indicates that z-calculated value of 0.39 at 0.05 level of significance is less than the critical value of 1.96. Therefore, the null hypothesis is accepted and the alternative rejected. This implies that there is no significant difference between the mean opinions of administrators and technical teachers on the items required for evaluating performance of teachers of EIMW in their use of pedagogical principles in teaching students EET in science and technical colleges.

Hypothesis 3

There is no significant difference between the mean opinions administrators and technical teachers on the appropriate items required for evaluating performance of teachers of EIMW in their administrative functions.

Table 7: z-Test Result Comparing Mean Opinions of Administrators and Technical Teachers on Items Required for Evaluating Performance of Teachers of EIMW in their Administrative Functions

| Group | N | \bar{X} | σ | Standard Error | z-cal | z-crit | Decision |
|--------------------|----|-----------|----------|----------------|-------|--------|----------|
| Administration | 50 | 3.71 | 0.98 | 0.17 | 0.53 | 1.96 | Accept |
| Technical Teachers | 60 | 3.77 | 0.81 | | | | |

Table 7 shows that z-calculated value of 0.53 at 0.05 level of significance is less than the critical value of 1.96. Therefore, the null hypothesis is accepted and the alternative rejected. This implies that there is no significant difference between the mean opinion of administrators and technical teacher’s items required for evaluating performance of teachers of EIMW in the administrative functions in teaching electrical engineering to students in science and technical colleges.

Hypothesis 4

There will be no significant difference in the mean opinions of administrators, technical teachers and students on the appropriate items required for evaluating performance of teachers of EIMW in their psycho-social factors in teaching EET to students.

Table 8: ANOVA result comparing mean opinions of administrators, technical teachers and students on items required for evaluating performance of teachers of EIMW in their psycho-social factors

| Source of Variance | Sum of Square | DF | Mean | F-cal | F-crit | Decision |
|--------------------|---------------|--------|-------|-------|--------|----------|
| Between Groups | 0.0083 | 2 | 0.004 | 0.003 | 3.01 | Accept |
| Within Groups | 758 | 558 | 1.358 | | | |
| Total | 7.58 | 0.0083 | 560 | | | |

Table 8 revealed that an F-calculated value of 0.003 at 0.05 level of significance is less than F-critical value of 3.10. Thus, the null hypothesis is accepted. This implies that there is no significant difference in the opinions of the three groups of respondents on items required for evaluating performance of teachers of EIMW in their psycho-social factors in the teaching electrical engineering trades to students in Science and Technical Colleges.

DISCUSSION OF FINDINGS

The findings of the study are discussed in relation to the findings of the study. The first of finding on appropriate items required on Electrical Engineering Trades (EET) to be used for evaluating performance of teachers of EIMW in Science and Technical Colleges. The finding revealed the items on EET are to be included in the instrument. This is because the items on electrical engineering trades were rated 3.30 and above by all respondents. The finding is in agreement with National Policy on Education (FRN, 2004) states that teachers will be equipped with knowledge, skills and attitudes to enable them perform their duties effectively.

One of the duties performed by teachers of EIMW is to teach students to acquire skills, knowledge and attitudes in EET. Teachers of EIMW need to possess skills during their training to enable them teach the students how to acquire skills in trade subjects. An instrument for evaluating performance of teachers of EIMW should consist of items on EET in order to ensure that teachers of EIMW possess the requisite skills and are demonstrating such skills to the students during practical lessons. According to NABTEB (2007), Electrical Installation and Maintenance Works is made up of electrical engineering trades. Teachers of EIMW should master their subject matter. Mastering electrical engineering trades means possessing the skills and then being able to teach such skills to students in Science and Technical Colleges. The inclusion of items on EET is vital in an instrument for evaluating performance of teachers of Electrical Installation and Maintenance Works.

The second findings on appropriate items required for evaluating performance of teachers of EIMW in their use of pedagogical principles. The finding is in line with educators such as Ahimade (1997), Wondung (2002), Oyetunde (2004), Daudu and Kukwi (2004) and Mangvwat (2004) who stated that for students to be guided to acquire skills, knowledge and attitudes in their learning experiences, teachers should use various methods of teaching (or pedagogical principles). For students to acquire skills, knowledge and attitude in electrical engineering trades (EET), they should be taught using pedagogical principles. The use of various methods of teaching helps students to learn what they have been taught. According to National Policy on Education (FRN, 2004), one of the objectives of Technical and Vocational education is to provide the technical knowledge and vocational skills for necessary agricultural, commercial and economic development. Technical teachers need to use various methods of teaching in guiding the students to acquire vocational skills. Evaluating performance of teachers of EIMW ought to be based on their ability to use pedagogical principles in teaching EET skills to students. This necessitates the inclusion of items on pedagogical principles for evaluating performance of teachers of EIMW in Science and Technical Colleges.

Thirdly, the findings revealed the appropriate items required for evaluating performance of teachers of EIMW in their administrative functions. The items on administrative functions yielded a mean of 3.18 and above from all the groups of respondents. The finding is in agreement with the works of Lassa (1993), Wazis(1994), Wahala (2001), Makeri and Opadeyi (2002) who outlined administrative functions of teachers such as managers, facilitators of learning, parent substitute among others. Furthermore, Teachers Registration Council (T.R.C.N., 2004) agreed that teachers performed administrative functions such as inspiring students to study hard, provide good leadership, keep and maintain records. Technical teachers like those of Electrical Installation and Maintenance Works should be evaluated based on their administrative functions. Evaluating performance of teachers of EIMW using an instrument will help to judge the teachers as to whether they are carrying out their administrative functions or not. This implied that all items on administrative functions should be used for evaluating performance of teachers of EIMW in Science and Technical Colleges.

Fourthly, the findings of the study show that the items of Psycho-social aspects are required and should be used for evaluating performance of teachers of EIMW in their Psycho-social factors. The items on Psycho-social factors were rated 3.18 and above by all the groups of respondents. The finding is in consonance with the work of Yakubu and Jacob (2004) who found out that the affective attributes pre-eminent in teaching and learning processes are friendliness, cooperation, good judgment, creativity, enthusiasm, among others.

Dangana (2007) also came up with affective adjustment competencies needed by graduates of vocational and technical education in Nigeria. These affective adjustment competencies included punctuality, resourcefulness, adaptability, neatness, patience, honesty, among others. An instrument for evaluating performance of teachers of EIMW needs to contain items relating to affective attributes of the teachers in terms of attitudes and characteristics. The National Policy on Education (FRN, 2004) stated that teachers shall be provided with the intellectual and professional background, adequate for their assignment and make them adaptable to changing situations. The personality of the teacher can influence students' learning outcome. Evaluating the personality of the teachers teaching EET to students can help to ascertain whether the teachers of EIMW are relating with the students properly or not in science and technical colleges. The use of appropriate items required on Psycho-social factors in an instrument for evaluating performance of teachers of EIMW is vital and cannot be over-emphasized.

Hypothesis 1 compared the mean opinions of administrators and technical teachers on appropriate items required on EET to be used for evaluating performance of teachers of EIMW in science and technical colleges. The result revealed that there was no significant difference between the mean ratings of the two groups for the items on EET skills. This indicates that the items on electrical engineering trades are required of the instrument. The used of items on electrical engineering trades for evaluating performance of teachers, according to the National Policy of Education (FRN, 2004), would test the professional competency of teachers of EIMW in teaching students electrical engineering trades in Science and Technical Colleges. Hypothesis 2 compared the mean opinions of administrators and technical teachers on appropriate items required for evaluating performance of teachers of EIMW in their use of pedagogical principles. The result revealed that there was no significant difference between the mean ratings of the two groups of respondents on items on pedagogical principles. This implies that all the items on pedagogical principles are appropriate and should be used for evaluating performance of teachers of EIMW in science and technical colleges. Educators like Wondung (2003) and Mangvwat (2004) agreed that pedagogical principles are methods of teaching; teachers employ to teach students skills and knowledge in different areas of studies. Furthermore, they observed that an instrument for evaluating performance of teachers should consist of items on pedagogical principles.

Hypothesis 3 compared the mean opinions of administrators and technical teachers on appropriate items required on administrative functions of teachers of EIMW. The result shows that there was significant difference between the mean ratings of the two groups of respondents for items on administrative functions. This implies that items on administrative functions should be included in an instrument for evaluating performance of teachers of EIMW in science and technical colleges. The results of hypothesis three are in agreement with works of Wahala (2001) which stated that technical teachers carried out administrative functions such as manage class, instructional materials, keep records, among others.

Hypothesis 4 compared the mean opinions of administrators, technical teachers and students on appropriate items required for evaluating performance of teachers of EIMW in their psycho-social factors. The result revealed that there was no significant difference in the mean opinions of the three groups of respondents on items on psycho-social factors. This implies that the items on psycho-social factors are appropriate and required, so the items should be used for evaluating performance of teachers of EIMW. Works of Yakubu and Jacob (2004) pointed out some psycho-social factors possessed by teachers such as patience, honesty, respect for others, friendliness, among others. An instrument for evaluating performance of teachers should include items on psycho-social factors. This implied that all the groups of respondents agreed that all items in the format are appropriate and required, so should be used for evaluating performance of teachers of EIMW in science and technical colleges.

CONCLUSION

Based on the results of the study, the following conclusions are drawn: An instrument for evaluating performance of teachers of EIMW is developed. The developed instrument contained items on EET, pedagogical principles, administrative functions, and psycho-social factors. The instrument is required for evaluating performance of teachers of EIMW in science and technical colleges.

RECOMMENDATIONS

Based on the findings of this study and implications, the followings are hereby recommended for action:

1. Items in the format should be considered for evaluating performance of teachers of EIMW in science and Technical Colleges.
2. The reliable developed instrument should be considered by Management of Board of science and technical colleges as an alternative appraisal form for evaluating performance of teachers of EIMW.
3. The items in the developed instrument should serve as a yardstick/benchmark for evaluating performance of teachers of EIMW by administrators of science and technical Colleges.
4. The instrument developed should be used to determine weakness and strength of performance of teachers of EIMW for further advice and recommendations by administrators in Science and Technical Colleges

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